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CONTENTS

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PRESIDENT FREDERICK H. FOX

PROCEEDINGS
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VOL. XV. FEBRUARY, 1929 NO. 1

CONTENTS

EDITORIAL NOTES AND COMMENT

Our New President. Professor Frederick H. Fox, elected to the presidency of the Society at the annual meeting, is a native of Tennessee, having been born at Chattanooga May 22, 1894. Having obtained his early education in the public schools of his native city and at Baylor Preparatory School, he entered Georgia School of Technology in 1912. At the end of his Sophomore year there he transferred to the Ohio State University, from which he graduated in 1916 with the degree of Bachelor of Engineering.

Starting work as instrument man for the N. C. & St. L. R. R., he afterwards became engineer for the Signal Mountain Traction Co. and the Signal Mountain Land Co. Just about this time the United States entered the World War and Mr. Fox enrolled for the First Officers' Training Camp at Fort Oglethorpe, Georgia, from which he was commissioned Second Lieutenant, Corps of Engineers, August 15, 1917. He served with the 306th and the 319th Engineers, both in this country and abroad, until discharged in the latter part of 1919.

While in France Mr. Fox was detailed to attend the Sorbonne in Paris, at which institution he completed a four months' course with certificate.

Upon returning to the United States he was engaged for one year upon highway location work in Hamilton County, Tennessee. He then entered the teaching field, becoming Instructor in Surveying at Kansas State College for the session of 1920-21. Called to the College of Engineering of Tulane University in 1921 as Assistant Professor of Civil Engineering, he now holds the rank of Associate Professor, having charge of the instruction in Surveying, Railway and Highway Engineering.

A considerable portion of Professor Fox's outside activity has been given to the affairs of the Louisiana National Guard, in which he has been for the past four years Captain of Cavalry, in command of Headquarters Troop, 108th Cavalry.

Professor Fox was engineer in charge of the layout and drainage of the grounds of the new Tulane Stadium, has engaged in highway location and has made industrial surveys for different corporations.

He has served the Society previously as Vice-President and member of the Board of Direction, so we may look forward to a very profitable and successful year under his administration.

Other Officers for 1929. The new Vice-President elected at the annual meeting is Mr. James M. Todd, formerly a member of the Board of Direction. Mr. John H. O'Neill was elected for the three-year term on the Board of Direction. Messrs. Muench and Frost hold over and Mr. Porter as retiring President be-

comes a member of the Board of Direction. Of course, Mr. Muth was re-elected Secretary and Mr. Moses, Treasurer, in recognition of their long years of faithful and efficient service.

Some changes have been made in the standing committees, a list of which will be found on the title page of the *Proceedings.*

Annual Reports. The reports of officers and of the Board of Direction which are published in the February issue of the *Proceedings* each year always contain information which should be of interest to the members of the Society.

The Society, for instance, shows a healthy rate of growth. On January 1, 1928, there were 458 members on the rolls, this year there are 468.

The Investment Fund, consisting of savings account, stocks and bonds, amounts to $7,009.78.

The publication of the *Proceedings* for 1928 cost $1,821.24. Actual revenues from ads. and from sales of copies of the journal amounted to $1,069.72. This leaves the net cost to the Society at $751.52. More ads., if they could be secured, would reduce this amount very materially. With 1929 the *Proceedings* starts in upon the fifteenth year of its publication.

Senior students in Engineering to the number of 72 took advantage of the opportunity to become student members of the Society.

During the year the Society lost two of its veteran members by death, Mr. M. P. Doullut and Chief State Engineer, George C. Schoenberger.

Outstanding Events of the Year. Visit to New Orleans of Western Society of Engineers in January.

Outing and visit to plant of Louisiana Portland Cement Company, now the Lone Star Cement Company.

Visit to new Raymond Machine Switching Exchange of Southern Bell Telephone and Telegraph Company.

Withdrawal from membership in American Engineering Council.

Arrangements made for reciprocal memberships with other engineering societies.

Effective work done by special committee in stopping proposed legislation which would have worked to the detriment of the present laws for the registration and licensing of civil engineers and surveyors.

Establishment of prizes of Junior Membership in the Society to the outstanding member of the graduating class in the engineering schools of Tulane University and the Louisiana State University.

The Smoker. Some weeks before the date of the Annual Smoker you were interrogated by post-card as to whether you would prefer to have:—

"A smoker similar to those in recent years," or

"A smoker of a more sedate character."

Of those who responded the majority voted for the first proposition, to continue the kind of smoker we had been having for a number of years.

Evidently the very efficient Entertainment Committee decided that something in the way of a compromise would be in order. So they moved the show over to the Florentine Room of the Jung Hotel, a very attractive place in which to hold such a function.

The girls who did the vaudeville stunts were more youthful, less sophisticated and more attractive than some of the entertainers of former years, and they brought their mamas to chaperone them.

Professor James M. Robert presided at the speaker's table, and introduced a novel stunt of presenting appropriate souvenirs to certain prominent members of the Society in recognition of their work in some special field of activity.

Mr. Kemper was presented with a model spillway; Messrs. Garsaud and Klorer were presented each with a key to the City of New Orleans; retiring President Porter received two bottles of water labelled "Before" and "After," in recognition of his efficient work in the purification of the Mississippi

River water; Mr. Dusenbury was given a bottle of Herpicide,—we wonder why?

The invited guests who were present at the Smoker were: President A. B. Dinwiddie of Tulane University; Major E. S. J. Irvine, Corps of Engineers, U. S. A., in charge of the Spillway construction; Commander R. E. Cassidy of the U. S. Naval Station, and Major R. C. Haven, local representative of the National Safety Council.

The Bonnet Carre Spillway. Major Irvine's paper, presented at the December, 1928, meeting of the Society and printed in this issue of the *Proceedings*, gives a very complete statement of the problems which enter into the design of this structure and of the various plans which are being investigated, and the experiments being made to secure the necessary data upon which to proceed.

One of the most interesting phases of the problem, and at the same time one of the most difficult of solution, is that of the type of weir section to be used in order to secure reasonable economy in construction and to prevent dangerous scouring at the toe of the dam. Extensive experiments with scale models are being made for the purpose of determining some of the factors entering into the design.

The subject is naturally one of great interest, not only from the point of view of the actual design and construction of the spillway, but to a greater extent, perhaps, from the point of view of the real efficacy of a spillway located at the point in question. It was this latter phase of the subject which brought out most of the discussion after the reading of the paper.

Mr. Kemper believes that the spillway at Bonnet Carre, with the sill at the height as now planned, will never be called upon to function because the Atchafalaya fuse plug levees will go out before the water at the spillway rises to a sufficient height to flow over the sill.

He further believes that there should be two spillways, one above and one below the city; the one above, however, should be located further up the river and should discharge into Lake

Maurepas rather than into Lake Pontchartrain, and should have its sill at natural ground level.

In a discussion, submitted after the meeting, Major Irvine calls attention to the fact that the question of the proper elevation of the sill of the spillway is under investigation, and curves and estimates are being drawn up covering a range of elevations from 8 to 18 feet. These studies are being made, however, from the point of view of the cost of construction rather than from any consideration of the possible effect of the spillway upon flood heights higher up the river.

Mr. Klorer's discussion, also submitted after the meeting, consists of a statement made by him originally before the Flood Control Planning Board, consisting of Major-General Jadwin, Brigadier General Jackson and Mr. Carleton W. Sturtevant. Mr. Klorer is emphatic in his belief that there should be two spillways, one at Bonnet Carre, above the city, and one at Caernarvon, below the city.

After all, is it not true that the whole matter of flood control on the lower Mississippi is still at the experimental stage? The City of New Orleans and the Orleans Levee Board have recently made experiments with the floodway below Point-a-la-Hache and the artificial crevasse at Caernarvon. Some claim that the results therefrom are positive, some say only negative. The Bonnet Carre Spillway and the Atchafalaya fuse plug levees are still another experiment, all looking, however, toward the ultimate proper solution of the problem. Whether or not they will give positive results, only time can tell.

PAPERS AND DISCUSSIONS

PROBLEMS IN DESIGN, BONNET CARRE SPILLWAY

By Major E. S. J. Irvine, Corps of Engineers, U. S. A.

Read Before the Society, December 10, 1928.

This discussion includes the major items affecting the design of the Bonnet Carre Spillway structure and floodway.

The field investigations, tests and studies having to do with the design of the spillway structure are now being carried on at the site and in the district office. Upon the completion of these, it is hoped that controversial opinions can be eliminated and that definite solutions of our problems can be arrived at which are based on established data. The most difficult question now presenting itself is the selection of type of weir cross section. We have as many opinions as to the best type as there have been engineers expressing them. The problem of most effectively controlling the velocities of water falling over the low head dam is still an unsolved one.

Location

The general location of the Bonnet Carre Spillway was indicated by the United States Spillway Board. (See Plates 1, 2, 3).

The district office considered two specific sites, namely, the Upper Site near Laplace, and the Lower Site near Sellers. The Lower Site was chosen because of greater protection against bank erosion and drift, better foundation conditions and economy of site.

The spillway structure will be located on the left bank of the Mississippi River with the lower abutment just north of Bell Town, about 28 miles west of New Orleans.

The structure will be about 7,500 feet long. The water will be discharged into a controlled floodway 6 miles in length and 8,000 to 12,000 feet in width, which empties into Lake Pontchartrain. The side levees for the floodway will be 12 to 19 feet high.

Floodway

In computing the flow in the approach channel, the roughness factor, n, in Kutters formula, was taken at .05. In the floodway, the value of n=.08 was used. The selection of these

values of the constant was based on results of experiments conducted by the Department of Agriculture in the St. Francis River Floodway and the Little River Drainage District.

It is proposed to keep the floodway cleared of trees and undergrowth but the office did not feel justified in assuming the clearing would be kept down to such an extent as would justify the use of n=.05 in the floodway.

Levee Problems

The construction of side levees on the lower part of the floodway will not be as simple a matter as the building of the usual river levees. The ground elevations at the lower end of the floodway are very low and the first 8 or 10 feet of the soil consists of decomposed vegetable materials. The problem of the borrow pit also presents difficulties. Normal practice prohibits the placing of the borrow pit on the outside of the levee except at a prohibitive small slope. Placing it on the inside near the toe would endanger the levee because the first water running through the floodway would seek this channel at increased velocities. We propose to move in a long boomed floating dredger and take the material as far from the inside toe of the levee as possible. Later, earth dams will be placed at intervals crossing the borrow pit and the flotation channel for the dredger will be filled in. The levee construction will be contract work and, of course, if the contractor can devise better means of building levees, while complying with our requirements for safety, the method outlined above need not be followed.

General Hydraulic and Foundation Conditions Affecting the Design of the Spillway Structure

The tentative plans call for a dam containing 330 steel gates each 20 feet wide. These gates will be opened on an average of once in four or five years for periods of one to three months. They will always be opened and discharging at full capacity before the fuse plug levees at the head of the Atchafalaya basin come into operation. The intermittent nature of the flow over the dam will make it possible to inspect the rip-rap protection and repair damages. However, the construction must be such that during any flow period the scouring action cannot reach

the main section of the spillway where serious damage might result.

While the gates will be open only at infrequent intervals, the water will be backed up against the upstream face of the dam every year. This condition, with water in front of the dam and no tailwater, presents the most critical condition relative to percolation under the dam and "piping action". The first few test holes sunk along the weir site indicate foundation strata to run about as follows; (elevations referred to ground level):

0 to —15 ft.	Grey sandy clay.
—15 ft. to —60 ft.	Blue clay and some fine sand.
—60 ft. to —100 ft.	Variations of compact sand and clay strata.

The ground water elevations along the site now average 4 to 8 feet below the ground surface.

Weir Cross-Section

The problem of fixing the type of weir cross-section (our most vexing problem) can be simply stated: It is to select the most economical weir section which will reduce the water velocities at the toe of the dam to a point where they will not cause dangerous scour of the natural ground.

The danger of toe scour is by no means an imaginary fear. The following is quoted from an article appearing in the Engineering News-Record April 9, 1925:

> "The scour is about as universal and persistent a phenomenon as any connected with overfall dams. In natural waterfalls and in primitive dams, the energy of the overfall hollows out a deep pool directly under the falling water. Modern construction, aiming to prevent this excavating effect by providing an apron which deflects the water horizontally downstream, merely transfers this scour to the front of the apron. The result is, in cases without number, undermining of aprons and progressive failure of the protective device, often so extensive as to threaten or destroy the dam itself. Costly repairs have been made necessary by this sequence of events; added to the cost of the apron, these expenditures make

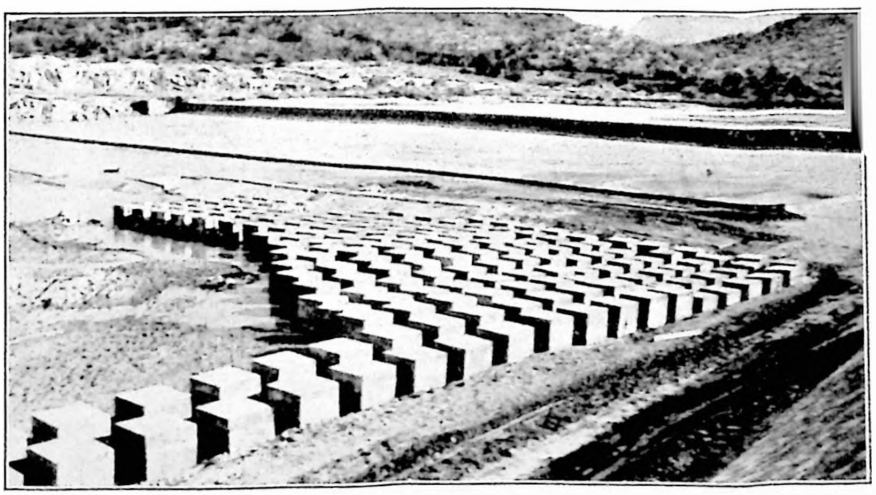
> the debit account against present practice in toe protection of dams remarkably heavy. It seems clear, then, that the dam apron is an anomaly, since it sets up the very actions which destroy it and which it is designed to prevent."

The following is from an article on Discharge of Overflow Dams, by Adolph F. Meyer, Consulting Engineer, in the same issue of the News-Record:

> "When the initial apron structure fails, as it usually does, it is replaced with a more massive and extensive one. If this too fails, still more concrete, cribwork or rock protection is placed, without regard to cost, until the force of the overfalling water can no longer displace the ponderous masses interposed in its path, or reach with its eddies to the outer limits of the protective works and undermine them. Yet, in most cases, the hole which the water gouged out, if perpetuated and limited with lining material, would have served as a far better and less expensive barrier to the destruction of the dam than the concrete and rock with which it was filled."

In case of overflow dams on previous foundation with which I am personally familiar, more than half have had real trouble with toe scour, and from records I have read, I believe the same statement could be made covering all overflow dams on soil foundations. The Granite Reef Dam on Salt River, Arizona, costing in the neighborhood of a million dollars, suffered complete failure to apron along sections of the dam. The Tisdale Weir on the Sacramento River required the addition of a tumble bay. The Daguerre Point Dam, Yuba River, California, has required additions of concrete slabs on its lower side and in spite of that, it is now in need of additional repairs to prevent under-cutting (this dam is on a harder foundation than others cited). The Sacramento Weir, a unit in the Sacramento River Flood Control project, now has holes 12 feet in depth immediately below its toe. Whether these have become stabilized or actually endanger the toe of the dam, I am unable to say. The Ashurst-Hayden Dam on the Gila River, Arizona, has suffered failure of its apron. (See plates 4 and 5.)

Pl. 4. Results of Toe Scour—Ashurst Hayden Dam.



Pl. 5. Ashurst Hayden Dam—Method of Repair.

With unlimited funds, it would be possible, of course, to build an apron and rip-rap protection of sufficient width to reach the point where the water velocities naturally subsided to the required flow. That would be poor engineering.

In general, the narrowest dam giving the required effectiveness in dissipating the energy of the falling water and reducing velocities will be the most economical one.

In considering the problem of reducing scour at the toe of the dam, we must definitely differentiate between low head dams on soil foundations and high head dams on rock foundations.

A number of model dam tests have been made recently on the latter problems. Among these are the Pit River experiments conducted in 1926 by the engineers of the Pacific Gas and Electric Company. These experiments have been covered by discussions in the proceedings of the American Society of Civil Engineers during the past year. Also, a very complete set of model dam tests were recently conducted by Colonel F. W. Scheidenhelm to determine the most feasible method of reducing scour at the foot of the Cheat Haven Dam. Mr. C. A. Wright has conducted a set of tests for thesis work at Cornell University. The above listed tests simulated dams 80 to 130 feet in height. We also have reports on a number of experiments carried on in Germany for both high and low head dams.

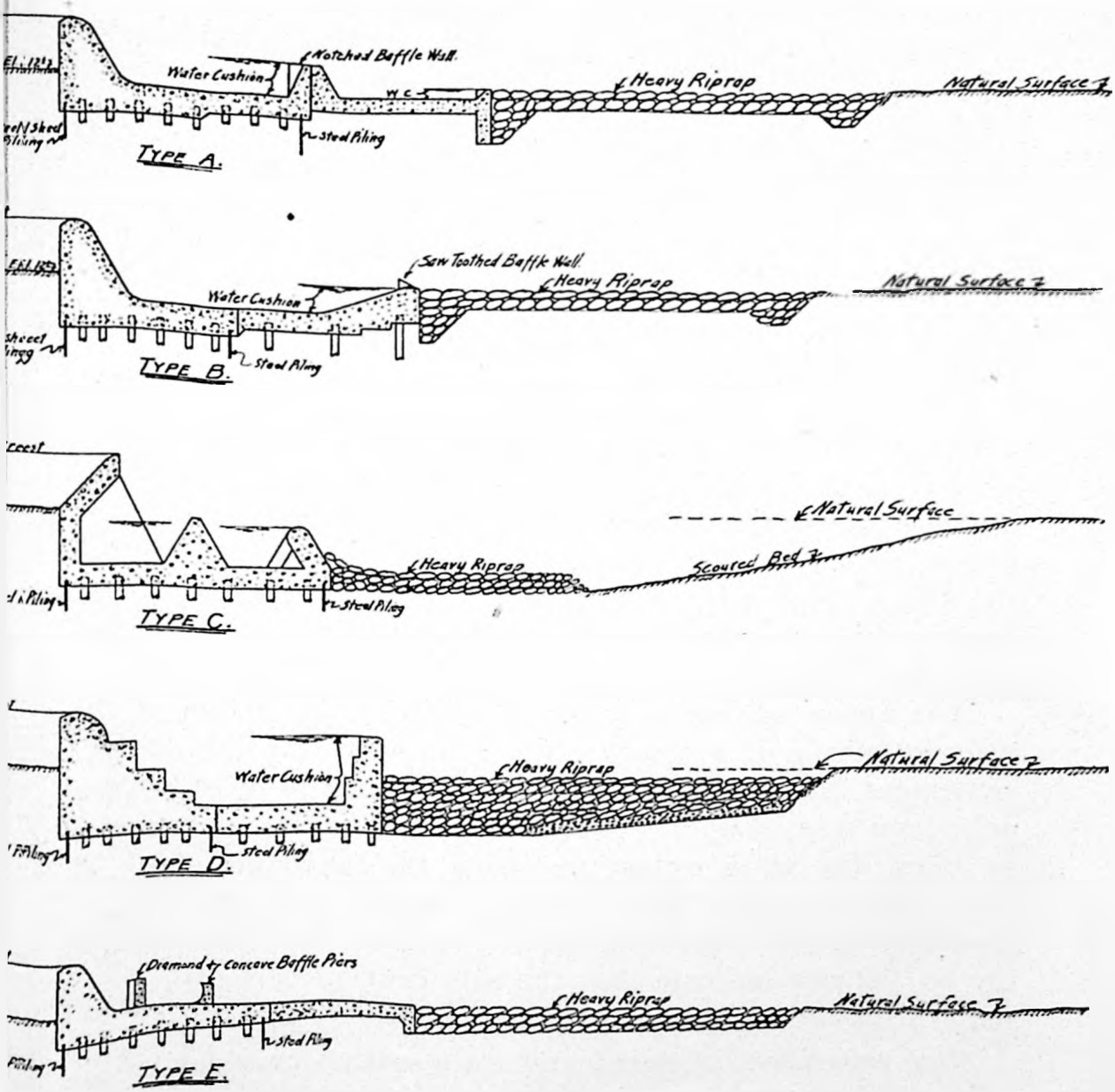
In our problem we have a sheet of water 6 feet in depth falling only a short distance into a tumble bay. The flow must be reduced to a very slow velocity at the toe of the dam to prevent scouring out of the soft river silt.

We now have under consideration five general types of weir cross-section.

These general types will be tested in our model dam flume to determine relative efficiency in reducing velocities. After the best types are determined, they will be subjected to extensive tests for varying dimensions and utilization of different types of baffle walls. We have already drawn up cost curves covering the variations in widths and depths of some of these types.

The worst conditions as regards scour action occur when the first gates are open and before the back water has been built up. Accordingly, it will be possible to have a more highly protected section where the first gates will be opened and have this flanked on the sides by lighter and more inexpensive sections. Mr. Boath, our Structural Designer, has worked out a scheme providing for three variations of cross-section.

I will now discuss the general features of the types of cross-section we have under consideration. (See Plate 6).



BONNET CARRE SPILLWAY

PROPOSED SECTIONS

Pl. 6. Types of Weir Sections—High Water El. 24.3

Type "A" Weir Section

This type represents a design worked out to fit structural and foundation conditions for this project.

The type of weir wall is the logical section to withstand horizontal stresses, serve as a seat for the steel gates and support the piers for the superstructure. This type of wall is not the true ogee type—the sheet of water will clear it and drop in the tumble bay as perpendicularly as if the downstream face were vertical. Vacuum conditions, if found detrimental, will be taken care of by pipes.

The weir or main section of the dam is designed to withstand all the heavy stresses occurring. The 4 foot thickness of concrete slab is carried out 16 feet from the weir crest or the distance the direct impact of the falling water is felt. The downstream cut-off wall is placed under this section so that the heavy uplift will occur under the main section. Also, this heavy section carries the entire load of the superstructure and operating railroad.

The apron section is attached to the main section of the weir by means of a construction joint providing for unequal settlement. Since this apron need be designed to resist erosion only (and a small uplift), it will be a light section and require no piles. The total weight including the maximum depth of water will fall below 800 pounds per square foot. Preliminary results from the foundation bearing tests we are now conducting on the site indicate that the safe bearing capacity of the soil will easily exceed 1500 pounds per square foot.

This separation of apron and main section provides for an economical section because of the omission of piles under half of the structure and of the placing all heavy stresses on the main section, allowing the apron section to be of light construction.

This type also provides for a deep water cushion by raising the intermediate baffle wall above the ground level and then forming a shallow secondary water cushion to take care of the secondary drop over the baffle wall. Our cost curves show that the cost of cross-section increases rapidly on the deepening of the water cushion—every additional foot adds a section to the

base of the weir wall 8 to 12 feet in area, as well as 30 to 50 feet of additional excavation. The same result can be obtained by raising the baffle wall, with the limitation, however, that it cannot be raised to a point where the channel capacity would be decreased below 275,000 c. f. s. The water velocities just below the weir wall are high and accordingly require a smaller area of cross section for the escape of the water.

For each general type, all practical variations in dimensions and types of baffle walls will be tested in the model flume. It is possible that the baffle wall in Type A might best be placed much nearer the weir wall and that the bottom of the water cushion should be sloped up towards the baffle wall.

Type "B" Weir Section

This section has been developed by German hydraulic engineers.

The water cushion, with curved bottom at the downstream end, develops a reverse current, throwing the water against itself. It also sends the current through the notched baffle walls in a manner to deflect the high velocity threads from the bottom of the stream toward the top.

Type "C" Weir Section

This section was proposed by Mr. John R. Freeman, Consulting Engineer. The middle baffle wall throws the current back into the water cushion under the weir crest; the water flowing back over the baffle wall and through openings between sections, at reduced velocities. The downstream baffle walls cause further eddies and reduction in velocity. Besides tests for efficiency in dissipating the energy of the falling water, this type will be tested for the weir crest efficiency, as differentiated from the curved weir crests used on the other types.

Type "D" Weir Section

This is the stepped type of weir. It is effective in breaking up volocities in that the falling water expends its energy at each successive step.

An objection to this type is that the step at the ground level would have to be 15 feet from the weir crest in order to catch the sheet of falling water. This would require an unusually heavy section of weir wall.

Type "E" Weir Section

This type of section, without the baffle piers, is that generally used by the U. S. Reclamation Service. It is the most economical of all the proposed types and will doubtless be used, with possible variations, on the side sections of the Bonnet Carre Spillway, where a natural water cushion will be developed by the building up of the tailwater on the opening of the center gates.

Other Types of Weir Section

While the above types include the general features of known practice, we propose to study the hydraulic effects of other special features, such as the so-called French type with an additional depth of tumble bay at the bucket of the dam; the type with a notch at the base of the weir wall, as proposed by Mr. Adolph Meyers; and the straight line section, as used by the U. S. Indian Service, on the Sacaton Dam, Arizona.

Superstructure and Movable Gates

The spillway structure will carry a railroad bridge for operation of the crane to be used for raising the movable gates. This bridge will be a simple steel girder structure carried on the concrete piers which form the frame work for the gates. The spans will be 20 feet long and designed for Cooper's E 30 loading.

The necessity for having reserve equipment for opening the gates has been considered: that is, in case of wreck of the crane, failure of a section of the bridge, etc. However, since the gates are to be opened only at high water and a floating derrick could be towed to the spillway, no reserve equipment is deemed necessary. In the operation of the gates, time is not an element, since emergency flood conditions are predictable weeks in advance.

Studies of type and design of the movable gates have not been completed. The tentative design calls for a simple steel shutter type, built up with steel plates and I-bars. Because of the small number of openings over a period of years, there is no necessity for providing Taintor, Roller or other easily maneuverable types. A wooden shutter type would cost less for initial installation but this advantage, it is believed, would be offset by cost of repair and more rapid deterioration.

Crossings

It will be necessary to provide three railroad bridges and one highway bridge across the floodway. The Illinois Central, the Yazoo and Mississippi Valley and the Louisiana Railway and Navigation Company have submitted preliminary plans and estimates for crossings. The Illinois Central will require a double track bridge. The problem of the Yazoo and Mississippi Valley crossings is complicated by the existence of yard tracks at Sellers, La. This will probably necessitate regrading of the yard.

It will also be necessary to provide means for the gas main crossing. Preliminary plans provide for three 12-inch pipes placed underground to replace the existing 18-inch gas main. This is the only main supplying New Orleans and on account of the small storage space available (two or three hours' supply) a safe crossing is a necessity.

Foundations

The foundation soil at Bonnet Carre consists of the grey clay, blue clay and sand peculiar to this area. We have a core drilling machine taking 3¾-inch cores, two 100 foot holes having been driven, one at each end of the site, as well as two shallower holes. About 12 other holes driven 50 to 60 feet deep will be spaced along the two proposed weir lines. These lines are a few hundred feet apart and the holes should determine the planes of the several strata of soil as well as showing up nonuniformity in soil conditions.

We are also driving test piles, both wood and concrete, centered at about 500 feet intervals on each line. In view of the practically everlasting nature of the structure, we would prefer to use concrete piles, providing tests indicate that their cost would be comparable to that of wood piles per ton of load.

We are not certain what the life of the steel sheet piling will be. However, these cut-off walls can be replaced by driving new piling just above or just below the concrete structure and making connection with the structure by a concrete joint. This method was successfully used on the Freemont Weir, California.

We are also making a comprehensive ground water survey and will attempt to reduce the readings to low water conditions. It is possible that the piles will be nearly submerged at all times. Under such conditions, wooden piles would be permanent.

Prevention of Percolation Under the Structure

There will be an upstream and downstream cut-off wall under the spillway structure, each made of steel sheet piling. The upstream cut-off wall will be deep and if possible, imbedded in an impervious clay strata. We are testing the various strata of soils for permeability. The piles of the downstream cut-off wall will be shorter and will be perforated near the top to allow for the escape of water under the structure, which otherwise would build up high uplift pressure.

Upon the determination of the type of weir cross-section, the length of the sheet piling will be computed according to Blythe's formula. This formula has been proved by various tests to be reasonably accurate but, of course, uniformity of foundation soils must exist or else the constant "c" taken high enough to provide for the worst possible condition.

Discussion

THE PRESIDENT: I am sure there are some members here who would be glad to either argue the question, or raise some points that perhaps they have not completely understood, or which have not been covered in every way. Mr. Klorer, have you something to say?

MR. KLORER: Mr. Chairman, I have nothing to say of a controversial character. I simply want to say that I enjoyed listening to Major Irvine's paper very much. He has given us a great deal of information as to past experiences with over-fall dams, and his presentation of the subject shows that the engineers in charge of this work, which is experimental in a way, are going along cautiously.

Everybody recognizes that the problem is one of placing a very important structure on a more or less unreliable foundation, and particularly is this so with regard to that section of the river. At that particular section of the river, comprising a length not in excess of a mile and a half, we have had crevasses

on the west side of the river, and crevasses on the east side of the river, an experience that has not been duplicated at any other portion of the river south of Cairo.

Several crevasses occurred at Bonnet Carre many years ago and more recently two crevasses at Hymelia on the west side. The last was caused by a leak flowing more sand than water out in the field beyond the road, twenty feet from a standard U. S. levee up to grade. The presence of these water bearing sands that seem to be prevailing at this locality warn us that we must be extremely cautious and provide for a large factor of safety in working out the foundation problem that is presented.

I may have something to say later, in a written statement after I have seen the paper in print. At this time I have nothing more to say than to commend Major Irvine for his very able and interesting presentation of his subject.

MR. PORTER: Prof. Gregory, would you care to say anything?

PROF. GREGORY: I think Major Irvine has told you all you need to know about the experiment. He didn't, however, describe the experimental plant, the water for which is being furnished at the present time by the dredge Iota, which is out in the river and has a thirty-two inch discharge pipe extending up and over the levee. That dredge is capable of giving us 100 to 110 cubic feet per second which is far more than we are going to need in the experiments we are now making.

The present experiment is made on the basis of 1/6th size, that is, dimensions are 1/6th those of the proposed structure.

It is hoped that later on we will make other experiments in which we will use 1/3rd of the dimensions of the proposed structure.

Now for our present needs, we need less than twenty cubic feet per second. This water comes down through a pipe under the road with a large reservoir on the side about six feet high. From the reservoir it is led to the measuring weir. You will recall the paper presented to the American Society of Civil Engineers by Dr. Schoder of Cornell University in 1927, entitled, "Precise Weir Measurements". We have copied the Cornell Weir.

The distance from the floor of the weir to the crest is 3 feet and the width of the weir is 4.22 feet. The depth over the weir is about a foot. After we have measured the water the flume is narrowed down to 3⅓ feet wide; in this flume is the small weir section which Major Irvine has described. We hope to find out what the value of the constant is in weirs of various types on which we are going to experiment. We shall endeavor to determine the best shape and most economical sort of weir to be used and the effect of the scour on the apron and beyond the apron.

This gravel we are using is something between a quarter of an inch and three-eighths of an inch in diameter. We want something that will be moved by the velocity that develops there and the amount of that movement will determine the relative values of these structures.

We are not interested in getting absolute measures, because after all it is all relative and in this way by measuring the movement of the gravel, we believe we will get that measurement. Day after to-morrow we expect to start with this experiment.

MR. PORTER: Is there anyone else who would care to say something?

MR. MCWHORTER: The laws of similitude as between models and the full size structures they represent are not perfectly known. The subject has received some attention in this country in connection with the design of certain dams, and also at Cornell University, and at some other American colleges. More intensive studies have been made by German investigators.

The dimensions of the model and the head are in direct proportion to corresponding dimensions of the structure, while the energy of the overfalling water varies as the 3.5th power of the linear ratio. Thus, it is seen that the energy per linear foot at the Bonnet Carre Spillway will be several hundred times as great as for the model built to 1/6th natural size. This consideration suggests conservatism in the protection to be provided just below the weir.

I think tests on two or more models of the same structure, built to different scales, would be enlightening. For instance, we propose to build and test models of the Bonnet Carre Spillway, one-sixth and one-third natural size. The smaller will, in

effect, be a model of the larger to one-half scale. By observing the relations between the performances of the two models, a better idea can be gained as to the relations that will exist between the larger model and the actual structure.

MR. KEMPER: I don't think there is a thing I could say about the question of structure. I am satisfied that everything will be done to take care of any kind of spillway that is built, and make it strong enough to take care of the hydraulic jump and all of that. However, there are some hydraulic questions upon which I would like to get a little more light.

If I understand Major Irvine correctly, the spillway will begin discharging at 18 feet mean gulf. Is that correct, Major?

MAJOR IRVINE: No. I think Mr. McWhorter can best explain that. As I understand, it maintains the Carrollton gauge below twenty. There is no such figure as eighteen. I said the elevation above mean gulf.

MR. KEMPER: That is what I mean. The spillway elevation would be eighteen mean gulf.

MAJOR IRVINES Yes.

MR. KEMPER: And extreme height twenty-five feet?

MAJOR IRVINE: A little under twenty-five feet.

MR. KEMPER: About that, and the maximum discharge would be 275,000 second feet.

MAJOR IRVINE: The maximum can run over that.

MR. KEMPER: At what stage would 275,000 run through?

MAJOR IRVINE: Now at twenty, is it not, Mr. McWhorter?

MR. MCWHORTER: The stage can best be given in terms of the Angola gauge. At a 57.5 foot stage on the Angola gauge the Bonnet Carre spillway would be required to discharge 250,000 c. f. s. in order to prevent the river from rising above the 20 foot stage at Carrollton. As long as the stage at Angola is below 57.5, it would not be necessary to divert the full 250,000 c. f. s. to hold the Carrollton gauge at 20 feet. I might say, that on a rising river, when the stage reaches 20 feet at Carrollton, it would be possible to divert 250,000 c. f. s. temporarily by suddenly opening all the gates. However, the river surface would be suddenly drawn down and the discharge through the spillway correspondingly reduced.

MR. KEMPER: What worries me, and what I can't get through my head, is that during the flood of 1927 and some previous floods, the stage was 57.5 at Red River Landing, producing 20 at Carrollton, which would produce a stage of about 25 at the spillway. I figure 1.7 feet per mile slope and a distance of about 30 miles to be a difference of about 5 feet, so at a stage of 25 feet you are having a stage of 20 at Carrollton, and are getting about 1,250,000 or 1,300,000 second-feet past Carrollton.

Well now, you are going to take 275,000 second-feet out of the river. You can't do that without lowering the river five feet at the spillway and then you will have one foot flowing over the dam which gives you about fifty or sixty thousand second-feet discharge through the spillway.

In other words, in order to get 275,000 second-feet through that spillway, it would appear to me that you would require a stage at Red River Landing (it rises there three feet to one at Carrollton) of about sixty-seven feet to maintain the stage of 25 feet at the spillway and to put this amount of water through the spillway. Under the plan of the adopted project, at the stage of 57.5 feet, the levees at the head of the Atchafalaya Basin will give way and turn the flood into that basin and cause the river to fall, and I have been unable to figure how any water will run through the Bonnet Carre Spillway with the crest set where it is.

I may be entirely wrong, but as it appears to me, under the plan of the Army Engineers which is not to raise the stage at the head of the Atchafalaya Basin any, if the levees stand at 57.5 which is their present height at Red River Landing, the water will never get high enough to require the opening of the gates of the spillway at Bonnet Carre until after the levees are broken and the flood water is put into the Atchafalaya Basin, and about $12,000,000 will be spent to no purpose.

MAJOR IRVINE: I think Mr. McWhorter can explain that. I might say I used the problem presented at certain elevations. The purpose of the spillway is to keep the Carrollton gauge at 20 feet, or less, and the past indicates that a flood of one million five hundred thousand second-feet will be taken care of with 250,000 second-feet to be taken off at Bonnet Carre.

You cannot get around the fact that our weir is set to take 250,000 second-feet when the Carrollton gauge is 20. That is the purpose of the weir.

MR. KEMPER: That is exactly the point I want to make. Then the purpose of the spillway is just an extraordinary precaution to keep the Carrollton gauge from rising above 20 feet. It has no relation to flood control in any other way than that. It is just an additional safety valve over and above the fuse plug they have at the head of the Atchafalaya Basin.

MR. MCWHORTER: Mr. Kemper's difficulty arises principally from an erroneous assumption of the Angola-Carrollton gauge relation. In a contained river, a flood that would reduce a stage of 57.5 at Angola would produce a stage at Carrollton much higher than 20 feet. It is well known that the capacity of the Mississippi River below Angola is approximately 1,500,000 c. f. s. for a 57.5 foot stage on the Angola gauge, and it is known further that a discharge of 1,250,000 c. f. s. will produce a stage of approximately 20 feet at Carrollton. Consequently, at such times as the river reaches 57.5 at Angola, it will be necessary to divert 250,000 c. f. s. at the Bonnet Carre Spillway in order to maintain the Carrollton gauge at 20 feet. The river slope above Bonnet Carre will be somewhat steeper and a little lower than normal, while below Bonnet Carre, the slope will be quite the same as the normal slope corresponding to a discharge of 1,250,000 c. f. s. Mr. Kemper's observation that the Bonnet Carre Spillway has no relation to flood control, other than to regulate the Carrollton gauge, is not entirely correct. That is the primary function of the spillway, but there are incidental benefits. The effect of the spillway will be to lower flood heights, not only below Bonnet Carre, but for a long distance above as well, thereby reducing the necessary height and cost of main river levees.

MR. KEMPER: Do you think you can get 250,000 second-feet to flow through that spillway at all without raising the stage at the mouth of Red River?

MR. MCWHORTER: Yes, it is certain that 250,000 c. f. s. can be diverted through the Bonnet Carre Spillway when the stage at Angola is 57.5. The river must rise to Elev. 24.3 at Bonnet Carre to produce a stage of 20 feet at Carrollton, and this positively assures the discharge over the Bonnet Carre weir.

MR. KEMPER: You can't take that 250,000 second-feet out unless it comes down the river.

MR. MCWHORTER: One million five hundred thousand c. f. s. will come below Angola and we will turn out 250,000 c. f. s. at Bonnet Carre.

MR. KEMPER: How could you get that 250,000 second-feet over and above a 20 foot stage at Carrollton to come down the river?

MR. MCWHORTER: As I have explained, it is necessary for only 1,250,000 c. f. s. to come down the river in order to produce a 20 foot stage at Carrollton, while the discharge corresponding to a 57.5 stage at Angola is 1,500,000 c. f. s. Unless the river is relieved of a portion of this water above New Orleans, it is very evident that the stage at Carrollton would be much higher than 20 feet and an intolerable condition would prevail. The record stage at Carrollton is 21.3 (1922 flood) and we purpose to make 20 feet the maximum in the future.

MR. KEMPER: That is about 60,000 second-feet.

MR. MCWHORTER: Mr. Kemper's assumption that an abstraction of 60,000 c. f. s. at Bonnet Carre will reduce the stage at Carrollton only about one foot is correct. However, for a flood that reaches a stage of 57.5 at Angola, as did the 1927 flood, it would be necessary to divert 250,000 c. f. s. at Bonnet Carre.

During the 1927 flood, the highest stage reached at Angola was 57.5, and the peak stage at Carrollton was 21 feet, but these peak stages did not occur at the same time, and should not be thought of as a true relation between the two gauges. The peak at Carrollton was reached before the levee was breached at Caernarvon and long before the peak stage was reached at Angola.

The nominal capacity of the Bonnet Carre Spillway, as called for in the adopted plan, is 250,000 c. f. s. The additional 25,000 c. f. s. now being allowed for in the design, is simply a margin of safety.

MR. KEMPER: I haven't any doubt in the world you will hold the gauge at Carrollton to 20 feet, but due to the fact of putting the sill so high there is no way on earth to get 250,000 second-feet to go through that spillway without raising the stage

at Red River Landing many feet above 57.5. One foot rise at Carrollton means a three foot rise at Red River Landing, 200 miles distant, and the slope practically uniform throughout, and when the Red River Landing gauge reaches 57.5 feet, pop goes the Atchafalaya fuse plug levee.

I wish to say that this spillway built under the present plan, which I am sure will never be carried out, is for the sole purpose of maintaining the Carrollton gauge at 20 feet.

We should have a spillway above the city and one below it, but it should be put there to do some good and its sill should go to the ground and let the water out in sufficient quantities to increase the slope and increase the discharge at Red River Landing very materially.

If the spillway above this city were located further up stream than Bonnet Carre, and made to discharge into Lake Maurepas, where the sediment could all be settled out before the flood water reached Lake Pontchartrain, not only would New Orleans be made perfectly safe at a much lower flood stage than 20 feet, but the Atchafalaya Basin would be saved from destruction.

As now planned, to put 1,500,000 second-feet of flood water into the Atchafalaya Basin, 5,000 of its 6,000 square miles will be flooded, St. Mary Parish will be inundated almost entirely, only a fringe of land about a half mile wide will be out of water along the Mississippi River. Bayou Lafourche and the upper Teche and the superstructure of the Southern Pacific bridge at Morgan City will go four feet under water.

It is unwarranted, unnecessary and unprecedented. I do not want to use the word "immoral," but it is something similar to it.

These people are to be ruined, and because the levees at the head of the Atchafalaya Basin are not to be lowered, when a crevasse destroys their property, they are to be told that they have no recourse. This, notwithstanding the fact that all other levees except theirs will be raised and strengthened for the avowed purpose of making their levees break.

It will never be done because it can't stand the test of simple justice.

Another reason why the spillway ought to go to the ground is to put the water through, which, as presently designed, it will not do. To get 250,000 second-feet through Bonnet Carre Spillway, you must lower the water in the river there at least 4.5 or 5 feet, and when you take 4.5 off 7, you have only 2 to 2.5 feet of water over the sill, which will not discharge 100,000 second-feet, to say nothing of 250,000.

The fundamental principle of the whole thing is wrong and unnecessary, and the people of the City of New Orleans and those on the Gulf Coast and north of Lake Pontchartrain, who are backing this proposition should realize that the result will be to cut off her communication to the west. We will be shut off when we get a flood once in four years, and not once in twelve years as is stated in the plan.

The reason of this is that they take water at the mouth of the Ohio River and increase it 450,000 second-feet by the aid of a by-pass. In doing that, they bring 450,000 second-feet more water to the mouth of the Arkansas River than they had before, and by means of a fuse plug levee at Cypress Creek, bring it through Boeuf Basin to the mouth of the Red, increase the discharge there 900,000 second-feet and blow that through fuse plug levees into the Atchafalaya Basin in volumes of about a million and a half second-feet. It is not necessary.

If, instead of accumulating that water in great volume and shooting it down, creating a maximum flood in order to take care of it, the spillway should be put where it will do some good, thereby increasing the discharge down the Atchafalaya from 450 to 750 thousand second-feet, you would be putting 8,000,000 acre feet of water in the Gulf ahead of the flood.

It is fundamentally wrong and will never be accomplished and the sooner the people of New Orleans realize they are working against their best interests in attempting this thing, the better it will be for them. They are destroying their own best contributing territory and making enemies of that entire country. And what's more, it will never be accomplished because it is going to fall of its own weight. It will cause a damage of more than $250,000,000; and when those things are realized, and they are bound to be, the whole scheme will collapse.

MR. MCWHORTER: The subject before the Society to-night is the Bonnet Carre Spillway and I shall confine my remarks to that as closely as possible. If it were possible to do anything at Bonnet Carre to materially simplify the Atchafalaya flood problem, I would be inclined to agree with Mr. Kemper. However, Bonnet Carre is about 170 miles below Old River and the ills of the Atchafalaya Basin cannot be cured by any possible action at Bonnet Carre. It is true that the diversion at Bonnet Carre will slightly lower flood heights at Old River and in the lower Tensas Pool and in that way give a direct, though a minor benefit, to the Atchafalaya Basin. But the major Atchafalaya problem would remain the same. The idea of diverting water from the main river through the Bonnet Carre Spillway at low or moderate stages has no merit. Such action could lead only to injurious results and would produce no good. The Bonnet Carre Spillway should *not* be operated when safe conditions obtain without it. If the spillway crest should be lowered to ground level or below, diversion could be made at any stage above bankfull, while with the crest at elevation 17.5 feet above mean Gulf level it would be impossible to make any considerable diversion at intermediate stages and the spillway would efficiently serve its true purpose of removing 250,000 c. f. s. from the river at times of peak flow.

MR. KEMPER: It would increase the Mississippi River discharge below Red River 10 per cent, wouldn't it?

MR. MCWHORTER: I think the discharge below Angola will never materially exceed 1,500,000 c. f. s. so long as the river is not permitted to rise above 57.5 feet at Angola. This is the premise upon which the design of that part of the general flood control project below Old River is based.

MR. KEMPER: Wouldn't it permit the water to begin pouring out two or three weeks earlier than otherwise? I want to make it run and not hold it in reserve for holding the Carrollton gauge at 20. It should run as soon as possible.

MR. MCWHORTER: Yes, with the sill at ground level, water could be diverted from the river probably two or three weeks earlier but this would be a pernicious practice and would produce only harmful results. As I have stated, the primary pur-

pose of the Bonnet Carre Spillway is for the protection of the City of New Orleans but there are some incidental benefits.

MR. KEMPER: Will you explain that, why that should be so?

MR. MCWHORTER: It is true of necessity; because of physical limitations.

MR. KEMPER: Why should be be exclusively so?

MR. MCWHORTER: It is not exclusively so.

MR. KEMPER: It is, practically.

MR. MCWHORTER: Yes. The flood control problems of the Atchafalaya Basin cannot be solved at Bonnet Carre.

MR. KEMPER: There is where I take issue with you, because I contend it can be otherwise. Every cubic foot of water let out in advance of the flood makes room for another cubic foot to come down.

While you are holding it in abeyance, you are consuming all the storage of the basin above Red River.

MR. MCWHORTER: Diversion through the Bonnet Carre Spillway at moderate stages can have little, if any, effect on the peak stage at Angola. But the diversion of 250,000 c. f. s. at the crest of the flood will have some beneficial effect there, though not very much.

MR. KEMPER: Wouldn't it be continuous for weeks in advance of the flood? If the sill is put at ten feet at Carrollton, which is about fourteen feet at Bonnet Carre as against eighteen, wouldn't you have four whole feet advantage? The river never rises more than three tenths of a foot a day. Wouldn't you have two or three weeks to put water through the spillway earlier than under your proposed plan?

MR. MCWHORTER: No, because when the Carrollton gauge is 10 feet, no water would run over the sill at elevation 14; but diversion could begin much earlier with the lower sill. It should not be done.

MR. KEMPER: It doesn't need to start to discharge immediately. I mean you can look at the Cairo gauge and tell three weeks ahead of the crest when a major flood is coming, then if your gates are down to the ground you can open them and get enough water out to avert an overflow because you have 4 feet deeper to flow. You can put that water into Lake Pontchartrain

in advance of the crest and make room for the water coming down and not permit it to accumulate at the mouth of Red River. You can thus keep that basin empty or as near empty as possible.

You have a spillway here and you are determined not to use it, and set the sill so high you can't use it to advantage until the Carrollton gauge is twenty feet, and at that stage the water can not come down the river to the spillway until after the fuse-plug levee into the Atchafalaya Basin gives way. Then you will not need the spillway.

MR. MCWHORTER: The trouble with that argument is that the peak stage at Angola cannot be greatly affected by any action whatsoever that might be taken at Bonnet Carre.

MR. KEMPER: If you increase the discharge from 1,400,000 to 1,600,000 second-feet which can be done if you put that spillway at Manchac, you have an increase of 200,000 second-feet. If you do that you will put 400,000 acre feet of water per day past Red River Landing which is now accumulated in that basin.

MR. MCWHORTER: The adopted plan fixes Bonnet Carre as the site.

MR. KLORER (communicated): I wish to ask the indulgence of the Louisiana Engineering Society to print in its Proceedings the inclosed statement made before the Flood Control Planning Board, consisting of

> Major General Edgar Jadwin, Chief of Engineers, U. S. Army;
>
> T. H. Jackson, Brigadier General, U. S. Army, recently appointed President of the Mississippi River Commission; and
>
> Carleton W. Sturtevant, Civil Engineer in private practice,

being a Board of Engineers appointed by President Coolidge to reconcile the engineering differences in the Mississippi River Flood Control Plan, as presented by the Army Engineers and by the Mississippi River Commission, respectively.

The purpose of the request is to record in some more or less permanent manner the views herein expressed, for future reference.

New Orleans, La.,
July 7th, 1928.

To the Members of the
Flood Control Planning Board,
New Orleans, Louisiana.

Gentlemen:—

At the request of Mr. Joseph Haspel, the President of the Orleans Levee Board, I am appearing before your committee to give the view-point of the local Levee Board on the subject matter of this hearing. I might say by way of introduction that the Orleans Levee Board and an official body of citizens known as the Safe River Committee of One Hundred interested themselves to a considerable degree in the flood protection of the lower end of the Mississippi Valley and of the City of New Orleans following the high water of 1922, and mainly through their joint activity and sustained interest the necessary legislation was passed in Washington in April, 1926, calling for a survey and investigation into the practicability of using controlled spillways as a means of reducing flood heights on the lower river; that is to say, below Red River Landing.

Previous to the passage of this Act by Congress, the Orleans Levee Board had acquired by purchase practically thirty miles of river frontage on the east bank of the river beginning at a point about 50 miles below New Orleans and extending down-stream, and had removed the levee along the frontage for a distance of about 11 miles, thus creating what was known as the Pointe-a-la-Hache Relief Opening.

The levee was relatively small, hardly exceeding 8 feet in height as referred to the land side elevation and possibly not more than three or four feet above the batture elevation on the river side. It was never expected that this relief opening would have any material effect in reducing flood heights at New Orleans on account of its great distance from the city. One foot relief was the amount counted on when the river would be 20 feet or over on the Carrollton gauge. The cost of the land acquired and the removal of the levee was less than a million dollars, and as that amount would hardly be sufficient to pay for an increase of one foot in the levee grade in front of New Orleans, the cost was a justifiable one, particularly since the Board also became an extensive land owner through the transaction.

Of far greater importance to the persons interested in flood control in this section, than the one foot relief was the opportunity that was afforded the Mississippi River Commission to conduct a study of river hydraulics on a scale much larger than that afforded in the usual laboratory, and to prove or disprove certain ideas prevailing as to what would likely take place in the river cross-section, and in the adjustment of flood slopes, in the event of the abstraction of greater quantities of excess flood waters through a spillway.

The stage was therefore all ready and set, when the U. S. Spillway Board entered on the scene in the fall of 1926, and by a remarkably fortunate circumstance the observations were in progress, during the advent, during the crest and during the subsidence of the record-breaking flood of 1927.

To make the opportunity still more ideal for study and observation, stern necessity at the height of the flood caused the creation of an artificial crevasse at Caernarvon, 15 miles below New Orleans, and again valuable information was added to the sum total of knowledge of the levee builder and river engineer. This last mentioned lesson, when all claims shall have been paid, will have cost the Orleans Levee Board the princely sum of between five and six millions.

I have taken occasion to refer to these matters to impress on your Board that the people of this community have shown a spirit of initiative in attempting to solve the flood problem by resorting to expensive experiments to the tune of six or seven millions of dollars, to convince the governmental authorities of the soundness of these views at a time when these authorities held opposite views.

During the period of nearly one year that the spillway Board was considering the problem assigned to it we maintained frequent and close contact and consultation with it and we were satisfied with the conclusions reached by that Board, in the provision of two spillways, one at Bonnet Carre, 30 miles above the city, and one at Caernarvon, 15 miles below. We were gratified to see the careful conclusions of the Spillway Board accepted by the Mississippi River Commission in its comprehensive plan for flood control and we were disconcerted to see the omission of the spillway at Caernarvon advocated by the Chief of Engineers in his plan for flood control.

We believe that any comprehensive flood protection plan for New Orleans and the lower river should provide for the removal of not less than 500,000 cu. ft. per second at times of great floods. A spillway at Bonnet Carre cannot well take out more than 250,000 cu. ft. per second without introducing a flood problem in the rear of the city and along the shores of Lake Pontchartrain, and this condition therefore forces the consideration of the additional spillway below the city.

In this connection we wish also to emphasize the nenessity of allowing for a wide latitude in the calculated relation of gage height to discharge. Any resultant estimated gage height that is arrived at by converting discharge through a spillway into terms of equivalent feet of reduction on the gage is bound to prove disappointing. To be specific, if the capacity of the spillway is 250,000 cu. ft. per second and the increment of discharge for each foot of gage height is 60,000 cu. ft. per second, the inference that a spillway having the above mentioned discharge will reduce flood heights four feet is not correct, notwithstanding its strong appeal from the point of view of elementary arithmetic. I have not yet found the text-book or the hydraulic engineer that could satisfactorily explain why adding 60,000 cu. ft. per second at Carrollton, let us say, will put the gage up 1 foot, and taking out 60,000 cu. ft. per second will not reduce it the same amount. This is not an argument against spillways; it is an argument against the assumption of too much credit for spillways as a flood reducing device.

If there exists any doubt as to the correctness of this observation let me refer you to the fact that when Caernarvon crevasse was discharging 300,000 cu. ft. per second (May 18 to 20) and the Pointe-a-la-Hache relief outlet was discharging 230,000 cu. ft. per second (May 13th to 19th) the gage at the Pointe-a-la-Hache Court House, which is 32 miles below Caernarvon and 5 miles above the upper end of the relief outlet, showed a reduction of only 1.6 feet. The addition of an amount equivalent to the combined discharges of 530,000 cu. ft. per second would have easily raised the gage at the Pointe-a-la-Hache Court House 4 feet.

The objections that were raised to a spillway at Caernarvon were objections that might apply to the location of a spillway at Caernarvon to the exclusion of

the one at Bonnet Carre, but certainly could not apply to the situation where two spillways were employed. Reference is made to the fear that the increase in the current velocity in the river past the city front may be such as to tear out or damage the under water protection work. Such fear is not well founded. The answer to that statement is the absence of any caving of the banks in the harbor of New Orleans either during or following the flood of 1922, when the Poydras crevasse, 14 miles below the city, was discharging in excess of 300,000 cu. ft. per second, and during or following the flood of 1927, when the Caernarvon Crevasse was also discharging about 300,000 cu. ft. per second.

It has been stated that the increase in the velocity of the current in the harbor of New Orleans that would follow the construction of a spillway at Caernarvon would be 12% greater than if the spillway were located at Bonnet Carre. A fairer statement would be to give the increase in the current velocity, if any, with both spillways in operation. Even should 12% increase in velocity result, it is by no means clear that this increase measures the difference between stability and instability of the mattress protected bank. This increase expressed in feet per second is less than one foot per second, as the high water velocity in the harbor of New Orleans is about 7 feet per second.

A great deal of concern was expressed by uninformed or mis-informed persons during the last high water that possibly the increased current in the river might cause the expensive Dock Board sheds to topple into the river, when a glance at the map will show that practically 80% of these wharf structures are on making or forming banks and the remaining structures are on mattress protected banks.

There has not been any valid reason submitted for the omission from a comprehensive plan of flood control of the Caernarvon Spillway unless it be the hope that perhaps Bonnet Carre Spillway alone will suffice. I believe it is a false hope. Time will tell, and if it is not built, the Flood Control Bill will have to be amended to complete an unfinished job.

Respectfully submitted,

JOHN KLORER,
Commissioner of Public Property,
Ex-Officio Member of the Orleans Levee Board.

General Plan

MAJOR IRVINE (submitted after the meeting): The Flood control Project provides for a river channel between Old River and Bonnet Carre capable of carrying 1,500,000 c. f. s., with the Angola gauge at 57.5 feet and without topping the fuse plug levees at the head of the Atchafalaya Basin. The plan calls for the diversion of 250,000 second-feet of the maximum flow through the Bonnet Carre Spillway, the river channel below the spillway carrying the remainder, 1,250,000 c. f. s. With this division of the maximum flow in the lower reaches of the Mississippi River, the Carrollton gauge will be maintained at 20 feet; the water plane at Bonnet Carre will be at elevation 24.3 feet; and the spillway will be in operation at full capacity, discharging 250,000 c. f. s. This division of flow will always occur before the fuse plug levees come into operation.

Elevation of Fixed Crest

The proposal has been made that the sill elevation of the weir be reduced to ground level in order to provide for a greater discharge, lowering of the water surface of the river in the reaches above the spillway, and to prevent scour.

The diversion at Bonnet Carre is limited by the project adopted by Congress to 250,000 c. f. s. The drawdown of the river surface above the spillway (except for a short distance) will be the same for the authorized diversion, regardless of the elevation of the sill. The scouring action, when the first gates are opened, would be greater for a ground level sill, since the water would be under a higher head.

However, the question of making a final determination of the elevation of the fixed crest is being given thorough study. Investigation may develop the advisability of lowering the fixed crest elevation in order to secure greater flexibility in discharge and a possible narrowing of the spillway structure and floodway.

The increase in discharge, resulting from lowering the fixed crest elevation, is not proportional to the increased area of the gate openings. The depth of tailwater has a critical effect on the discharge over the weir. The depth of tailwater, for a given discharge, is in turn determined by the width and length of the floodway and the surface roughness. Approximate computations

indicate that a ground level sill at Bonnet Carre would require a spillway 20 per cent shorter between abutments than for a fixed crest at elevation 17.5 (the controlling ground level on the river side of the weir line is at approximately elevation 14 feet).

The question of fixing the height of the fixed crest is primarily an economical one. We are drawing up flow capacity curves and estimates covering variations of the sill elevation from 8 feet up to 18 feet. Computations are being made covering the cost of excavation required for reducing the floor of the approach channel down to as low as elevation 8 feet, and computing the resultant increase in channel capacity.

The variable factors involved in fixing the sill elevation are: *a*. Cost of concrete section per lineal foot, including piers. *b*. Cost of gates per lineal foot, including capitalization for operation and maintenance. *c*. Run-off capacities per lineal foot of spillway for various sill elevations, which in turn are inversely proportional to the length of structure required. *d*. Cost of excavation of approach channel to establish various critical ground elevations. *e*. Increase or decrease in cost of land, levees and railroad crossings for different widths of floodway. *f*. Scouring action (determinable by field tests).

Cost curves have been prepared for *a*, showing the increase in cost of concrete per lineal foot as the sill elevation is varied from 8 feet to 18 feet. Similar curves are being prepared for *b*, *c*, *d* and *e*. A comparison of these cost data, which cover the greatest possible variation in sill elevations, together with a consideration of the hydraulic features of the problem, should give a definite determination of the problem of fixing the elevation of the crest of the weir.

MEMOIRS OF TWO DECADES

A compilation of addresses given by Dr. J. A. L. Waddell since 1905.—Edited by Frank W. Skinner.

(Reviewed by ARTHUR M. SHAW)

Among engineers, Dr. Waddell stands unique in the number and the variety of his writings, and seldom has any author dealt with so wide a range of subjects as have been covered in these memoirs. Many engineers have written authoritatively on matters in which they have specialized and a few there are who have shown an ability to write entertainingly, but one will look in vain for a parallel among technical works to those of the author, in scope, interest, style and value to the profession.

Having been favored by the author's confidence and friendship for a number of years, and having been acquainted with his writings for practically my entire professional career, it is with special pleasure that the preparation of this review is undertaken, though perhaps it should be called an appreciation, rather than a review.

As the editor and the author have been close friends for half a century, it has been possible for the former to throw side lights onto the various papers which add materially to their value and interest. Brief introductory paragraphs recite the circumstances under which each paper was prepared, its purpose, etc. Included in the introductory portion of the book are two especially valuable contributions, a brief biographical sketch of the author and "Condensed Reviews of the Earlier 'Principal Professional Papers' of Dr. J. A. L. Waddell". These two, the biography and the earlier papers, will correct the erroneous impression which the casual reader of the title of the present book might get, that the "Two Decades" covered the period of writing which has been indulged in by the author.

From the biography, we learn that Dr. Waddell knows how to play, as well as to work, intensively, and this doubtless explains, in part, his continuing ability to work under high pressure when occasion demands. It is true that he does complain

that after more than half a century of active practice of his profession, he is compelled to wear glasses when engaged in trap shooting but, even with that handicap, I have seen him break clay pigeons with such monotonous regularity that it seemed to the non-participating observers that he never would miss one. Trap shooting is too tame a sport for any but emergency relief however, as he frequently takes a month off from work for tarpon fishing at Aransas Pass or a week or two of duck shooting in the Louisiana marshes.

An idea of the purpose and value of the book may be gained from the following which is quoted from the editor's preface:

"The editor's main reasons for undertaking the task of compiling and editing these papers are as follows:

First: A firm conviction of their great value to the Engineering Profession and that their loss or non-availability would be a calamity to civil engineers throughout the world.

Second: A close friendship with the author that has endured without a single break of any kind for nearly half a century; added to a deep appreciation of his efforts to advance the interests and improve the standing of the Engineering Profession, and immense satisfaction in the outstanding success of his entire professional career."

The Memoirs have been divided into eleven groups which are given the following captions:

1. The Engineering Profession.
2. Ethics of Engineering.
3. Technical Education.
4. Engineering Literature.
5. Alloy Steels for Bridge Construction.
6. Economics.
7. Bridge Construction in General.
8. Contracts.
9. Railroad Subjects.
10. Matters Chinese.
11. Miscellaneous Topics.

Articles and lectures under the above headings cover such widely separated subjects as "Nickel Steel for Bridges" and "A Scheme for the Regeneration of China"; "The Engineer's English" and "The Spread of Smallpox by the Bite of the Bed Bug".

While the most of Dr. Waddell's writings are peculiarly of interest to bridge specialists, they may be read with profit (and interest) by any engineer who is interested in his profession, unless we except some of the newer branches (?) of the profession of which we occasionally read, such as the "Renovating Engineer" and the "Cattle Tick Engineer". As a teacher of Engineering during the earlier years of his practice, Dr. Waddell became acquainted with the problems of the class room and, as he progressed, he was able to weigh carefully the advantages and the shortcomings of the courses offered by the various technical schools of this country and of Europe. His criticisms always have been constructive and his recommendations for betterment have held up high ideals, though difficult ones, for our colleges and universities. There can be no doubt however of the benefit to the profession which will result from a striving for these ideals.

No doubt the greatest value which the engineering profession as a whole can derive from the Memoirs will be from a careful study of the discussions of Economics. The author has written one special book—"Economics of Bridgework"—in which the subject is especially stressed, but he so fully appreciates the necessity for the application of the principles of Economics to all lines of endeavor in the profession that it rereives its full share of attention in all of his writings. Economics, in its broadest sense, might almost be said to form the central core of all the professional studies, research, designs and writings of the author. It would appear as though he has adopted still another definition for Engineering—setting up for his own guidance the criterion that "if it is good Economics, it is good Engineering"—and what better standard could be adopted, whether it be applied in the selection of the type of bridge to suit certain conditions, the selection of materials for that bridge, or the arrangement of a college curriculum? The idea was expressed in his address to the International Congress of Arts and Sciences at the St. Louis Exposition in 1904 as follows: "The aim of pure science is discovery, but the purpose of Engineering is usefulness."

It is interesting to note that even with the great resources which he has accumulated through his many years of practice,

and a sustained ability to "get back to first principles" when occasion demands, Dr. Waddell does not disdain to use empirical rules if their use will save time and effort. It is obvious however that he uses all such rules and short-cuts with discretion and that the empirical rules which he mentions having found to be useful are those which have been derived in his own practice. It is to be regretted that he has not expanded somewhat on the use of short-cuts and of empirical rules, bringing out even more plainly the advantages which may be taken of them if used with a full knowledge of their limitations but, at the same time, stressing the danger which lurks in the use of rules of unknown origin and of doubtful suitability. Dr. Waddell has demonstrated, in his own practice, that short-cut methods of estimating may be employed with safety provided they have been developed from known sources and that they cover a sufficiently wide range of conditions to be representative. They are especially useful as a check agains carefully detailed estimates and might be employed in th manner in practically all classes of engineering estimates.

Many engineers who are not bridge specialists frequentl are called on to decide on the type of bridge to be selected for some certain locality, even though they may not be charged with the preparation of detailed design. Of especial value to such is the paper read before the Western Society of Engineers entitled "Suitability of the Various Types of Bridges for the Different Conditions Encountered at Crossings". While the author admits that under certain peculiar conditions, a crossing may be on the border line, permitting a choice between two or more different types, the rules which he has laid down are sufficient to enable any competent engineer to select the most suitable type of bridge for almost any set of conditions. The principles which he has stated in this paper have been commented on favorably by some of the best authorities of this county, the discussions of the paper being included in the Memoirs.

In his various lectures and papers on report writing, writing for publication and the writing of books, Dr. Waddell does not prescribe any particular style of "English for Engineers" but he does assail, with good reason, the frequent (if not

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habitual) misuse of English by engineers. By his own exceptionally good use of the language and by criticism and suggestion, he places forcibly before the reader the dangers and disadvantages of careless writing and the important advantage which can be gained by the employment of the best words, sentence construction and arrangement of material. In his paper on "Technical Book Writing," he gives interesting and instructive directions regarding the mechanics of writing a technical book, stressing the importance of planning the whole book, systematic procedure and careful attention to detail. It was my good fortune to visit the author in his private office in Kansas City on two occasions during the period when he was preparing the original copy for his largest work—"Bridge Engineering"—and to be shown the methods employed. While it must be admitted that the sheets were not much "to look at", they were systematically arranged and, in spite of many interlineations, were easily legible. With a little explanation egarding cross references and methods of indicating insertions, ny good typist could copy the originals with little chance of rror through misunderstanding the author's meaning and intentions. Many of the suggestions offered as an aid in book writing might well be adapted to the less ambitious efforts of writing reports, technical articles for periodicals, etc.

Under the group heading "Matters Chinese", Dr. Waddell again shows the engineer's regard for securing that type of construction best suited to local conditions. He draws an interesting comparison between the problems of railway construction under present conditions and the problems presented to the railway builders of this country of a generation ago. He notes the close parallel of great areas to be served, long lines to be built in countries of quite similar topographic features and the necessity of providing for comparatively high speed of trains. In other respects, he notes that the very antithesis is found as China already is densely populated, labor is cheap and the supply of timber is extremely limited. It is to be understood, however, that these remarks are not meant to be applied to China as a whole but to those sections in which extensive railway construction probably will be undertaken first. It is predicted that the bulk of the long bridges which

will be required for crossing the broad river bottoms of the alluvial areas will consist of series of steel plate deck girders, the prohibitive cost of timber precluding the use of the miles of pile trestles which were so typical of early American railways of the Middle West. He suggests that if a sufficiently extensive program of railway construction is undertaken, a great saving in cost of these plate girders can be effected by the erection of a fabricating shop at some suitable point in China. It is not expected that the steel industry will be developed in China for many years but even with the importation of the necessary plates and shapes, the saving in ocean freight rates over shipping the materials after fabrication would justify the erection of special shops for the construction of the girders.

Dr. Waddell has just gone to China on a second mission for the Chinese Government and it is hoped that on this trip he will make other contacts and collect additional material which will enable him to add to the valuable contributions already made on "Matters Chinese". In the past he has shown a breadth of vision and of sympathy which has resulted in his writing entertainingly, not only in regard to the bridges of China but also, to a limited extent, of China's educational, social and political problems, the future of engineering work in China in its regeneration, and a short article entitled "Following the Great Wall of China".

The author has avoided the pitfall which has trapped so many foreigners who have sojourned for a short time in that country, in that he does not attempt to catalog the characteristics of the people. Perhaps he already has come to an appreciation of the Chinese characteristics which was reached over seventy years ago by that keen student of China, George W. Cook, who, while serving as special correspondent to the London Times, wrote his paper as follows:

> "I have, in these letters, introduced no elaborate essay on Chinese character. It is a great omission. * * * The truth is that I have written several very fine characters for the whole Chinese race but, unfortunately having the people under my eye at the same time with my essay, they were always saying something or doing

> something which rubbed so rudely against my hypothesis. that, in the interest of truth, I burned several successive letters. * * * A smart writer, entirely ignorant of the subject, might readily strike off a brilliant analysis, which should leave nothing to be desired but the truth."

While Dr. Waddell has promised himself, and his family, that the "Memoirs" is to be his last book, it is to be hoped that he will continue to write shorter articles for publication, giving to the profession, as he has done in the past, the results of his studies and observations. He always has given generously of his time to research, to writing and to lecturing (especially to engineering students) and to other activities which have redounded to the benefit of the Engineering Profession, though they have not led to personal gain, and it is the opinion of those who know him best that he will continue this practice so long as his health permits.

SPRING MEETING OF A. S. C. E.

DALLAS, TEXAS

Engineers from all sections of the United States and several foreign countries, representing many phases of engineering, will gather in Dallas, Texas, April 24, 25 and 26 for the spring convention of the American Society of Civil Engineers.

This is the first meeting of the kind in the Southwest since the annual national convention was held in Houston in 1921, and all of the states of the Southwest are making every effort to entertain the visitors and to arrange a profitable convention. Officers in charge of arrangements predict an attendance of at least a thousand.

Among the departments of modern engineering which will be presented on the program are public utilities, covering electricity, oil and gas, irrigation, public highways, sanitation, surveying and maping and city planning. The latest developments of engineering in these various departments of the sciences will be discussed by outstanding leaders. As an example, the public utility section will be especially interested in the adoption of powdered lignite to the production of electricity and they will find Texas especially adapted for demonstrating this modern engineering accomplishment because of the great beds of lignite found in the state. One of the interesting features of the meeting will be a trip to the generating plant of the Texas Power & Light Company at Trinidad, Texas, a short distance southwest of Dallas. This is perhaps the best example in the United States of the use of powdered lignite.

One of the important addresses will be delivered by Martin J. Insull of Chicago, president of the Middle West Utilities Company, whose subject will be "Economic Changes in Industrial Life". One of the greatest natural resources of the Southwest, oil and gas, naturally will take a considerable part on the program. Outstanding leaders of the oil industry will deliver addresses, among them W. S. Farish, president, Humble Oil and Refinery Company, Houston, and J. Edgar Pew, former president, Sun Oil Company, Dallas. Mr. Pew will discuss the development of oil and gas in the Southwest. The vast oil and

gas pipe line systems of the Southwest will be of especial interest to engineers, and this subject will be discussed by E. C. Kincade, vice president, Gulf Pipe Line Company, Houston, Texas.

The irrigation problems in the lower Rio Grande Valley, which present some of the best examples of this type in the United States, highway location problems in Texas, which has the greatest road mileage in the country, city planning in southwestern states, problems in retracing old survey lines in Texas and many similar problems indicate the various divisions into which the program has been arranged.

The first day, Wednesday, April 24, will be devoted to a general program, and starting Thursday, April 25, the meeting will break up into five technical divisions. The meeting will be called to order by Major W. J. Powell, president of the Texas section. George Waverly Briggs, president of the Dallas Chamber of Commerce, will deliver the address of welcome and the response to this address will be presented by Anson Marston, president, American Society of Civil Engineers. Mr. Marston is dean of engineering, Iowa State College, Ames, Iowa, and is one of the leading engineers of the United States.

In addition to addresses on the oil industry the fascinating story of this great business will be unfolded in a moving picture entitled, "The Story of Petroleum", which will feature a dinner on the first night of the convention. At the same dinner R. B. Whitehead of Dallas, chief geologist of the Atlantic Producing Company, will deliver an address on "Geophysics of Petroleum and Natural Gas." The main meeting of the convention will be held in the Crystal Ballroom of the Baker Hotel and the sectional meetings will center around this general meeting place. The committee in charge of arrangements consists of W. J. Powell, Walter Meier, and E. N. Noyes. Mr. Noyes is chairman.

Among cities of the Southwest Dallas is especially adapted for an engineering convention. It is the center of the great oil and gas development, is the public utility's capital of this section, is one of the leaders among American cities in modern city planning, and is at the heart of one of the greatest high-

way developments in the country. Within the past few years Dallas has developed as the engineering center for municipal improvements, public highways, land reclamation, and city planning in the Southwest.

The city was founded in 1841 by John Neely Bryan, a Tennessee adventurer, and the name Peter's Colony was changed in 1845 to Dallas in honor of George M. Dallas, vice-president of the United States under President Polk.

To-day Dallas ranks 19th in bank clearings, 23rd in postal receipts, 15th as a general jobbing market and only four cities surpass it in the distribution of dry goods. The 1928 City Directory gives a population of 290,000. It has some 800 factories, turning out more than $150,000,000 worth of manufactured goods each year. It has 7 high schools, 46 grade schools, and 80 private schools. The city has 50 parks covering 4,000 acres, and 16 golf courses, 5 of which are municipal. The temperate climate makes golf a year around pastime. Dallas hotels have grown in magnificence and hospitality with the city. Thirty million dollars are invested in the 130 hotels here. Twenty thousand visitors can be comfortably housed each night. Some of the largest conventions have been handled here with ease.

Visitors to Dallas from the North and East will be immediately impressed with the clear atmosphere and the clean buildings due to the universal use of natural gas. Despite the 800 busy factories there is seldom to be seen a single smoke stack sending forth smoke.

The local members of the American Society of Civil Engineers have formed an informal local chapter which is very active in behalf of the profession, and these men are among the leaders in the Texas section. The local chapter, co-operating with the very active Technical Club of Dallas, was instrumental in the establishment of an engineering school along co-operative lines at Southern Methodist University in Dallas, one of the largest universities in the Southwest.

Visitors attending the convention will find an excellent system of highways leading into Dallas from the North and leading from Dallas to the West and South, and it is anticipated that many will avail themselves of the opportunity to enjoy automobile trips to the Mexican border.

The unique history of Texas holds a fascinating story for visitors. From the time of the Spanish and French conquerers to the present day the state has had varied and interesting history, having been a Spanish and Mexican province, lone republic, a confederate state and now the largest state in the American Union. It has existed under six flags, the French, Spanish, Mexican, Lone Star Flag of Republic, the Confederate flag, and the American Stars and Stripes. It revers its own Declaration of Independence and has heroes ranking with the noblest characters of American history. No visitor should neglect the rare treat of visiting the Alamo at San Antonio and the San Jacinto Battle Field, near Houston, where General Sam Houston routed the Mexican army in 1836 and made possible the independent existence of Texas.

The committee on arrangements is making ample preparations for thoroughly entertaining the guests.

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ROGER I. TANNER, (1921), Abbeville, La.

FRANK J. TRELEASE, (1928), with Ford, Bacon and Davis, 39 Broadway, New York City.

STEWART TICKNOR, (1922), with Ford, Bacon and Davis, 1104 La. Bank Bldg., Baton Rouge, La.

WM. F. TRIGGS, (1914), Operating and Maintenance Engineer, E. Fifth St., Crowley, La.

THOS. H. TUTWILER, (1898), President and General Manager, The Memphis Street Railway Co., also President, Memphis Power and Light Co., Memphis, Tenn.

WM. VON PHUL, (1908), Ford, Bacon & Davis, Inc., 39 Broadway, New York, N. Y.

RICHARD CHARLES SANCHEZ WATSON, (1926), Civil Engineer, General Practice, Box 155, Hattiesburg, Miss.

J. LESTER WHITE, (1920), Reiszner & White, Civil Engineers, Lecompte, La.

W. S. WHITE (C. M.), Box 44, Sulphur, La.

A. A. WOODS, (1911), Chief Engineer, Maintenance of Ways and Structures, Southern Railway System, Lines West, 506 Southern Railway Bldg., Cincinnati, Ohio.

D. F. WOODS, (1922), Lutcher, La.

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R. H. BAUMBACH, (1911), Manager, Eugene Dietzgen Co., 316 Camp St., New Orleans.

JOSEPH A. BRENNAN, (1920), General Contractor, The Brennan Co., 1805-07 Market St., Dallas, Tex., 1703 Hayden St., Amarillo, Tex.

MICHAEL A. COOPER, (1927), Representing Utica Heater Co., 622 S. Peters St., New Orleans.

LEWIS McCLELLAN DALGARN, (1921), 1517 Nashville Ave., New Orleans.

H. W. FLETCHER, (1913), Treasurer and General Manager, The Clyde Co., Inc., 309 Magazine St., New Orleans.

WILLIAM HENRY GARGES, (1926), Branch Manager, Chamberlain Metal Weather Strip Company, 427 Carondelet St., 5623 Milne St., New Orleans.

GEORGE B. GIBSON, (1921), 2103 Painter St. ,New Orleans.

PAUL JOSEPH GILBERT, (1925), 602 S. and W. Board Bldg., New Orleans.

GEORGE J. GLOVER, (1916), General Contractor, 1032-1035 Whitney Bldg., New Orleans.

JULES GODCHAUX, (1899), 1007 Masonic Temple Bldg., New Orleans.

WALTER F. JAHNCKE, (1920), Secretary-Treasurer, Jahncke Service, Inc., 814 Howard Ave., New Orleans.

RICHARD HARRISON MILLER, (1926), Manager, A. K. Miller Engineering Co., New Orleans.

JOHN McINERNEY, (1920), Construction Superintendent, 1343 Penobscot Bldg., Detroit, Mich.

EDWARD T. MALLOY, (1920), 1211 N. Hagan Ave., New Orleans.

JOHN J. STEADHAM, (1912), Supervisor, Bridges and Buildings, N. O. & N. E. R. R. and N. O. T. Co., 308 Newman St., Hattiesburg, Miss.

F. W. STEVENS, (1900), Manager, New Orleans District Sales Office, Allis-Chalmers Mfg. Co., 1124 Canal Bank Bldg., New Orleans.

WILLIAM LOUIS STEVENS, JR., (1925), with W. Horace Williams, Inc., 88 Fontainebleau Drive, New Orleans.

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SCOTT THOMPSON, (1928), with Lone Star Cement Co. of La., 1120 Hibernia Bank Bldg., New Orleans.

RESIDENT JUNIOR MEMBERS.

WILMOT A. ACKERMANN, (1928), with Mississippi-Warrior Service, Board of Trade Annex, 223 S. Clark St., New Orleans.

CHARLES L. JACOB, (1911), 1409 Northfield St., Greensboro, N. C.

E. S. JARRETT, (1909), President, Jarrett-Chambers Co., Inc., Contractors, 342 Madison Ave., New York City.

CHARLES E. JOUBERT, (1909), Civil Engineer, Box 563, Monroe, La.

L. A. LOUSTALOT, (1913), Civil Engineer, Hammond, La.

R. S. McCORMICK, (1922), Engineer, Napoleonville, La.

HERBERT H. McGEHEE, (1920), 1773 Evelyn Ave., Memphis, Tenn.

RUFUS S. MANLEY, (1912), President, Texas Creosoting Co., Orange, Texas.

RALPH H. MANN, (1921), Assistant Secretary, Am. Society of Civil Engineers, 33 West 39th St., New York City.

ERNEST J. MEAD, (1922), Forest Engineer, 2220 North St., Beaumont, Texas.

HENRY A. MENTZ, (1915), Consulting Engineer, Lock Drawer 929, Hammond, La.

WALTER I. NEEL, (1928), City Engineer, Monroe, 1006 N. 2nd St., Monroe, La.

CHARLES W. OKEY, (1911), Land Department, Lesser-Goldman Cotton Co., Walnut Ridge, Ark.

WILLIAM C. OLSEN, (1914), Consulting Engineer, Raleigh, N. C.

GUY OSBORNE, (1913), Gable, S. C.

BOYKIN W. PEGUES, (1907), Professor of Civil Engineering, Louisiana State University, Baton Rouge, La.

H. N. PHARR, (1908), Sugar Planter and Manufacturer, Olivier, La.

H. A. PHILIPPI, (1912), Civil Engineer and Superintendent of Construction, 316 Audubon St., New Orleans.

FREDERICK F. PILLET, (1922), Associate Professor, Civil Engineering, Louisiana State University, 613 St. Mary St., Baton Rouge, La.

OTTO F. REISZNER, (1916), Reiszner & White, Civil Engineers, Lecompte, La.

J. B. REYMOND, (1922), 709 Main Street, Baton Rouge, La.

FRANK LOUIS REYNOLDS, (1916), General Superintendent, Irons and Hoover, Inc., 420 Lexington Ave., New York City.

UNION SANDERS ROANE, (1926), with Louisiana Highway Commission, 711 Hypolite St., Baton Rouge, La.

W. B. ROBERT, Civil Engineer, 408 Evergreen St., Baton Rouge, La.

JOHN A. SALMEN, (1911), Vice-President, Salmen Brick & Lumber Co., Ltd., Slidell, La.

T. H. SAMPSON, (1900), Ambarwood Manufacturing Co., P. O. Box 138, Helena, Ark.

REGINALD McC. SCHMIDT, (1915), Assistant Engineer, 4th District, Mississippi River Commission, 1923 Leontine St., New Orleans.

HOBART D. SHAW, (1917), City Engineer and Chief Engineer, Harrison County Road Protection Commission, Gulfport, Miss.

JOHN A. SILSBEE, (1915), Consulting Petroleum Engineer, 1767 So. Utica St., Tulsa Okla.

JULIUS SLOVENKO, (1924), 6803 Dante Ave., Chicago, Ill.

T. BAKER SMITH, (1919), Houma, La.

JOHN Y. SNYDER, (1918), Engineer, 1211 City Bank Bldg., Shreveport, La.

KIRBY LAND SWINNEY, (1926), with Southern States Building & Construction Co., Mobile, Ala., and Biloxi, Miss., Box 797, Biloxi, Miss.

IRA W. SYLVESTER, (1901), Consulting Engineer, Rapides Bank Bldg., Alexandria, La.

ROGER I. TANNER, (1921), Abbeville, La.

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HENRY HESTER RATE, (1921), Civil Engineer, Huasica Pet. Corp., Tampico, Tampas, Mexico.

J. J. BULLUING, (1915), Marker Street Power House, New Orleans.

JOHN S. BURKE, (1925), Distribution Engineering Department, New Orleans Public Service Inc., 2215 Dante St., New Orleans.

PHILIP HOPE CAMPBELL, (1925), Engineer, with Mississippi-Warrior Service, 6041 Perrier St., New Orleans.

F. FOWLER CASE, (1922), Draftsman with Sewerage and Water Board, 923 Arabella St., New Orleans.

SALVADOR DI BENEDETTO, (1925), Assistant Engineer, Orleans Levee Board, 1810 Elmire St., New Orleans.

ROBERT JOSEPH DRUEDING, (1925), Assistant Engineer, Orleans Levee Board, 1220 Second St., New Orleans.

DONALD C. DUPLANTIER, (1922), Assistant Engineer, Geo. J. Glover Co., Inc., 2319 Joseph St., New Orleans.

EDWIN FRANK, (1925), 2375 Laurel St., New Orleans.

JAMES L. FULMER, (1923), with Cumberland Telephone and Telegraph Co., 2238 General Pershing St., New Orleans.

HORATIO L. GILBERT, (1917), Surveyor, 602 Queen and Crescent Bldg., New Orleans.

GILBERT TESLA GRAY, (1925), with New Orleans Public Service Inc., 1321 Nashville Ave., New Orleans.

FRANK E. HOIGHT, (1926), Draftsman, La. Highway Commission, 311 Church St., Baton Rouge, La.

WALTER HOLLOWAY, (1923), District Engineer, Mississippi Power Co., Gulfport, Miss., 34 Washington Ave., Ocean Springs, Miss.

JOSEPH W. JOACHIM, (1919), President and Manager of Home Ice Co., 5117 Prytania St., New Orleans.

WILHELM EMIL KOCH, (1913), Civil Engineer, 2627 Coliseum St., New Orleans.

ROBERT JAMES KUHN, (1925), Electrolysis Engineer, New Orleans Public Service Inc., 529 Washington Ave., New Orleans.

FRANCIS A. LANDRIEU, (1926), with Board of Commissioners, 1720 N. Rampart St., New Orleans.

CHARLES RENE MADUELL, (1925), with Truscon Steel Co., 5650 Ada Place, Lakeview, New Orleans.

ROBERT VINCENT MARKEY, (1926), Draftsman, Office City Engineer, 2309 Cleveland Ave., New Orleans.

ALBERT E. MARKS, (1925), Draftsman, Phoenix Utility Company, 3320 Palmyra St., New Orleans.

NATHANIEL LEVIN MARKS, (1925), Assistant City Engineer, 2017 Lowerline St., New Orleans.

ALEX H. McCOMISKEY, JR., (1919), 2837 Carondelet St., New Orleans.

GORDON J. McLEAN, (1924), Power Plant Equipment, New Orleans Public Service Inc., 1544 Henry Clay, Ave., New Orleans.

HU. B. MYERS, JR., (1927), Civil Engineer, 7734 Belfast St., New Orleans.

EDWARD M. NABERSCHNIG, JR., (1923), Assistant to Works Superintendent, Southern Cotton Oil Co., Box 360, New Orleans.

WILLIAM P. OSTER, (1928), 1430 Frenchmen St., New Orleans.

CHARLES L. RITTENBERG, (1923), Designer, Dock Board, 4437 S. Rocheblave St., New Orleans.

HARRY STEPHEN SALZER, (1927), Assistant Lighthouse Engineer, U. S. Lighthouse Service, 6028 Catina St., New Orleans.

S. A. THEARD, (1920), Maintenance Engineer, Louisiana State Highway Commission, Baton Rouge, La.

SID E. TROUARD, JR., (1928), 1526 Conery St., New Orleans.

ALVIN A. VOSS, (1928), Engineer, 1701 Valmont St., New Orleans.

NON-RESIDENT JUNIOR MEMBERS.

G. O. ALLAIN, JR., (1916), Southern Bell Telephone Co., New Orleans.

G. C. BADGER, (1913), Superintendent of Engineering and Construction, Grinnell Co., of the Pacific, 601 Brannan St., San Francisco, Calif.

CHARLES MILTON BROUGH, (1927), 2125 Cherry St., Vicksburg, Miss.

MARTIN CARBONNELL, (1927), with United Fruit Co., Banes, Oriente, Cuba.

LIONEL J. CUCULLU, (1928), with The South Coast Co., Houma, La.

JACOB F. MULLER, JR., (1912), Vice-President, Muller Furniture Manufacturing Co., Ltd., 3731 Canal St., New Orleans.

WILLIAM L. MYERS, JR., (1927), with Arkansas Highway Department, Camden, Ark.

HERBERT P. NATHAN, (1913), Mechanical Engineer, Southwestern Engineering Corporation, 632 Lafayette Ave., Culver City, Calif.

HENRY W. PAGE, (1928), 301 Arkansas Ave., Monroe, La.

JAMES KILBOURNE PETRIE, (1924), Petrie & McFarland, Inc., Mansfield, La.

STUDENT MEMBERS.

MICHAEL CHARLES ABRAHM, 816 Cherokee St., New Orleans.
R. L. ATKINSON, 312 Audubon Blvd., New Orleans.
CHARLES ALBERT BENDER, JR., 1729 Marengo St., New Orleans.
PERCY L. BERNSTEIN, East Beach, Gulfport, Miss.
LOUIS CARON, JR., 1715 Napoleon Ave., New Orleans.
LESTER B. CLARK, care Bureau of Patents, Washington, D. C.
HOWARD M. CRAIG, 2533 Calhoun St., New Orleans.
WILLIAM HENRY CREIGHTON, 1445 Henry Clay Ave., New Orleans.
ALBERT BAKER DAVIS, JR., Box 5038, Harrisburg, Texas.
ARTHUR A. DE FRAITES, 620 State St., New Orleans.
LUCIEN DEVALL, 2124 Milan St., New Orleans.
NEWTON C. EBAUGH, 7018 Jeannette St., New Orleans.
THEODORE LAWRENCE ESTORGE, 614 State St., New Orleans.
GEORGE FINLEY EUSTIS, 1469 Henry Clay Ave., New Orleans.
CHARLES JULIUS FRITCHIE, Slidell, La.
JOHN B. GEIGER, 902 Eighth St., Gretna, La.
JOHN J. GIDIERE, 1015 Eleonore St., New Orleans.
JOHN MASON GUILLORY, 5201 Magazine St., New Orleans.
JULES R. GUIDROZ, 6324 S. Robertson St., New Orleans.
ERIC J. HANEMANN, 1126 Dumaine St., New Orleans.
VIC. F. HARTEL, 2001 Prytania St., New Orleans.
E. C. HAWKINS, 7019 Panola St., New Orleans.
W. T. HESS, 7917 Burthe St., New Orleans.
ALVIN E. HOTARD, 829 Lafayette Ave., Gretna, La.
EDMOND FAVRE HUGHES, 4502 S. Miro St., New Orleans.
HAROLD H. JAQUET, 4501 S. Rocheblave St., New Orleans.
FRANK EMIL JOHNSON, JR., 4469 Lafaye St., New Orleans.
LEONARD REGINALD KIRST, 2113 Tulane Ave., New Orleans.
F. LAWES KLEINPETER, 2210 Nashville Ave., New Orleans.
CARL VINCENT LAZARONE, Kenner, La.
CHARLES LOB, 3309 St. Charles Ave., New Orleans.
LEO LEVY LOWENTRITT, John Jay Hall, Columbia University, New Yor kCity.
ALGERNON ASHE MABSON, 4020 Prytania St., New Orleans.
E. PEUCH MADDEN, 1228 N. Rendon St., New Orleans.
EVAN WILLIAM MAHONEY, 806 Belleville St., New Orleans.
GEORGE ELMER MAY, 1533 Broadway, New Orleans.
JOHN K. MAYER, 1728 Carrollton Ave., New Orleans.
LEAL C. McLEAN, 1544 Henry Clay Ave., New Orleans.
TIM L. McNAMARA, Sellars, La.

HAROLD E. MEADE, 119 Audubon Blvd., New Orleans.
PAUL GRENVILLE MERRITT, JR., 1931 Gen. Pershing St., New Orleans.
EUGENE HERBERT MIAZZA, 3424 Prytania St., New Orleans.
HERMAN DAY MYSING, 2115 Palmer Ave., New Orleans.
J. F. NUNEMACHER, 4915 Baccich St., New Orleans.
WALTER K. OSER, 1108 Pine St., New Orleans.
PASCAL PARETI, JR., 619 Bourbon St., New Orleans.
PHILIP FRANK PHILIPS, 4424 S. Claiborne Ave., New Orleans.
LEON MYERS REINACH, 1805 Robert St., New Orleans.
RENE H. REINACH, 926 Maqueda Place, New Orleans.
ASHLEY HURT ROBINSON, 1735 Palmer Ave., New Orleans.
HARTWELL JOHN ROSSON, 1322 Elysian Fields St., New Orleans.
RODNEY B. ROUGELOT, 2237 Napoleon Ave., New Orleans.
HENRY B. SARGANT, 1804 State St., New Orleans.
JOSEPH HENRY SAUCIER, 2616 Ursuline St., New Orleans.
S. B. SCHWARTZ, Superintendent, Maginnis Cotton Mills, New Orleans.
BEN ZION SEGALL, Tester, N. O. Public Service Inc., 530 Magazine St., New Orleans.
GEORGE JACOB SEGEL, 3022 Baronne St., New Orleans.
LEWIS MONROE SHELTON, 4915 Baccich St., New Orleans.
WALTER SUMNER SIMPSON, 19 Audubon Place, New Orleans.
DAVID STAYER, 3215 Shady Ave., Pittsburg, Pa.
FRANK GURLEY STEWART, 7453 Dominican St., New Orleans.
HERBERT C. SWAN, 6316 Magazine St., New Orleans.
JOSEPH F. THOMPSON, 139 S. Genois St., New Orleans.
BERNARD JAMES TORTOMASI, with N. O. Public Service Inc., 2461 Burgundy St., New Orleans.
NELSON W. TREMBLAY, 2025 Jena St., New Orleans.
STEPHEN J. WALLBILLICH, 4027 Delgado Ave., New Orleans.
LUCIEN T. VIVIEN, JR., 1519 N. Broad St., New Orleans.
JOHN MORT WALKER, JR., 6039 Prytania St., New Orleans.
O. P. WALKER, 5918 Chestnut St., New Orleans.
JAMES EVANS WEED, 319 Pennsylvania Ave., Hawley, Pa.
CHARLES CARROLL WIGGIN, JR., 3203 Napoleon Ave., New Orleans.
CHARLES LAFAYETTE WRIGHT, JR., Romeville, La.

SUMMARY.

Honorary Members	6
Resident Members	238
Non-Resident Members	87
Associate Members	22
Non-Resident Associate Members	0
Junior Members	33
Non-Resident Junior Members	10
Student Members	72
Total	468

MINUTES OF THE MEETINGS AND BUSINESS OF THE SOCIETY.

Minutes of the Board of Direction, December 10, 1928.

The meeting was called to order by President Porter and the following members were present: Messrs. Fox, Todd, Moses and Muth.

The minutes of the previous meeting were read and approved, and bills on hand were ordered paid.

Report was made that the Committee on Technical Papers had tentatively arranged for the February meeting and that Mr. Frank P. McKibben would address the Society and guests whom we would invite on: "Electric Welding for Steel Buildings and Bridges."

On motion, duly seconded, it was voted to recommend to the Society that the February meeting be held on February 25, to take care of this meeting, and that architects, also local members of the A. S. M. E. and A. S. C. E. be invited.

On motion, duly seconded, the following applications for membership were ordered to ballot:

For Resident Member.

O. Gordon Frick — Claire W. Ricker

For Non-Resident Member.

Walter I. Neel

For Transfer From Student to Resident Member.

Arthur J. Naquin

For Resident Student Member.

Louis Caron	Eric J. Hanemann
Howard M. Craig	Alvin E. Hotard
Theodore L. Estorge	Harold H. Jaquet
John B. Geiger	Evan W. Mahoney
John J. Gidiere	John K. Mayer
Jules R. Guidroz	Nelson W. Tremblay

There being no further business, the meeting adjourned.

F. A. MUTH, Secretary.

Minutes of the Society, December 10, 1928.

The meeting was called to order, with President Porter in the chair, F. A. Muth, Secretary, and 84 members and guests present.

The minutes of the previous meeting were read and approved.

The Chairman of the Committee on Entertainment and Outings reported that in view of the previous expressions of opinions from members as to the smoker, that the forthcoming Annual Smoker would be changed in deference to their opinions. In view of the fact that there are so many other entertainments at the regular time for the Annual

Meeting, on motion, duly seconded, the Society voted to postpone the date of the Annual Smoker and Meeting to the third Saturday in January, or January 19, 1929.

Report of Mr. R. H. Baumbach, Chairman of the Committee on Employment, was read, showing the splendid work this committee is doing to connect up the prospective employers and employees.

Announcement was made relative to notices which had appeared recently in the press in regard to employment of highway engineers from without the State of Louisiana. The Secretary then read correspondence from the President to the Chairman of the Highway Commission and his reply, the result of the correspondence indicating that our Society desires to co-operate in every way with the Highway Commission in its program and that the Highway Commission desired to employ engineers from the State of Louisiana whenever prasticable.

Announcement was made relative to the technical address for the February meeting, and the recommendation of the Board on this evening was placed before the Society. On motion, duly seconded, the Society voted to postpone the February meeting until February 25, and to invite the A. I. of A., the A. S. M. E. and the A. S. C. E. members in New Orleans to be present at that meeting.

The following members were appointed tellers to serve in connection with the nomination of officers for the ensuing year: Messrs. Barelli, Eastwood and Moses.

Nomination for officers resulted as follows:

For President.

Fox	32
Hogg	1
Todd	1
Carr	1

For Vice-President.

Todd	26
Nelson	4
Moses	1
O'Neill	1
Robert	1
Hogg	1
Kohnke	1

For Director to Serve 3 Years

O'Neill	28
Hogg	3
Kohnke	1
Wiggins	1
Robert	1
Riess	1
Hammett	2
Bres	1

On motion, duly seconded, it was voted that the President cast ballot for the Society for F. A. Muth for Secretary, and on separate motion, duly seconded, it was voted that the Secretary cast a ballot for the Society for W. B. Moses for Treasurer. Both motions were unanimously carried.

Following members were declared official nominees, and their names were ordered to ballot:

For President.....F. H. Fox
For Vice-President.....J. M. Todd
For Secretary.....F. A. Muth
For Treasurer.....W. B. Moses
For Member of Board to Serve 3 Years.....J. H. O'Neill

The technical exercise of the evening consisted of an interesting address on "The Problems of the Bonnet Carre Spillway", by Major E. S. J. Irvine. This paper was illustrated with lantern slides and an interesting discussion followed.

A rising vote of thanks was then tendered the speaker.

The meeting then adjourned to the usual collation.

F. A. MUTH, Secretary.

Minutes of the Board of Direction, Annual Meeting, January 19, 1929.

The meeting was called to order by President Porter and the following members were present: Messrs. Fox, Todd, Frost, Muench and Muth.

The minutes of the previous meeting were read and approved. The Annual Reports of the Treasurer and the Secretary were read and approved, and ordered referred to the Society.

The reports of the Library Committee and the Committee on Employment were read and received, and the Secretary was then instructed to have them printed in the Proceedings.

Professor Donald Derickson also met with the Board and spoke about some requirements of engineering licensing in this state. On motion, duly seconded, it was ordered that the President appoint a committee of three members (not including a member of the State Board of Engineering Examiners) to investigate the matter, and to submit a report to the Board of the Society.

A report prepared on "Street Traffic Control," by Miller McClintock and Holland Bartholomew, was brought before the Board and on motion, duly seconded, it was voted that the incoming President appoint a committee to investigate the report and to report to the Board.

The Secretary brought before the Board the matter of certain members who were in arrears, also the matter of certain advertising accounts, and he was instructed in regard to letters to be written regarding same.

The resignations of the following members were accepted with regret: Messrs. B. S. Merrill, H. J. Malochee, W. B. Gregory, Jr., M. A.

Beranger, J. Slovenko, James Weed, H. J. Rosson, A. McComiskey, Jr., and F. Eckstein.

The membership of Mr. R. Herpich was changed to Non-Resident.

President Porter thanked the Board for its co-operation and assistance to him during the year and requested continuance of the support for the incoming President.

There being no further business, the meeting adjourned.

F. A. MUTH, Secretary.

Minutes of the Society, Annual Meeting, January 19, 1929.

The meeting was called to order by President Porter, F. A. Muth, Secretary, and 29 members and guests present.

The minutes of the previous meeting were read and approved. The annual reports of the Treasurer and Secretary were read and ordered printed in the Proceedings. The Annual Report of the Board of Direction was approved, and ordered printed in the Proceedings.

Mr. James M. Todd announced that the World Engineering Congress would be held in Tokio, Japan, in October, 1929, and that those interested should confer with Professors Douglas Anderson and W. B. Gregory.

It was also announced that although the Society had been invited to send a representative, that the Board had previously voted not to undertake to do so nor to provide any papers. It is therefore an individual consideration for those who may wish to attend.

Ballots were canvassed for new members, there being 84 formal ballots and 4 informal ballots, and the following members were declared elected:

Resident Member

O. Gordon Frick — Claire W. Ricker

Non-Resident Member

Walter I. Neel

Transfer From Student to Resident Member

Arthur J. Naquin, Jr.

Resident Student Member

Louis Caron, Jr.
Howard M. Craig
Theodore Lawrence Estorge
John B. Geiger
John J. Gidiere
Jules R. Guidroz
Eric J. Hanemann
Alvin E. Hotard
Harold H. Jaquet
Evan William Mahoney
John K. Mayer
Nelson W. Tremblay

Ballots were also opened for officers, there being 87 formal ballots, 1 scratched ballot, and 4 informal ballots. The following officers were declared elected for the ensuing year:

President	Prof. Frederick H. Fox
Vice-President	Mr. James M. Todd
Secretary	Mr. Frank A. Muth
Treasurer	Mr. W. B. Moses
Member of Board to Serve 3 Years	Mr. John H. O'Neill

The President took this opportunity of thanking all of the officers, committees and members of the Society for carrying out the work so successfully during the past year. The new President, Professor Frederick H. Fox, was then conducted to the chair by Mr. G. W. Lawes, and made a few appreciative remarks, thanking the membership of the Society for the honor conferred upon him.

There being no further business, the meeting adjourned to a most enjoyable smoker, which was held in the Florentine Room of the Jung Hotel.

F. A. MUTH, Secretary.

ANNUAL REPORTS

ANNUAL REPORT OF THE BOARD OF DIRECTION

Year 1928.

New Orleans, La., January 8, 1929.

To the Members of the Louisiana Engineering Society:

Your Board of Direction begs to report that during 1928 there were held 10 regular and 4 special meetings, or a total of 14 meetings of the Board for the transaction of the business of the Society.

The Technical Papers Committee has given us an excellent program of very high grade papers. The meetings have included a special program celebrating the 30th anniversary of the Society, also an interesting trip through the Main and Raymond telephone exchanges as guests of the Southern Bell Telephone Company.

The Library Committee has done good work, and some valuable accessions have been made to the library during the year.

The Committee on Employment has done fine work in taking care of members who desired employment or a change of employment. This committee is a valuable one to the members concerned.

The Membership Committee has done good work during this year. The increase in membership has been gratifying in that 20 members were admitted. Of course, as usual, there have been a number of resignations and adjustments, with two deaths, the net increase resulting in ten new members.

It has been very gratifying that a number of members in lower grades were transferred to higher grades, and it is hoped that this work will be kept up in future years.

The Publication Committee has given us six very excellent issues of the Proceedings during 1928. The Board of Direction reiterates the statement of former boards that the Proceedings is a very powerful factor in the interest and usefulness of our Society, and Professor Douglas Anderson, the editor of the journal, deserves the highest praise for the quality and tone of this magazine.

The Committee on Publications, Division "B", has done good work this year in securing advertisements and renewing others, and we are hopeful that greater gains will be made during the next year in order to maintain the high character of our publication.

The Committee on Entertainment has been quite active during the year; in addition to our Annual Smoker, our Society made an outing to the cement plant as guests of the Louisiana Portland Cement Company, and on another occasion, we entertained the Western Society of Engineers and some members of the Chicago Section of the American Society of Civil Engineers.

Attention is invited to the financial condition of the Society. The financial statement shows that the Proceedings fund has increased $164.48. Our investments are well placed, and amount to $7,009.78. The General Reserve Fund shows a balance of $9,209.96, having increased $1,374.79 during the year. The Treasurer's Report shows a cash balance on January 1, 1929, of $1,663.86.

Two junior memberships in the Society were awarded to the most outstanding Senior, one each in the College of Engineering at Louisiana State University and at Tulane University.

During the year the Society withdrew membership in the American Engineering Council, effective June 30, 1928.

The Society voted favorably upon an addition to our constitution, providing for reciprocal membership, which provides the advantages of an interchange of membership with other societies under certain conditions.

The Special Committee appointed to look after the interests of legislation affecting engineers did some good work in protecting the interests of the profession in legislation relative to the present law for the registration of civil engineers and surveyors, which had not been submitted to our Society. The former committee, which had been appointed, returned to the Society the full allotment of $50.00 which had been made to carry on the work of that committee.

In conclusion, the Board wishes to thank the various committees and members of the Society for their co-operation and interest in carrying on so successfully the work of the Society.

Respectfully submitted,

J. L. PORTER, President.
F. H. FOX, Vice-President.
F. A. MUTH, Secretary.
WALTER B. MOSES, Treasurer.
E. S. LANPHIER,
FRANK G. FROST,
JAMES M. TODD,
C. G. MUENCH,

Board of Direction.

ANNUAL REPORT OF THE SECRETARY

Year 1928

New Orleans, La., January 8, 1929.

To the Board of Direction, Louisiana Engineering Society, New Orleans, La.

Gentlemen: As Secretary of the Society, I herewith submit the following report for the year 1928:

During the past year the Board of Direction has held 10 regular meetings and 4 special meetings, a total of 14 meetings; the Society has held 10 regular meetings, with an average attendance of 66, maximum 99, minimum 37. One of the meetings of the Society was a joint meeting with the local chapter of the American Society of Mechanical Engineers and the other with the local chapter of the American Institute of Radio Engineers.

The membership shows a steady increase from year to year. This year there has been a net increase of 10 members, although there was a total of 24 members elected and reinstated.

GRADE	On Roll Jan. 1, 1928	Elected	Reinstated	Transferred to	Transferred from	Dropped	Resigned	Failed to Qualify	Died	On Roll Jan. 1, 1929
Honorary Member..	6	0	0	0	0	0	0	0	0	6
Resident Members..	240	6	2	3	4	1	6	0	2	238
Non-Res. Members'	86	1	0	4	1	2	0	1	0	87
Associate Members	21	1	0	0	0	0	0	0	0	22
Non-Res. Associate	0	0	0	0	0	0	0	0	0	0
Junior Members.....	32	0	1	1	1	0	0	0	0	33
Non-Res. Junior.....	6	0	1	3	0	0	0	0	0	10
Student Members....	67	12	0	0	5	1	1	0	0	72
Total.....	458	20	4	11	11	4	7	1	2	468

It is with regret that the deaths of Mr. M. P. Doullut and Mr. George C. Schoenberger are recorded.

The Treasurer's report is submitted separately, and shows a cash balance of $1,663.86.

During the year the Investment Account, as submitted in the Treasurer's Report, stands as follows:

Total Receipts	$6,664.61	
Total Disbursements	5,000.85	
		$1,663.86
Checking account in New Orleans Bank & Trust Co.		1,663.86
1 Yerxa Steeves Bond	$1,000.00	
2 $100.00 First Liberty Loan	200.00	
1 50.00 First Liberty Loan	50.00	
5 50.00 1917 Liberty Loan	250.00	
Greater New Orleans Homestead	975.00	
Union Homestead	500.00	
Standard Homestead	500.00	
Italian Homestead	500.00	
Security Homestead	500.00	
Columbia Homestead	500.00	
New Orleans Bank and Trust Co. Savings Account	1,494.08	
Canal Bank and Trust Co. Savings Account	540.60	
		7,009.78
Total cash and investments		$8,673.64

It is noted from the above that during the year $1,000.00 was set aside in amounts of $500.00 each for Security Homestead Stock and Columbia Homestead Stock.

In addition to the above, the Society still holds a share in the New Orleans Building, Louisiana State Fair, costing $100.00.

The following technical exercises were held:

February 13.—"Reminiscences," by some of the older members called "Old Timers."

March 12.—"Asphalt in the Paving Industry," by Leroy M. Law.

April 9.—"The World's Largest Concrete Seawall, Showing Methods of Construction," by H. D. Shaw.

May 14.—"New Orleans and Its Gas," by Col. Arthur M. Shaw.

June 11.—"Motion Picture Film Produced by Aeronautic Research Institute of the Tokyo Imperial University." This was a joint meeting with the local chapter of the American Society of Mechanical Engineers.

September 10.—"Development of, and Timber Preservation With, Zinc Meta-Arsenite," by Kenneth M. Bailey.

October 8.—"Outline of Underlying Principles of Movietone, Vitaphone, and Television," by Messrs. Pendleton Lehde and A. A. Schiele. This was a joint meeting with the local chapter of the American Institute of Radio Engineers.

November 12.—"Evolution of the Central Office Equipment," by Messrs. B. B. Copeland and Sam Weinstein. A trip through the Raymond and Main telephone exchanges was an attraction of this meeting.

December 10.—"The Problems of the Bonne Carre Spillway," by Major E. S. J. Irvine.

Attached hereto are statements showing the financial condition of the Society.

The Secretary desires to thank you for your kind co-operation during the year. It has been an honor and a privilege to serve you.

Respectfully submitted,

F. A. MUTH, Secretary.

FINANCIAL CONDITION OF THE SOCIETY JANUARY 1, 1929.

Assets:

Cash on Hand and in Bank	$1,663.86	
Accounts Receivable (Members)	2,466.75	
Accounts Receivable (Advertisers)	116.42	
Entrance Fees Receivable	217.00	
Smoker Memberships	192.00	
Investments	7,009.78	
		$11,665.81

Liabilities:

Proceedings Reserve Fund	$1,278.13	
Building Fund	151.65	
Library Fund	694.82	
Accounts Payable	324.75	
1929 Dues in Advance	6.50	
		2,455.85
Balance in General Fund		$ 9,209.96

General Reserve Funds.

Balance from 1914	$ 165.00	
Balance from 1915	189.75	
Balance from 1916	377.45	
Balance from 1917	299.49	
Balance from 1918	27.47	
	$1,059.16	
Deficit from 1919	62.93	
	$ 996.23	
Balance from 1920	$ 198.09	
Balance from 1921	90.94	
Balance from 1922	1,186.58	
Balance from 1923	309.84	
Balance from 1924	586.43	
Balance from 1925	975.61	

Balance from 1926	1,128.05	
Balance from 1927	1,363.40	
Transferred from Proceedings Reserve in 1927	700.00	
Transferred from Library Fund Reserve in 1927	300.00	
Balance from 1928	1,374.79	
		$ 9,209.96

Proceedings Reserve Fund

Balance from 1915	$ 112.20	
Balance from 1916	566.13	
Balance from 1917	568.14	
Balance from 1918	567.52	
Balance from 1919	41.08	
	$1,855.07	
Deficit in 1920	221.98	
	$1,633.09	
Balance from 1921	26.25	
	$1,659.34	
Deficit in 1922	301.02	
	$1,358.32	
Deficit in 1923	110.65	
	$1,247.67	
Deficit in 1924	120.26	
	$1,127.41	
Balance from 1925	184.56	
Balance from 1926	353.57	
	$1,665.54	
Balance from 1927	148.11	
	$1,813.65	
Less Amount Transferred to General Fund	700.00	
	$1,113.65	
Balance from 1928	164.48	
		$ 1,278.13

Proceedings Fund

Revenues:		
Advertising Revenues	$1,031.22	
Members Subscriptions	916.00	
Sales of Proceedings	38.50	
		$ 1,985.72
Expenses:		
Salary of Editor and Secretary	$ 360.00	
Printing and Mailing	1,113.02	
Stenographer	85.00	
Miscellaneous Expenses	180.00	
Advertisements Cancelled	83.22	
		$ 1,821.24
Gain for 1928		$ 164.48

Annual Statement of Library Fund, January 1st, 1929

Revenues:		
Balance, January 1, 1928	$ 456.47	
Received from General Fund	480.00	
Total Revenues		$ 936.47
Expenditures:		
February—		
Miss Carrie Freret	$ 15.00	
March—		
Miss Carrie Freret	$ 15.00	
American Society for Testing Materials	10.40	
April—		
Miss Carrie Freret	$ 15.00	
Rowland & McRedmond	20.00	
May—		
Miss Carrie Freret	$ 15.00	
June—		
Miss Carrie Freret	$ 15.00	
July—		
Miss Carrie Freret	30.00	
September—		
Miss Carrie Freret	$ 15.00	
October—		
Miss Carrie Freret	$ 15.00	
November—		
Miss Carrie Freret	$ 15.00	

December—		
Miss Carrie Frerct	$ 15.00	
Owen Gernon Co.	22.25	
December 31—		
Accounts Payable	24.00	
		241.65
Balance on Hand December 31st, 1928		$ 694.82

General Fund, Year 1928

Revenues:

Membership Dues for 1928	$4,023.00	
Smoker Account	325.00	
Entrance Fees	176.00	
Interest on Investments	374.87	
Refund of M. Garsaud	50.00	
		$ 4,948.87

Expenses:

Subscription to Proceedings	$ 916.00	
Appropriation to Library Fund	480.00	
Salary of Secretary	540.00	
Printing and Postage	270.40	
Refreshments	120.30	
General Expenses	219.53	
Exchange	4.75	
Dues to American Engineering Council	133.30	
Dues of Secretary	12.00	
Auditor	50.00	
Smoker Expense	515.43	
Loss on Membership	137.50	
Allowance on Honorary Prizes	14.00	
Entertaining	160.87	
		3,574.08
Net Profit for Year 1928		$ 1,374.79

Cash Account, Year 1928

Receipts:

1925 Dues Collected	$ 9.00
1926 Dues Collected	113.00
1927 Dues Collected	504.00
1928 Dues Collected	2,526.50
Smoker Account	302.50

Proceedings Fund

Revenues:		
Advertising Revenues	$1,031.22	
Members Subscriptions	916.00	
Sales of Proceedings	38.50	
		$ 1,985.72
Expenses:		
Salary of Editor and Secretary	$ 360.00	
Printing and Mailing	1,113.02	
Stenographer	85.00	
Miscellaneous Expenses	180.00	
Advertisements Cancelled	83.22	
		$ 1,821.24
Gain for 1928		$ 164.48

Annual Statement of Library Fund, January 1st, 1929

Revenues:		
Balance, January 1, 1928	$ 456.47	
Received from General Fund	480.00	
Total Revenues		$ 936.47
Expenditures:		
February—		
Miss Carrie Freret	$ 15.00	
March—		
Miss Carrie Freret	$ 15.00	
American Society for Testing Materials	10.40	
April—		
Miss Carrie Freret	$ 15.00	
Rowland & McRedmond	20.00	
May—		
Miss Carrie Freret	$ 15.00	
June—		
Miss Carrie Freret	$ 15.00	
July—		
Miss Carrie Freret	30.00	
September—		
Miss Carrie Freret	$ 15.00	
October—		
Miss Carrie Freret	$ 15.00	
November—		
Miss Carrie Freret	$ 15.00	

December—		
Miss Carrie Freret	$ 15.00	
Owen Gernon Co.	22.25	
December 31—		
Accounts Payable	24.00	
		241.65
Balance on Hand December 31st, 1928		$ 694.82

General Fund, Year 1928

Revenues:

Membership Dues for 1928	$4,023.00	
Smoker Account	325.00	
Entrance Fees	176.00	
Interest on Investments	374.87	
Refund of M. Garsaud	50.00	
		$ 4,948.87

Expenses:

Subscription to Proceedings	$ 916.00	
Appropriation to Library Fund	480.00	
Salary of Secretary	540.00	
Printing and Postage	270.40	
Refreshments	120.30	
General Expenses	219.53	
Exchange	4.75	
Dues to American Engineering Council	133.30	
Dues of Secretary	12.00	
Auditor	50.00	
Smoker Expense	515.43	
Loss on Membership	137.50	
Allowance on Honorary Prizes	14.00	
Entertaining	160.87	
		3,574.08
Net Profit for Year 1928		$ 1,374.79

Cash Account, Year 1928

Receipts:

1925 Dues Collected	$ 9.00
1926 Dues Collected	113.00
1927 Dues Collected	504.00
1928 Dues Collected	2,526.50
Smoker Account	302.50

Entrance Fees	125.00	
Advertisers in Proceedings	1,136.98	
Proceedings Sales	38.50	
Interest	209.94	
M. Garsaud, Refund	50.00	
Total Receipts		$ 5,015.42
Deduct Exchange		4.75
		$ 5,010.67
Add Balance of January 1, 1928		1,653.94
		$ 6,664.61
Total Warrants Paid During Year		5,000.75
Balance on Hand, Checking Account		$ 1,663.86

ANNUAL REPORT OF THE TREASURER

Year 1928

New Orleans, January 1st, 1929.

To the President, Louisiana Engineering Society, New Orleans, La.:

Dear Sir: As per requirements of Article No. 4 of the Constitution, I have the honor to submit the following report covering receipts and disbursements for the period of January 1st, 1928, up to January 1st, 1929.

Received from Secretary—	Deposited in New Orleans Bk. & Tr. Co.	Exchange Charged
Feb. 14, Memo. 1 to 9 inclusive	$1,588.03	$ 1.10
Mar. 13, Memo. 10 to 13 inclusive	563.06	.55
Apr. 12, Memo. 14 to 15 inclusive	299.64	.25
May 16, Memo. 16 to 19 inclusive	497.46	.70
June 21, Memo. 20 to 21 inclusive	330.12	.45
July 17, Memo. 22 to 23 inclusive	209.37	.35
Aug. 17, Memo. 24 to 26 inclusive	348.93	.25
Sept. 13, Memo. 27 to 28 inclusive	162.98	.15
Oct. 18, Memo. 29 to 30 inclusive	173.33	.10
Nov. 15, Memo. 31 to 32 inclusive	311.81	.45
Dec. 10, Memo. 33 to 35 inclusive	202.51	.30
Dec. 27, Memo. 36 to 37 inclusive	243.80	.10
	$4,931.04	$ 4.75
Int. Yerxa Steeves Bond	$ 65.00	
Coupons Deposited	19.38	
		$5,015.42
Less Exchange		4.75
		$5,010.67
Balance on Hand as per Treasurer's Report Jan. 1, 1928		1,653.94
		$6,664.61

Disbursements from Jan. 1st, 1928, to Jan. 1st, 1929.

No.	Name—	Amount
January 16th—		
1	Carrie Freret	$ 15.00
2	F. A. Muth	44.50
3	Edna Doll	15.00
4	Tulane Press	254.50
5	Electrical World	5.00
6	Ry. Engr. & Maintenance	2.00
7	American Engr. Council	66.65
8	Chess, Checkers & Whist Club	217.00
9	W. B. Moses	258.43
10	N. O. Bank and Trust Co	6.00
February 13th—		
11	Edna Doll	15.00
12	Carrie Freret	15.00
13	W. B. Moses	102.90
14	F. A. Muth	71.43
15	Ed. Smith's Stencil Works	10.00
16	Leo Loubere	50.00
17	Cabildo Restaurant	18.05
18A	Boylan's Detective Agency	3.00
February 15th—		
18B	Columbia Bldg. and Loan Association	500.00
19	Security Bldg. and Loan Association	500.00
March 12th—		
20	Edna Doll	15.00
21	Carrie Freret	15.00
22	F. A. Muth	54.50
23	American Society for Testing Materials	10.40
24	Aarde Steno. Parlor	10.00
25	Tulane Press	45.15
26	Boylan's Detective Agency	3.00
27	Cabildo Restaurant	12.00
April 9th—		
28	American Engr. Council	66.65
29	Edna Doll	15.00
30	Carrie Freret	15.00
31	F. A. Muth	55.60
32	Harcol Film Co.	15.00
33	Boylan's Detective Agency	3.00
34	Aarde Steno. Parlor	12.00
35	Cabildo Restaurant	13.75
36	Ferd Marks Ins. Agency	17.50

No.	Name—	Amount
May 14th—		
37	Rowland & McRedmond	20.00
38	Aarde Steno. Parlor	11.00
39	Addressograph Co.	3.34
40	Tulane Press	325.37
41	F. A. Muth	54.50
42	Edna Doll	15.00
43	Carrie Freret	15.00
44	Boylan's Detective Agency	3.00
45	Cabildo Restaurant	14.00
June 11th—		
46	Harcol Film Co.	15.00
47	Carrie Freret	15.00
48	Edna Doll	15.00
49	F. A. Muth	54.50
50	Tulane Press	162.57
51	Cabildo Restaurant	14.50
52	Boylan's Detective Agency	3.00
53	Aarde Steno. Parlor	16.00
July 17th—		
54	A. M. Shaw	20.16
55	Carrie Freret	30.00
56	Edna Doll	30.00
57	Harcol Film Co.	5.00
58	F. A. Muth	113.50
59	Tulane Press	248.55
60	Douglas Anderson	150.00
Sept. 10th—		
61	Edna Doll	15.00
62	Carrie Freret	15.00
63	F. A. Muth	54.50
64	Boylan's Detective Agency	3.00
65	Cabildo Restaurant	14.50
Oct. 8th—		
66	P Kaul	10.00
67	W. C. Rondeau	5.00
68	F. A. Muth	54.50
69	Edna Doll	15.00
70	Carrie Freret	15.00
71	Cabildo Restaurant	17.00
72	Boylan's Detective Agency	3.00
73	Tulane Press	25.00

No.	Name—	Amount
Nov. 12th—		
74	Tulane Press	17.40
75	W. C. Rondeau	10.00
76	F. A. Muth	53.50
77	Edna Doll	15.00
78	Carrie Freret	15.00
Dec. 10th—		
79	Douglas Anderson	150.00
80	E. M. S. LeBlanc	35.00
81	Edna Doll	15.00
82	Carrie Freret	15.00
83	F. A. Muth	56.50
84	Tulane Press	422.10
85	W. C. Rondeau	6.00
86	Owen Gernon, Inc.	22.25
87	Boylan's Detective Agency	3.00
88	Cabildo Restaurant	16.50
		$5,000.75

RECAPITULATION

Total Receipts	$6,664.61	
Total Disbursements	5,000.75	
		$1,663.86
Checking Account in New Orleans Bank & Trust Co.		1,663.86
1 Yerxa Steeves Bond	$1,000.00	
2 $100 First Liberty Loan	200.00	
1 50 First Liberty Loan	50.00	
5 50 1917 Liberty Loan	250.00	
Greater New Orleans Homestead	975.10	
Union Homestead	500.00	
Standard Homestead	500.00	
Italian Homestead	500.00	
Security Homestead	500.00	
Columbia Homestead	500.00	
New Orleans Bank and Trust So. Savings Account	1,494.08	
Canal Bank and Trust Co. Savings Account	540.60	
		7,009.78
		$8,673.64

Respectfully submitted,
THE LOUISIANA ENGINEERING SOCIETY.
WALTER B. MOSES, Treasurer.

REPORT OF EMPLOYMENT COMMITTEE

To the President and Members of the Louisiana Engineering Society:

Gentlemen: As Chairman of the Employment Committee of the Louisiana Engineering Society, I beg to hand in herewith my report

covering the year's activities of this committee, which is composed of the writer and Mr. Raymond Bassich.

I have just received a report from Mr. Bassich and in combining his records with my own I am pleased to report that during the year 1928 I have the following to report:

Number of applicants	214
Number of vacancies	83
Number of vacancies filled	62

Referring to the vacancies filled, I might mention that in many cases applicants who have secured positions do not notify us that they have secured the position, and it is probable that more positions have been filled than shown by this report.

I feel sure that you will agree that this committee is doing good work for the members of the Society, and we hope they will continue to file their applications either with Mr. Bassich or the writer, and we will continue to do everything we can to secure positions for engineers out of employment. Also fill such vacancies for which we receive inquiries.

Hoping that this report is satisfactory to you, I remain,

Yours truly,

R. H. BAUMBACH, Chairman.

REPORT OF THE LIBRARY COMMITTEE, 1928

New Orleans, La., January 19, 1929.

To the President and the Board of Directors of the Louisiana Engineering Society:

Gentlemen: Your Library Committee held one formal meeting during the year with all members present.

The following subjects and decisions or opinions were covered in this meeting:

(1). **Purchase of New Books.**

A list of desirable books already in the hands of the committee was checked over and amplified, and it was decided that this list, which will cost in the neighborhood of $230.00 (Two Hundred and Thirty Dollars) should be purchased by this or the incoming committee as desired as soon as the Board of Directors shall authorize the expenditure.

(2). **Binding of Periodicals.**

The committee felt that the list of periodicals now being bound was well selected and that the binding should be continued.

(3). **Providing Additional Shelf Space.**

It was decided that more shelf space should be provided, perhaps as open shelves for the current periodicals, thereby releasing several shelves of the Globe-Wernicke sectional cases for other books. These are needed for the municipal reports and the experimental bulletins from several of the universities, both of which sets are being amplified and will be arranged logically when the space is available.

(4). **Present Use of the Library.**

Our record of withdrawals last year shows 78 volumes in all removed from the library by the members. If we calculate the volumes removed per member of the Society or the cost of the library to the Society per volume removed, it does not seem to indicate that we are getting much use out of the library.

(5). **Possibilities of Increasing Usefulness.**

Several schemes for increasing the usefulness of the library to the Society were discussed but your committee was unable to suggest any better solution to the problem than the present arrangement, when the funds available and all other factors were taken into consideration.

In conclusion I wish to state that I have found both Mr. H. E. Crump and Mr. Charles Johnson, the two members of the committee, co-operative, ready with suggestions, and sincerely interested in the welfare and improvement of the library.

Assuring you that your Library Committee has considered it a privilege to serve the Society in this capacity for the year 1928.

Yours sincerely,

(Signed) RALPH EARL,
Chairman, Library Committee for 1928.

REPORT OF THE AUDITOR

New Orleans, January 3, 1929.

To the President and Board of Directors, Louisiana Engineering Society, New Orleans, La.:

Gentlemen: Acting in accordance with instructions from Mr. F. A. Muth, Secretary, I have made a complete audit of all books and records of The Louisiana Engineering Society covering operations for the calendar year 1928, and I verified all cash records as well as the Assets and Liabilities of the Society, and I can certify that the attached Balance Sheet truly reflects the financial condition of your Society at December 31, 1928.

Appended hereto you will find the following detailed exhibits in substantiation of my report.

Exhibit "A"—General Balance Sheet December 31, 1928.

Exhibit "B"—Statement showing results of General Fund and changes during 1928 as well as net revenues for the year.

Exhibit "C"—Statement showing results of Proceedings Fund also changes during 1928 as well as balance December 31, 1928.

Exhibit "D"—Statement of Library Fund for the year 1928.

Exhibit "E"—Cash Receipts and Disbursements for the year 1928.

Cash

I wish to state that I have carefully checked all receipts and warrants for payment issued in 1928 and found everything in order, and the cash records in balance with statements from your bankers. Exhibit "E" shows in detail the source of revenue and a detail of the disbursements.

The Savings Accounts were verified from Pass Books and I took special care to see that the balances carried at December 31, 1928, included the interest due by bank and added on the Pass Books.

Accounts Receivable—Membership Dues $2,466.75

The balance is made up of unpaid dues for the following years:

For 1925 dues	$ 92.00	
For 1926 dues	260.00	
For 1927 dues	660.75	
For 1928 dues	1,454.00	
		$2,466.75

Exhibit "A"—**General Balance Sheet, Dec. 31, 1928.**

This exhibit shows in detail all Assets and Liabilities of the Society at December 31, 1928, and to the best of my knowledge and belief is correct. All stocks and bonds and savings accounts were verified by me and found in order.

The total assets at December 31, 1928 are	$11,334.56
The total assets at December 31, 1927 are	9,556.94
Total increase in assets in 1928	$ 1,777.62

My audit discloses the fact that your surplus funds have been invested in the following securities which are all good and sound:

Bank Savings Accounts:

New Orleans Bank and Trust Co	$1,494.08	
Canal Bank and Trust Co	540.60	
		2,034.68

Bonds:

2	$100 First Liberty Loan	$200.00	
1	50 First Liberty Loan	50.00	
5	50 1917 Liberty Loan	250.00	
			500.00
1	Yerxa Steeve Bond	1,000.00	
			1,500.00

Stocks:

Greater N. O. Homestead Installment Stock	975.10	
Union Homestead Full Paid Stock	500.00	
Standard Homestead Full Paid Stock	500.00	
Italian Homestead Full Paid Stock	500.00	
Security Homestead Full Paid Stock	500.00	
Columbia Homestead Full Paid Stock	500.00	
		3,475.10
Total Securities at Dec. 31, 1928		$7,009.78

I take this occasion to suggest that all surplus funds be worked and the best investment I can offer is homestead stock. You appear to have surplus funds at present which should be invested unless you have some contingencies to meet.

I wish to say that the books and records were neatly kept and in very good order. Your Secretary and Treasurer have performed their duties very well and handed me a very fine set of records to audit. I wish to thank them both for their assistance and co-operation, and before closing I want to wish the officers and members of the Society a very Happy and Prosperous New Year.

Respectfully yours,

LEO A. LOUBERE,
Public Accountant-Auditor.

GENERAL BALANCE SHEET
December 31, 1928
Assets

Current Cash:		
Checking Account, N. O. Bank & Trust Co.		$ 1,663.86
Accounts Receivable:		
Membership Dues Unpaid (1925 to 1928)	$2,466.75	
Due by Advertisers	116.42	
Entrance Fees Uncollected	217.00	
Smoker Membership Uncollected	192.00	
		$ 2,992.17
Reserve Investments:		
BONDS—		
U. S. Liberty Bonds	$ 500.00	
Other Bonds	1,000.00	
	1,500.00	
STOCKS—		
N. O. Bank & Trust Co. Sav. A/C	$1,494.08	
Canal Bank & Tr. Co. Sav. A/C	540.60	
	2,034.68	
		7,009.78
Total Assets		$11,665.81

Liabilities and Reserves

Accounts Payable (December Salary and Bills Unpaid)		$ 324.75
1929 Dues Paid in Advance		6.50
Reserve Funds:		
Proceedings Reserve Funds (Exh. C)	$1,278.13	
Building Fund	151.65	
Library Fund (Exh. D.)	694.82	
		2,124.60
TOTAL LIABILITIES AND RESERVE FUNDS		$ 2,455.85
GENERAL FUND BALANCE AT DEC. 31, 1928 (Exh. B.)		9,209.96
TOTAL		$11,665.81

EXHIBIT "A"

GENERAL RESERVE FUND

At December 31, 1928

Balance from Last Report, January 1, 1928	$ 7,835.17
Add Profit for 1928 as Detailed Below	1,374.79
Balance General Reserve Fund at Dec. 31, 1928	$ 9,209.96

ANALYSIS OF GENERAL FUND FOR CALENDAR YEAR 1928

Revenues:

Membership Dues for 1928	$4,023.00	
Smoker Account	325.00	
Entrance Fees	176.00	
Interest Earned on Investments	374.87	
Refund by M. Garsaud	50.00	
		$ 4,948.87

Expenses:

Allow Dues of Secretary	$ 12.00	
Subscription to Proceedings	916.00	
Appropriation to Library Fund	480.00	
Salary of Secretary	540.00	
Printing and Postage	270.40	
Refreshments	120.30	
General Expense	219.53	
Exchange on Out of Town Checks	4.75	
Dues to American Eng. Council	133.30	
Auditor	50.00	
Smoker Expense	515.43	
Loss of Members Dropped for Non-payment of Dues, etc	137.50	
Allowed on Account Honorary Prizes	14.00	
Entertaining	160.87	
		3,574.08
Net Revenues Over Expenses—Added to General Reserve Fund		$ 1,374.79

EXHIBIT "B"

PROCEEDINGS RESERVE FUND

At December 31, 1928

Balance at January 1st, 1928, as per last report	$ 1,113.65
Add Net Gain for 1928, detailed below	164.48
Balance December 31, 1928	$ 1,278.13

ANALYSIS OF PROCEEDINGS FUND FOR CALENDAR YEAR 1928

Revenues:

Advertising Revenues	$1,031.22	
Members Subscriptions	916.00	
Sales of "Proceedings"	38.50	
		$ 1,985.72

Expenses:

Salary of Editor and Secretary	$ 360.00	
Printing and Mailing	1,113.02	
Stenographer	85.00	
Miscellaneous Expense	180.00	
Loss from Cancelled Ads	83.22	
		1,821.24
Net Revenues Over Expenses (Transferred to Credit of Proceedings Reserve Fund		$ 164.48

EXHIBIT "C"

ANNUAL STATEMENT OF THE LIBRARY FUND COVERING THE TWELVE MONTHS ENDED DECEMBER 31, 1928

Revenues:

Balance January 1st, 1928	$ 456.47	
Appropriation from General Fund	480.00	
		$ 936.47

Expenses:

February—		
Carrie Freret		$ 15.00
March—		
Carrie Freret	$15.00	
American Society for Testing Materials	10.40	
		25.40
April—		
Carrie Freret	$15.00	
Royland & McRedmond Ins. Co.	20.00	
		35.00
May—		
Carrie Freret		$ 15.00
June—		
Carrie Freret		$ 15.00
July—		
Carrie Freret		30.00
September—		
Carrie Freret		$ 15.00

October—			
Carrie Freret		$ 15.00	
November—			
Carrie Freret		$ 15.00	
December—			
Carrie Freret	$15.00		
Owen-Gernon Corp.	22.25		
		37.25	
Unpaid Bills Dec. 31—			
Carrie Freret	$15.00		
Eng. News Record	5.00		
Concrete Pub. Co.	4.00		
		24.00	
			241.65
Balance of Library Fund at December 31, 1928			
Net Revenues remaining to be carried over to 1929			$ 694.82

EXHIBIT "D"

STATEMENT OF CASH RECEIPTS AND DISBURSEMENTS FOR PERIOD JAN. 1st TO DEC. 31st, 1928

Balance in Checking Account, New Orleans Bank & Trust Co., January 1, 1928			$ 1,653.94
Receipts			
Dues Collected:			
1925 Dues	$ 9.00		
1926 Dues	113.00		
1927 Dues	504.00		
1928 Dues	2,526.50		
		$3,152.50	
Smoker Memberships Collected:			
1925-26-27	$ 35.00		
1928	267.50		
		302.50	
Entrance Fees		125.00	
Proceedings Advertising		1,136.98	
Proceedings Sales		38.50	
Interest on Investments		209.94	
M. Garsaud Refund		50.00	
TOTAL RECEIPTS		$5,015.42	
Less—Exchange		4.75	
			$ 5,010.67
Total Current Cash—Accountable			$ 6,664.61

Deduct Disbursements

Insurance Premium	$ 17.50
Dues to American Eng. Council	133.30
General Expenses, Watchman, etc	163.53
Smoker Expense	475.43
1927 Accounts Paid	336.00
Refreshments	120.30
Printing and Mailing	963.02
Stenographer	70.00
Investments in Homestead Stock	1,000.00
Harcol Film Co	35.00
Auditor	50.00
Proceedings Miscellaneous Expense	165.00
Library Fund Expense and Salary	217.65
Entertaining	160.87
Salary Secretary and Editor	355.00
Salary Secretary	495.00
Printing and Postage	243.15
TOTAL PAID OUT	$ 5,000.75
Dec. 31, 1928, Balance N. O. Bk. Checking Account	$ 1,663.86

EXHIBIT "E"

PROCEEDINGS
OF THE
LOUISIANA ENGINEERING SOCIETY

VOL. XV. APRIL, 1929 NO. 2

CONTENTS

EDITORIAL NOTES AND COMMENT

Hydraulic Research. The paper by Mr. Israel A. Winter, read before the April meeting of the Society, presents an interesting and instructive summary of experimental work done in connection with the design of certain hydro-electric power plants.

The thesis developed and illustrated by the paper is that while hydraulics is one of the oldest of our applied sciences, yet its laws are still far from being so definitely formulated as to admit of their direct application to the solution of many of the practical problems now presented to the engineer, without availing himself of the knowledge to be secured by means of experiments and research, but obtained through the use of homologous models built to a definite scale.

Mr. Winters' paper describes how such experimental research has been carried out with reference to four of the very important phases of hydro-electric power plant design, viz.:

draft tubes for hydraulic turbines; effective head increases during times of flood; determination of backwater curves for flows over rapids, and the treatment of spillway aprons to prevent scour at the river bed.

It was due to his experience with research problems of this nature that lead to Mr. Winter being brought here to conduct the tests now being made with scale models at the site of the Bonnet Carré Spillway.

It would be an interesting experience for any member of this Society to take a trip up to Bonnet Carré and see the model spillway now in operation for the purpose of securing some of the data necessary for the design. It shows evidence of most careful thought and planning in order that the various factors which enter into the design may all be given due consideration, and the details of the model have been worked out in a way which must arouse the admiration of anyone accustomed to experimental work.

The correct solution of this problem, it goes without saying, is a matter of tremendous importance to this community, and it is to be hoped that Mr. Winter will at some time in the near future contribute another paper setting forth his experiments as applied directly to our local problem.

Certificate of Membership. It is the custom of some of the national engineering societies to present each member with an engraved certificate which, if he so pleases, may be framed and displayed in his office. The Secretary desires to announce that arrangements have been made by which members of the Louisiana Engineering Society may secure such certificates for a fee of one dollar each. Where possible, the certificate will be signed by the President of the Society holding office at the time of the election of the member in question.

Licensing of Engineers. In a brief paper, published in this issue of the Proceedings, Mr. Muth calls to the attention of the Society its responsibilities and obligations with reference to the upholding of the existing laws, and furnishes information for those who may not be familiar with the situation. So far in Louisiana only Civil Engineers, Architects and Survey-

ors are required to be licensed. Sporadic attempts have been made to require registration of members of the other branches of the profession, but without avail.

The profession of Engineering will, in the opinion of the writer of this editorial, never attain the dignity it should have, nor will the title "Engineer" be the honorable one it should be, until both are protected by a universal registration law, impartially and effectively enforced.

Both the medical and legal professions have protected themselves, as well as the general public, by rigidly enforced laws concerning registration and licensing, and through their respective associations they are also exerting a powerful influence in the matter of the amount and quality of the education required of candidates for these two professions.

To practice law in Louisiana, the candidate, in order to be eligible for the Bar examination, must have either graduated from an approved college of law, or must have "read law" for three years in a lawyer's office approved by the Committee on Education of the Bar Association. There is a strong movement on foot now to restrict this eligibility for the bar examination to graduates of an approved law school.

In Louisiana no person may be licensed to practice medicine who has not graduated from an approved medical school.

It is not contended that education will abolish quackery and shystering, but it will certainly prove a strong factor in the prevention of them. The engineering profession, through its important societies and associations, must co-operate with the schools toward this end as is now being done in the professions of law and medicine.

Even with our existing laws, municipal, parish and state authorities should insist that all engineers in their employ be registered, and district attorneys should vigorously prosecute any person practising civil engineering or surveying without a license.

Too great praise cannot be given to the men in Louisiana who have given so freely of their services and who have done so much to maintain high standards in the examinations and rules for the licensing of civil engineers and surveyors.

It is greatly to be hoped that the time will soon come when the system may be extended to include all branches of the profession.

New Orleans Safety Council. Major R. C. Havens, Secretary and Manager of the New Orleans Safety Council, contributes to the Proceedings a brief statement of the aims and purposes of this important organization.

According to statistics, New Orleans does not enjoy a very good reputation for safety, particularly in the matter of street traffic. Perhaps one of the principal reasons for this is the lack of enforcement of already existing laws. Would more laws, therefore, do much good? Why are automobiles permitted to park on both sides of very narrow streets in the congested business districts? Why are drivers of "for hire" cars permitted to park for long periods of time in front of hotels and restaurants, while the "private citizen" is ordered to move on even if he tries to stop a few minutes in order to pick up some friends? Instead of keeping the whole block clear so that persons with business to transact could park for a few minutes, these "for hire" cars occupy the whole space with the exception of a very short section immediately in front of the entrance. While it is not the contention that these things are the immediate cause of accidents, still they are evidences of lack of law enforcement. Where the law is lax in one respect it is very apt to be so in others.

Perhaps the most prolific cause of accidents are lack of courtesy and lack of consideration of the rights of the individual. How many of us, when we see a fellow-motorist in a tight place in traffic, will slow up or turn out, or do whatever else is necessary to let him extricate himself? Not many, unfortunately. How many of us, when we get held up in a traffic jam, will refrain from "tooting" our horns, thus adding to the troubles of the already much harassed traffic officer? Not many!

And so perhaps the most important phase of the activities of the Safety Council is that of education, not only in the technique of accident avoidance and prevention, but education in common sense, decency, fair play and courtesy.

PAPERS AND DISCUSSIONS

HYDRAULIC RESEARCH IN CONNECTION WITH POWER PLANT DESIGN

By Israel A. Winter,

Senior Hydraulic Engineer, Corps of Engineers, Bonnet Carre Spillway Section, New Orleans River District.

Read before the Society, April 8, 1929.

Introduction

The practice of engaging in laboratory research on an extensive scale is of comparatively recent date in this country. The major part of the advancement of the arts has been carried on by a few private concerns, interested in improving their products with the object of effecting greater returns on their investments. This is, of course, a commendable policy, as the country in general is benefitted by such improvements, but it is also true that still greater advantages are to be derived by co-operative experiments and the interchange of data pertinent to a common industry or enterprise.

The engineering societies are the greatest factors in the dissemination of research knowledge. It is most gratifying to note the increasing number of worth-while papers presented to the societies for publication. These papers represent considerable time and expense in their preparation and should be encouraged in every way possible. Those who are most competent to prepare articles relative to the engineering arts are frequently reluctant to present their ideas before the societies. This situation is improving, but there is still a great opportunity for filling in the missing links between two established engineering facts.

The science of hydraulics offers one of the most opportune fields for research to-day. Although one of the oldest of the arts, comparatively little is known of the laws of moving water. When it is considered that in the design of most hydraulic structures and machines practically no safety factor is allowed in determining the quantity and action of the water to be handled, it is evident that the designer should resort to research

relative to his particular problems. Inherently most hydraulic structures represent many thousands, or millions of dollars in capital, and therefore should be investigated from all angles to arrive at the correct engineering solution.

This paper has to do principally with problems in hydro-electric power plant design, but the facts presented are equally applicable to other hydraulic structures. The subjects to be covered are: draft tubes for hydraulic turbines; effective head increasers during times of flood; determination of backwater curves for flows over rapids, and the treatment of spillway aprons to prevent scour at the river bed.

The question of draft tube design has always been foremost in the problems on power plant layout. The foundations are complicated by the necessity of large water passages leading from the turbine discharge.

Structural consideration has to be given an important place in designing an efficient tube. Any increase in turbine efficiency must be balanced by the additional costs involved in a refined water passage. The amount of energy represented in velocity head at the discharge of a turbine will vary from three to fifteen per cent., depending upon the specific speed of the wheel. It is possible to regain as much as ninety-five per cent. of this energy under laboratory conditions. The ideal conical diffuser, as exemplified in the downstream leg of the venturi meter, is seldom practical in a power plant installation, due to the great length necessary to convert velocity head to pressure head at the known rate of negative acceleration. In all the larger units the water must be turned through a ninety degree angle and caused to decrease in velocity while making the turn. The difficulties encountered in arriving at the correct shape of efficient passages to meet these conditions can readily be appreciated by recalling the inherent impact losses accompanying negative acceleration and pressure losses created in an ordinary pipe elbow where no effort is made to regain velocity head.

Many theories based upon fundamental laws of positive acceleration have been advanced relative to design of draft tubes. All of these ideas have proven erroneous when tested

in the laboratory. This fact has brought about a respect for experimental data heretofore unappreciated. The design of a large station to-day is usually proceeded by extensive laboratory investigation before adopting a final design.

To illustrate the advantages of research in this connection, the Mitchell Dam Plant of the Alabama Power Company will be cited.

Draft Tube Investigations

Due to the unusual physical and hydraulic conditions at this station the foundations, incorporating a concentric type of draft tube, necessitated an unsupported span of sixty feet in diameter. The superimposed uniform load over this area was 1800 pounds per square foot. The usual design of beam and arches could not be applied in this case.

To determine what suitable supports could be introduced in the draft tube without effecting the turbine efficiency, extensive experiments were conducted at the Alden Hydraulic Laboratory of the Worcester Polytechnic Institute. These tests were conducted on twelve-inch homologous turbine and draft, and resulted in the design of columns capable of carrying the superimposed loads with only a slight drop in turbine efficiency. To have this excessive loading over a clear span of sixty feet would have incurred many times the cost of the experiments.

During the series several types of tubes were investigated, including an elbow design, which proved equally as efficient as the concentric type of tube.

As a comparison of laboratory results with performance in the field and as a matter of economy in the construction of the elbow tube, two units of each design were installed at the Mitchell Dam Plant. A comparison of costs of the two types is shown by the time required to erect forms and place the steel re-enforcing. In the case of the concentric tube, three weeks were required to perform this operation, while only five days were necessary for the elbow type.

A check on the performance of these two types of units in the field indicated that the laboratory tests gave relative performance of the prototypes.

The experiments were extended to cover investigation of the Lock 12 plant where the old type of elbow tube was installed. These tests resulted in the development of an alteration increasing the overall turbine efficiency by one and one-half per cent. and the maximum horse power by three per cent. These old tubes had been designed using the laws of positive acceleration. The alteration made, theoretically, should have produced negative results, but were actually nearer the correct rate of negative acceleration, as is now known.

Subsequent investigations have been made in the manufacturers' private laboratories in connection with the Martin Dam, Jordan Dam, Upper and Lower Tallassee Plants. These experiments covered all phases of the turbine installation, such as penstocks, scroll case, speed ring and draft tubes, always using homologous models. In these tests substantial improvements in structural conditions and better efficiencies have been realized. Slight changes in water passages often effect the overall efficiency of the turbine by as great as one per cent. The importance of the improvements developed by these tests is apparent when considering the effect on six plants totaling over 700,000 horse power in capacity.

Backwater Suppressor

Experimental work has also been successfully applied to problems of spillway design. These experiments were conducted in the private laboratories of the Alabama Power Company and resulted in several unique and effective designs.

At the Mitchell Dam site the Coosa River forms a relatively narrow gorge and consequently has high river stages during periods of flood. This condition makes the spillway design of prime importance, also the loss in effective pressure head on the turbines is of considerable moment.

To successfully pass a flood of 200,000 cubic feet per second and maintain the plant output during this flood, the Thurlow Backwater Suppressor type of plant was developed.

The principle involved is the utilization of the hydraulic jump to remove the hydrostatic pressure from the turbine discharge, thereby increasing the net effective head with a corresponding increase in power. This action is effected by passing the spillway water over the draft tube outlet at a very high

velocity, creating a hydraulic jump some distance downstream from the turbine discharge.

This design also permitted the power house to be placed in the forebay immediately above the spillway, utilizing the entire width of the river for flood purposes.

Investigations were made on models to a 1/10 and a 1/24 scale. These tests indicated that not only could the normal pressure head be maintained during the time of high river stages, but would actually be increased.

The plant has been in successful operation for six years and has performed identically with the model results. At times the increase in output has been as great as fifty per cent. over the conventional type of plant. The average yearly increased KWH generated is about seven per cent.

Energy Dissipators at Toe of Spillway

The Martin Dam Plant located on the Tallapoosa River at the old Cherokee Bluffs site, has a maximum effective head of 145 feet. This is a storage plant and is primarily operated during the dry weather season.

A spillway problem of passing a flood of 173,000 cubic feet per second in a narrow channel developed at this site. The Mitchell Dam principle was not feasible, due to the high head and the nature of the load carried by the plant. Only 300 feet of effective river channel was available after placing the power house in the most advantageous location. This necessitated the construction of an arched dam with practically fifty per cent. of the spillway on the river banks.

A laboratory model to a scale of 1/100 was constructed to determine the proper treatment of the spillway apron to prevent undermining of the dam and protection of the power house substructure. The performance of the model indicated that the entire spillway discharge would be concentrated in a huge jet moving at a velocity of ninety feet per second at a distance of 200 feet below the dam. The problem of controlling this jet was studied from many angles, resulting finally in the utilization of a stilling basin created by an auxiliary inverted arched dam 22 feet high.

This stilling basin served two purposes; the first was to form a positive hydraulic jump to dissipate the energy of

twelve of the twenty spillway gates. In effect this basin converted the 145 foot fall to 18 feet in a distance of only 117 feet. The total amount of energy dissipated in this pool is something like two million of horsepower. The second function of the inverted arch dam is to receive the converging spillway discharge and create a diverging flow. What would normally be an effective apron length of 100 feet was increased to 350 feet.

The transverse flow from the hill side spillway was treated by means of a banked paving so designed that the waters would spread over the entire surface at the entrance to the river channel under all conditions of flow. This feature enabled the building up of a backwater with a minimum amount of energy per foot of exposed river bed. In effect the normal passage for water increased from 75 feet to an effective width of 200 feet.

The 1/100 model proved satisfactory for determining these hydraulic features but required extremely close observations and many repeated tests to be certain that the correct phenomena were being reproduced. Many secondary features were also solved on this model, but the most significant was the conversion of a normal spillway channel of 300 feet to an effective channel of 550 feet with an energy dissipator capable of handling 90,000 cubic feet per second, included.

During the month of March a flood of 140,000 cubic feet per second passed over the Martin Dam Spillway. The performance of the hydraulic features proved satisfactory and agreed with the model experiments. A check observation during a flow of 80,000 cubic feet per second in the stilling basin showed the hydraulic jump agreed with the predicted elevation to within a half foot. This is remarkable agreement when it is considered that this value is represented by .005 of a foot in the model.

Backwater Curves

At the lower Tallassee Site, located about 15 miles below Martin Dam, a backwater problem was successfully solved on a 1/100 model. This model was constructed in detail representing all features of the topography and structures affecting the flow of water.

The economical location of the power house indicated a site about midway of a 30-foot rapid. The available data for the maximum stage of water during floods were not sufficiently accurate for design purposes. Immediately below the rapids, records of river stages during many years was available which made possible the reproduction of the backwater on the rapids.

To determine the correct elevations at the power house, three piezometers were placed in the river bed of the model corresponding to gauge locations in the field. A quantity of water was passed over the model dam corresponding to a known flood over the rapids. The three gauges were then made to read corresponding elevations, by means of fixed obstructions at the model discharge. This method was continued until the correct gauge heights were reproduced for flow, ranging from 5,000 to 200,000 cubic feet per second. The establishing of the backwater elevations up the rapids was then only a matter of calibrating the profile.

This model reproduced engineering data which resulted in a lowering of the power house substructure twelve and a half feet. It substituted facts for beliefs and netted a great saving in power house concrete.

Conclusion

Hydraulic experiments on a model are relatively inexpensive and when conducted by experienced observers will reproduce faithfully the performance of its prototype. It is true that considerable funds are wasted in experimentation, but this is due to a lack of fundamental knowledge of the laws of similitude and to failure to grasp the problem in hand. Too frequently this type of work is placed in the hands of energetic youths whose endeavors are certainly to be commended, but who lack the matured judgment necessary to reproduce and interpret the phenomena. This matter should be given serious thought by those responsible for the policies of an engineering organization. The old idea that it is easy to spend ten thousand dollars for concrete in a structure, but quite difficult to appropriate $5,000 to effect a saving in design equivalent to that amount is gradually losing ground by repeated proofs that experimental research pays.

DISCUSSION

THE PRESIDENT: I am sure we have all enjoyed Mr. Winter's talk on the importance of having larger views of the new problems of the hydraulic engineer. As is customary, we will now throw the meeting open to discussion of the paper. I know Mr. Winter will be glad to answer any questions.

PROFESSOR GREGORY: I wish to express my admiration for the very illuminating paper we have just listened to. Mr. Winter is a contributor to a recent publication by John F. Freeman, entitled: "Hydraulic Laboratory Practice." This book starts with the history of hydraulics and gives in considerable detail the work of all the important hydraulic laboratories of Europe and America. Among other contributors are found the names that are well known in Europe where this kind of work has been carried on for 30 years. Some of the special problems have been studied there for 25 or 30 years. Experimental work with models has not been developed as much in this country as in Europe but some work of this nature has been undertaken at universities like Cornell, Worcester Polytechnic, Michigan, Iowa State, Wisconsin and others. However, some of the best experiments have been carried on by the large power companies such as the Alabama Power Company, and by manufacturers of turbines, centrifugal pumps and hydraulic machinery such as Allis-Chalmers, I. P. Morris and others.

There is some hope, I believe, that the Engineer Corps of the U. S. Army will establish laboratories in this country for the study of these problems of river control, of spillways, of harbor development and others of a similar nature. It is very much hoped that one of these laboratories will be established in New Orleans. It is only logical that the laboratories should be on the Mississippi River, and we hope that one will be located here. Some of you know that there has been an effort made on the part of some engineers to establish a National Hydraulic Laboratory under the direction of the Bureau of Standards in Washington to investigate problems of this nature and where work of a public and private nature can be carried to a definite conclusion. The efforts in this direction have not been very successful so far but they will be continued. Mr. Winter is doing some excellent work

up at the Bonnet Carre Spillway site, about 25 miles above here. I am sure he would tolerate your presence if you felt like going up there and I think he will, in the next two of three weeks, have something in the way of models that will be well worth seeing. I want again to express the pleasure and profit we have all had in listening to Mr. Winter to-night.

MR. KEMPER: I am interested in knowing what effect, if any, power reservoirs have on flood control. In other words, if the entire flow of a stream is consumed in developing power, what effect does that have on the velocity of flow above and below the power dam? Would the reservoir above the power dam flatten out the peak of the flood and would the run off below the dam be slower than would be the case if the energy of the water were not consumed in developing power?

MR. WINTER: They help only to a very limited degree. The plant I have just shown you will give you some interesting figures; out of a drainage area of 3600 square miles a reservoir covering 45,600 acres was filled to a depth of 25 feet in 3 days. The flood continued to flow until 19 of the 20 spillway gates were opened. The flood for 3 days was stored within the reservoir and the peak of the flood was reduced by just that much, but continued rising floods proved conclusively that reservoirs act only as shock absorbers. Without the reservoir the damage would have been considerably greater.

MR. KEMPER: Ignoring the effect that might be produced further down stream on account of changing the timing of the crests, and treating the stream as a local proposition, would not the power dam lower and prolong the flood and would not the fact of having taken say 70 per cent. of the energy out of the water by the turbines cause the tail-race to be slower and reduce the destructive energy?

MR. WINTER: The danger lies in the fact that a flood of 100,000 sec. ft. caught in a reservoir on one river might be augmented by a second flood of 100,000 sec. ft. in another river and the combined discharge being passed simultaneously would create a false flood height. The potential energy in the power reservoir is the only energy consumed in generation and the effect on the flood is only to flatten out the peak.

LICENSING OF ENGINEERS IN LOUISIANA

By F. A. Muth, Member, Louisiana State Board of Engineering Examiners.

As a rule, individuals can hardly be expected to give support to institutions with which they are not familiar. The administration of the law regulating the practice of civil engineering and surveying in Louisiana has gone along so quietly that there has apparently been little interest or discussion on the subject. This may or may not be due to a lack of interest in the law, although it is very probably due to the fact that the law is operating and the engineering public has accepted it ipso facto.

There are phases of the work which are of general interest to engineers, which it is the purpose of this article to discuss for the benefit of the Louisiana Engineering Society.

The status of engineering licensing was clearly brought out in "Fifteen Years of the Engineering License Law in Louisiana", which was the retiring address in 1923 of Professor Donald Derickson, President of the Louisiana Engineering Society. It is hoped that in bringing some of the data in Professor Derickson's paper down to date, our Society will feel an increased interest in the law and its enforcement.

It is well known that the original law of 1908 was initiated and strenuously supported by the Louisiana Engineering Society; it is therefore a creature of this Society. As such the members of the Society should know about it.

Those who are familiar with the law can see a great deal of good in it, and are giving it their moral support. The law was enacted in 1908 and was one of the first of its kind in this country, if not the very first. It is, therefore, incumbent upon the Louisiana Engineering Society, whose members were the pioneers in this work, to at all times keep informed as to what the State Board is doing and to manifest an active interest in the successful operation of the law.

"Written laws are like spiders' webs and will, like them, only entangle and hold the poor and weak, while the rich and powerful will easily break through them". (Anacharsis, 594 B. C.).

What was true about written laws in the time of Anacharsis is likewise applicable to-day, and it is just as true in all states

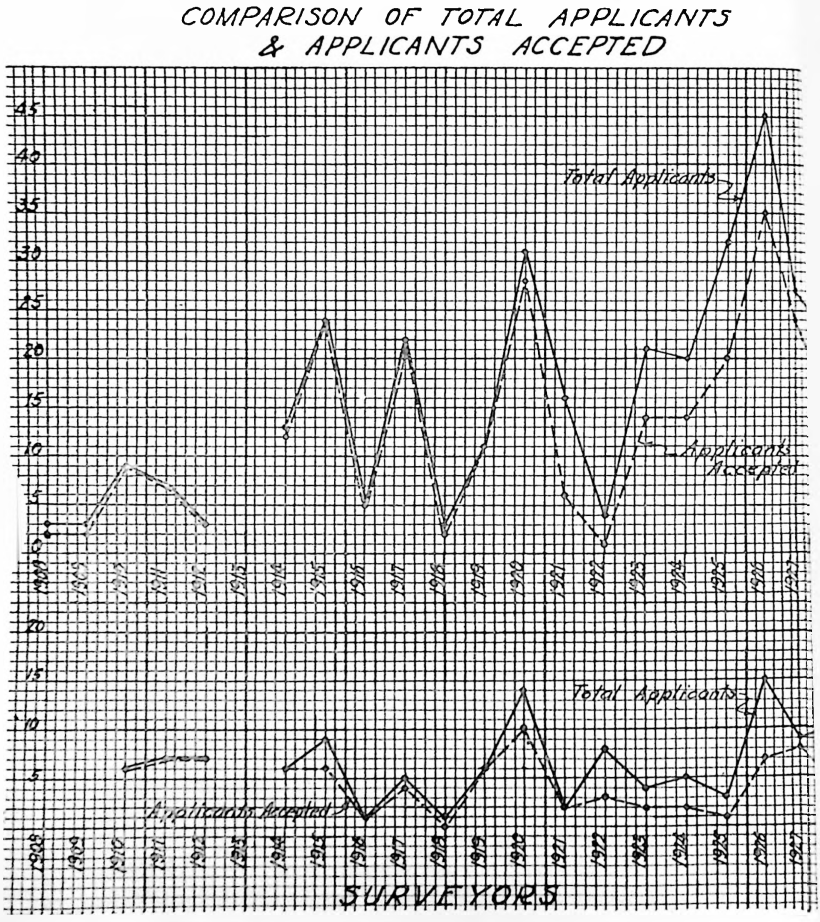
having laws somewhat similar to ours. It is believed to be becoming less true as the sentiment among engineers throughout the country is placing greater emphasis on engineering as a profession. While the licensing of engineers does not necessarily add prestige to those who are licensed, it seems to be the best manner of indicating to the world that those who are not licensed in the state requiring it are not qualified to practice.

This leads to the question of how to become licensed or registered. There are three methods of registration in this state for the qualified civil engineer, viz., first qualifying as a graduate of an approved college of civil engineering; second, by a written examination; third, by reciprocal registration from a state board which is a member of the National Council of State Boards of Engineering Examiners.

For the competent civil engineer of sufficient experience in engineering, who is not a graduate of an approved course of civil engineering, the written examination is provided. The examination is a test not only of his mental and professional fitness but an examination is made of his record, and his character references. The record of applicants is carefully investigated. The confidential voucher issued by the Board for all applicants for registration requires that the references be three engineers as well as former employers. The voucher of a family dentist is no longer considered as a measure of a man's ability as an engineer. The aim is to keep up the standards and to have engineers to so support them that there will be a stronger movement to make the engineer of higher quality. While this cannot be done quickly, it is believed that there is a tendency throughout the country to this end.

The curves shown in the cut indicate the number of applicants and the number registered as civil engineers and as surveyors since the law has been in force.

There were 418 civil engineers and 78 surveyors licensed at the close of the year 1928. No matter how exacting the registration requirements may be, mere laws alone will not make high-grade men. Bacon said: "That laws were like cobwebs, where the small flies were caught, and the great break through." Practicing civil engineering without a license has become less noticeable than it was. This is due largely to the attitude of the various


COMPARISON OF TOTAL APPLICANTS
& APPLICANTS ACCEPTED
Total Applicants
Applicants Accepted
Total Applicants
Applicants Accepted
SURVEYORS

employer-engineers perhaps, rather than to the law itself. It is to such an attitude that we would like to appeal.

The method of examination of the applicant seems to be satisfactory. But the enforcement clause in the law is weak. Misunderstandings have arisen, too, due to some overlapping of other branches of engineering and architecture with civil engineering, but in the main it is safe to say that registration is gaining in effectiveness. The State Highway Commission has recently shown its desire to have its engineers become registered. The City Engineer of New Orleans requires his engineers to place themselves in accord with the law in order to qualify for appointment. Many other engineers require registration of their applicants for employment.

The engineering profession can welcome and should encourage such an attitude on the part of employer-engineer. This sentiment is what is required to further the enforcement of the law and when adopted by individuals or corporations, will place the engineering profession on the plane where it belongs.

There has been considerable discussion all over the country as to the good to be derived from the regulation or licensing of professional engineers. A number of organizations are investigating the question. The neighboring state of Texas is working on legislation and the State of Mississippi has enacted a law within the past few weeks. In fact, 25 states already have laws for registration of professional engineers. A careful study of the question of licensing of professional engineers is being made both by the American Society of Mechanical Engineers and the American Society of Civil Engineers. Their findings will be enlightening. According to our present knowledge, no state which has passed a registration law has ever repealed it without substituting what is considered as something better. The State of Pennsylvania recently wrote another law on its books to replace its original law. Some states have from time to time added amendments or revised their registration laws, but always in keeping with the modern trend and not relaxing their requirements to admit the artisan rather than the professional engineer. Our own law of 1908 was re-enacted in 1920.

The number of states having compulsory registration is increasing and it is believed that before many years all states will

require registration of professional engineers. No doubt the good to be derived is evident in the attitude of the public as well as that of the engineer in having some assurance of the competency of the engineer who is to design structures where the safety of life and limb are involved ,as well as the safety of property.

The question has been asked: "How do you protect the public and the profession from the engineer who may be incompetent because of laziness, dishonesty or poor judgment?" In the case of the registered engineer and surveyor, the law provides that the man's license be revoked. In the case of the unregistered engineer, the case is brought before the proper authority, which in Louisiana is the local District Attorney and the Attorney General. However, in the last analysis the members of the profession are the best protection against incompetents. To them is given the lever to make it difficult for the incompetent to practice.

It cannot be said that in this state increases of pay have ever resulted from registration, but it is believed by numerous engineers that great inconvenience has been avoided in their practice by the elimination on certain works of the cut-throat engineer who has not placed himself in accord with the law.

Civil engineers of Louisiana who are registered and are qualified for reciprocal registration should avail themselves of the opportunity for such registration in order that they may have the reciprocal card for presentation in other states where such licensing is in effect.

It is also believed that the Louisiana State Board of Engineering Examiners has done much to raise the status of the engineer, not only in the eyes of the public, but in the self-esteem of the individual engineer. This is evidenced in the approval and co-operation of the Louisiana Engineering Society. The Society has been able to prevent well-meaning but unfavorable amendments to the law, when it could point out a better way for the enforcement. It is vital to the success of the law that the Society should continue its hearty support of measures which will make it possible to enforce the law, creating a sentiment favorable to such enforcement.

WORK ON NEW ORLEANS SAFETY COUNCIL

By Major R. C. Haven, Manager.

Members of the Louisiana Engineering Society:—I am glad to tell you what the New Orleans Safety Council is and does.

It was organized December 13, 1928, and is a locally sponsored, officered and managed association of influential and interested citizens. Its sole purpose is to carry on a year-round, coordinated program of accident prevention work in an effort to reduce the annual toll of life, limb and property, due to preventable accidents. The work is carried on systematically and scientifically.

It is co-operative, non-profit-making and non-political. It embraces in its organization all phases of community life and therefore cannot be made the cat's paw for any selfish schemes or undertakings. Its officers are:

Richard R. Foster	President.
J. V. Gresham	Vice-President.
Adam Lorch, Jr.,	Vice-President.
Ray M. McWilliams	Vice-President.
Sidney W. Sours	Treasurer.
R. C. Haven	Secretary.

Through its Board of Control and standing committees it brings into active and interested co-operation a large number of leading citizens. Through them it will, in one way or another, reach the entire weave and warp of the city. It is functioning under the executive management of a full time, experienced manager with staff, who will direct the work incident to a well-rounded accident prevention program.

It operates on the basis of Engineering, Education and Enforcement.

It will collect and analyze the accident data of the city in such a way that accident causes may be clearly set forth, and then undertake the correction of the conditions that have given rise to them.

It will create public sentiment in favor of carefulness, and good sportsmanship, through the use of all forms of educational

propaganda and will inform the public upon the most successful methods of accident prevention. Its field of service can best be described by the following nine standard committees whose work forms the basis for the program:

Public Education Committee
Mr. Nicholas Bauer, Chairman.

The most effective way to reduce accidents is by education. This committee will conduct a program tending to rouse every man, woman and child to the seriousness of the accident problem and instruct them in the avoidance of the common hazards of the streets, home and industry.

Industrial Safety Committee
Mr. Scott Thompson, Chairman.

Our annual losses to industry due to fatal and non-fatal accidents are tremendous. The purpose of this committee is to carry on an intensive safety educational campaign for local industries. Through our activities we will not only keep the bread-winners on the job, but by developing better accident experiences, eventually reduce compensation insurance and other costs.

Child Activities Committee
Mr. L. diBenedetto, Chairman.

The ultimate solution of the accident problem is through the education of the child. Our committee will encourage safety instruction in the class room and co-operate in the further development of Junior Safety Councils, Junior Safety Patrols and Playground Safety Committees in every school. It will issue a school Safety News and use other means of keeping the dangers of everyday life before the child.

Commercial Vehicle Committee
Mr. Myles F. Brynes, Chairman

Our committee will deal with the safety education of drivers of commercial vehicles. In addition to keeping constantly before the driver his responsibility to his employer, his family and the community in general, we will strive, through the elimination of accidents, to eventually reduce the cost of insurance to the employer.

Home Safety Committee
Mrs. Godfrey Zehner, Chairman.

In thirteen months (Jan. 1, 1928, to Feb. 1, 1929,) 10 children and adults died and 82 persons were sent to the Charity Hospital as a result of burns which occurred in the homes of New Orleans. Figures are not at hand for the many other types, but there were 39 deaths last year from home accidents. Through our many activities we will endeavor to reduce to a minimum these unnecessary accidents, which cause so much distress and suffering among our people.

Law Enforcement Committee
Mr. Frank Dameron, Chairman.

The enforcement of law is one of the three important factor in every community-wide program of accident prevention. This committee will co-operate with our judges, police and other law enforcing bodies, giving them every possible assistance and encouragement in compelling the heedless minority to observe the safe practices which the great majority have adopted as measures of public safety.

Traffic Committee
Mr. Rathbone DeBuys, Chairman.

The purpose of this committee is to interest a large group of citizens in the serious traffic situation confronting our city, who will study street conditions, traffic control and legislation, making such safety recommendations to the city officials as may result from these investigations. The committee will provide an outlet for the desire of many citizens to help solve the traffic problems.

Fire Prevention Committee
Mr. Rush P. Strong, Chairman.

This committee will co-operate with those agencies desiring to stimulate community-wide fire prevention activities, including legislation matters and a year-round program in the home, schools, industry and commercial houses. Its work will deal principally with fire prevention as it pertains to personal injury.

Statistics Committee
Mr. J. O. Fernandez, Chairman.

Councils cannot operate intelligently without determining where, when, how and why accidents occur; their cost to the community; who was responsible, etc. This is the "Facts Finding"

Committee. It will collect from the Coroner's office, hospitals, health department, police department, insurance companies and other sources data regarding public, home and industrial accidents, the basis on which the Council determines its problems and develops its activities. These facts will be used by the various committees and disseminated.

But why a Safety Council to do all this?

Because it is the accepted procedure of fifty-nine large American cities and has produced results. Because no individual city official or department, no single campaign and no single organization, no matter how broadly constituted, can do the community safety job alone; the job will be completed only when the principles and practices of safety have been thoroughly "sold" to all organizations and groups constituting the community, and when all of these, both official and unofficial, have themselves taken over appropriate parts of the safety program.

Because through this organization our city will have, not only the accumulated experience of the National Safety Council during the past fifteen years in promoting local organizations, but the current experience of fifty-nine local organizations throughout the country as an aid in developing and carrying on its program in this city.

Because the problem in New Orleans will never be less but is growing worse as the accident problem becomes more intensified.

Because a large percentage of philanthropic expenditures goes into cases arising from accidents.

Because there is no other form of city advertising more potent than one's ability to say that a city is a safe place in which to live and rear a family.

Because reduction in earning power due to accidents, interferes to a definite extent with the buying power of the citizens and the consequent prosperity of the community.

Because the problem in New Orleans is serious, particularly in connection with street safety. There were 124 lives lost in traffic accidents in 1928 (an estimated economic loss of $627,000, not taking into consideration the property damage resulting from the many other traffic accidents, of which we have no record at

this moment.) Eighty-two of these were people killed by pleasure cars alone, as against only fifty-four in 1927, or an increase of 52%. Due to our bad accident record here there has been an increase of 16.3% in our liability and property damage insurance rate level in the last five years.

Because the foundation upon which the Community Safety Council is built is sound, both from the economic and humanitarian view point.

Because an ounce of prevention is still better than a pound of cure.

You will see from the foregoing that it is purely an engineering problem.

In closing, let me say that the efforts of all concerned are justified by the fact that last year 124 people died as the result of traffic accidents, 139 from accidents in the home, 27 from accidental deaths in our industries, and 53 from miscellaneous causes, an economic loss of $1,715,000.

Note: The Louisiana Engineering Society is represented on the Council by Prof. Frederick H. Fox; The Engineering Traffic Committee is composed of the following members of the Society who are investigating the Traffic Report: Mr. John L. Porter, Chairman; Mr. J. M. Todd, Mr. W. T. Hogg and Professor D. Derickson. Mr. C. G. Muench is also a member of the Committee on Safety in Plants.

F. A. MUTH, Secretary.

MINUTES OF THE MEETINGS AND BUSINESS OF THE SOCIETY

Minutes of the Board of Direction, March 25, 1929.

The meeting was called to order, with President Fox in the chair and the following members present: Messrs. Porter, Muench, Frost, O'Neill and Muth.

The minutes of the previous meeting were read and approved, attention invited to the fact that no meeting was held in February due to the illness in the family of the proposed speaker.

Communication from Hon. J. A. L. Waddell was brought up for consideration and on motion duly seconded, it was voted that the Board believed it is not within the province of the Society to make recommendations to the government in regard to international loans.

The matter of furnishing a suitable certificate of membership to those members of the Society who desire it, was brought up for consideration. After discussion it was voted that an announcement be published in the Proceedings calling attention to the fact that members who desired certificates of membership can have them at a cost of $1.00 each. These certificates would be suitable for framing. In cases where it would be desired, the certificate of membership would be signed by the President of the Society at the time the member was elected, if that were possible.

The name of Col. A. M. Shaw was transferred to non-resident member. The name of J. H. Bernhard was removed from the roll.

There being no further business, the meeting adjourned.

F. A. MUTH, Secretary.

Minutes of the Regular Meeting of the Society, March 25, -929.

The meeting was called to order about 8:10 P. M., with President Fox in the chair, F. A. Muth, Secretary, and 68 members and guests present.

On motion duly seconded, it was voted to dispense with the reading of the minutes, announcement having been made that no meeting was held in February.

Reports were received from various committees.

The technical exercises of the evening were most interesting, due to the splendid speakers who were our guests. The address of the evening was on: "Cement and Concrete," by Mr. Duff A. Abrams. This was followed by a short talk on "Suspension Bridges," by Mr. Ralph Modjeski. Interesting discussions followed, which were enjoyed by all. Then

Major R. C. Haven spoke, and made some announcements in regard to the work of the New Orleans Safety Council.

A rising vote of thanks was then tendered our speakers.

The meeting adjourned to the usual collation.

F. A. MUTH, Secretary.

Minutes of the Board of Direction, April 8, 1929.

The meeting was called to order by President Fox and the following members were present: Messrs. Frost, Todd, Porter, O'Neill, Moses and Muth.

The minutes of the previous meeting were read and approved, and bills on hand were ordered paid.

A communication from Mr. James M. Todd, chairman, New Orleans Section, A. S. M. E., was read, relative to the report of the Committee of the American Engineering Council on "Street Traffic, Signals and Markings." This report was turned over to Mr. John L. Porter, chairman of the Engineering Traffic Committee, Louisiana Engineering Society, for the New Orleans Safety Council. On motion duly seconded, it was voted that the President appoint Mr. Todd as additional member of this committee.

The matter of providing additional comfort for the members of the Society from the small amount of funds available was brought up, with special reference to the feasibility of providing an amplifier system for the meeting room, and perhaps a system of electric fans. On motion duly seconded, the following committee was appointed to investigate the advisability and estimated cost of: First, an amplifier system for the large meeting room downstairs; second, a system of electric fans.

Mr. James M. Todd, chairman; Professor Douglas Anderson, Professor James M. Robert, were appointed as the committee, to submit its report with recommendation, to the Board, as soon as convenient, pertaining to the above matters.

The resignation of Mr. F. T. Foote was accepted with regret.

A communication from the National Committee on Calendar Simplification was brought to the attention of the Board, and on motion, duly seconded, it was voted that the Board believed it was not in the province of this Society to make recommendations in regard to the calendar.

There being no further business, the meeting adjourned.

F. A. MUTH, Secretary.

Minutes of the Regular Meeting of the Society, April 8, 1929.

The meeting was called to order about 8:10 P. M., with President Fox in the chair, F. A. Muth Secretary and 72 members and guests present.

The minutes of the previous meeting were read and approved.

A copy of a book on "Hydraulic Laboratory Practice," edited by Mr. John R. Freeman, was presented to the Society by Mr. James M. Todd, Chairman of the New Orleans Section of the A. S. M. E. This volume was accepted for the library of the Society.

The technical exercises of the evening consisted of an address on: "Hydraulic Research in Connection with Water Plant Design," by Mr. I. A. Winter. This address was illustrated with motion pictures and lantern slides. An interesting discussion followed and a rising vote of thanks was tendered our speaker.

The meeting then adjourned to the usual collation.

F. A. MUTH, Secretary.

PROCEEDINGS
OF THE
LOUISIANA ENGINEERING SOCIETY

VOL. XV. JUNE, 1929 NO. 3

CONTENTS

EDITORIAL NOTES AND COMMENT

The Modern Airport. Mr. Saal's paper, published in this issue of the Proceedings, discusses the characteristics of the modern airport as demanded by the present and future development of commercial aviation. It should have some of the characteristics of a circus ground and tourist camp, with hotel accommodations and repair plants, and should be a recreation center for the people of neighboring cities and towns. All this in addition to the absolutely necessary and proper space and facilities for the safe handling of all the aireraft which may come to it.

One's mind naturally turns to the situation as far as our own city of New Orleans is concerned, and Mr. Saal also discusses that. His point of view is of special interest in view of the fact that the Orleans Levee Board is proposing to create an airport on the shore of Lake Pontchartrain, a short distance outside the city. This project will cost considerably in excess

of $600,000 and in the opinion of Mr. Saal its location and other conditions do not merit the expenditure of public funds to this extent. It would appear that Mr. Saal feels that the present municipal airport at Belle Chasse, even with its rather difficult accessibility, is a better proposition than the one on Lake Pontchartrain.

His real choice of a location for the municipal airport for New Orleans is the annex to City Park. It provides sufficient acreage, lies adjacent to Canal Boulevard and Bayou St. John which could be made available under proper conditions for the landing and anchorage of seaplanes. It would perhaps be difficult to convince the people of New Orleans, however, that any land already dedicated to park purposes should be taken over for an airport.

One cannot but experience a considerable degree of surprise at Mr. Saal's attitude toward the Lake Shore site, as it would appear that the engineers of the Orleans Levee Board, as well as the Commission Council, would have studied this problem in every detail and would have secured the approval of the Department of Commerce before launching a project of the magnitude and importance of this one.

Railroad Construction Methods. At the May meeting of the Society, Mr. Pickens, representing the Southern Pacific Railway System, exhibited and explained a very interesting motion picture showing the methods employed in the construction of a line in the Rio Grande Valley. He also exhibited a film showing the principal points of interest and the scenic wonders on a trip from New Orleans to California.

Why Not a Club House? At a recent meeting of the Board of Direction the President was authorized to "appoint a committee to investigate the feasibility of a meeting place more centrally located, also a place for housing the library where it can be of greater use to the members."

How much do the members use the library? Very little, judging by the last report of the Library Committee.

The writer of this editorial note believes that the center of location of the resident membership of the Society, location in this case meaning residence, would be perhaps in the neighborhood of Peters (now Jefferson Avenue) or even further uptown.

The suggestion is that the Society might lease for a period of years, or even purchase, a residence in an uptown section of the city and with a few necessary changes convert it into a club house which would serve all the purposes of the Society. With a care-taker and one servant the house could be kept open day and night and the library would then be accessible at a time when it might be most needed, viz.—in the evening. Some of the upstairs rooms in the house might even be made a source of revenue.

This, in effect, is just what the Round Table Club has done, but on a much more elaborate scale than we could hope to do at the present time, principally for the reason that their dues are something over twice as much as ours. While the Round Table is a social club, it also has the important feature of a weekly lecture meeting during the season from October to June. Simple refreshments are served after each of the meetings and the average attendance is approximately the same as at one of the meetings of the Louisiana Engineering Society.

It would seem as if comfortably heated and well lighted rooms, always ready and open, would promote sociability among the members and would conduce to greater and more satisfactory use of the library, both for books and the current engineering periodicals.

The principal factor involved is that of expense, and this would require a very careful survey of our available resources before any consideration could be given to carrying out the suggestion.

It would, moreover, be interesting to hear what the members as a whole think of the plan.

New Members. The following names have been passed upon by the Board of Direction either as new members or for change of classification:

Resident Members

George E. Brown, 7804 Spruce St., Chemical Engineer, representing the International Filter Co. and the National Aluminate Corporation, both of Chicago.

James H. Collins, 1310 Short Street, Office Engineer with Outdoor Advertising Co.

Robert E. Gosa, care W. Horace Williams, Inc., Vice-President W. Horace Williams, Inc.

Robert A. Nadler, Engineer with Celotex Co., Marrero, La.

Hugo Schlenk, Jr., Research Engineer with Celotex Co., Marrero, La.

Ernest K. Strahan, 2115 Octavia Street, President E. K. Strahan, Inc.

Victor W. Webb, 310 Pere Marquette Bldg., Secretary-Treasurer E. K. Strahan, Consulting Engineering and Salesman.

Transfer From Student to Resident Member

Leonard R. Kirst, 2113 Tulane Avenue, Engineer with Henry A. Mentz.

Leon M. Reinach, 1805 Robert Street, Engineer with Ford, Bacon & Davis.

Non-Resident Members

Jean Earl Christian, care Graham Engineering Co., 208 Godchaux Bldg., New Orleans, Oil Refining Design.

Associate Members

Perry H. Beall, 4632 Banks Street, Engineer with F. H. Chisolm.

Frank C. Codifer, 107 Balter Bldg., General Contracting, Real Estate and Developments.

Otto S. Jessen, 4956 Music Street, Draftsman and Designer.

Gus C. Kraus, 2723 Paris Ave., Assistant to Superintendent Rolling Stock and Shops Department, N. O. Public Service.

Philip P. Samuel, 2511 S. Carrollton Ave., Purchasing Agent, Supply Division, U. S. Engineer Office.

Junior Members

Joseph W. Havlicek, 6014 Catina Street, Radio Electrician, Eighth U. S. Lighthouse District.

Charles E. Wuerpel, 1520 Jefferson Avenue, with U. S. Engineer Office on Bonnet Carré Spillway Survey.

Stephen C. Howath, 3508 Magazine Street, Consulting Engineer.

Alfred Lippman, Jr., 2329 Joseph Street. (Awarded Society's Prize as best student in graduating class 1929 at Tulane University).

Transfer From Student to Junior Member

Frank G. Stewart, 7453 Dominican Street, City Engineer Office, New Orleans.

Non-Resident Junior Member

Brister B. Pierce, 841 St. Hypolite Street, Baton Rouge, La. (Awarded Society's Prize as best student in graduating class 1929 at Louisiana State University).

Resident Student Member

Samuel P. Landry, 4901 Magazine Street.

PAPERS AND DISCUSSIONS

LAYOUT, DESIGN AND RATING OF AIRPORTS

By Raymond Saal,
General Manager, New Orleans Airport Commission.
Read before the Society, May 13, 1929.

It may be bad form to start talking with an alibi, but at the outset, I wish to say to you that, although I am on your program as the leader of the technical exercises for this meeting, I am anything but an engineer. By profession, I am a lawyer; by occupation, I am a textile manufacturer; by inclination only, am I an aviator. I shall, therefore, talk to you in a purely non-technical manner.

It is, of course, unnecessary to talk to you fundamentally about airports. You all know what an airport is primarily: a flat, level place for the landing and taking off of aircraft. However, it is in nine out of ten cases not located in the proper place, and that is what I particularly wish to talk to you about this evening.

The airport of today should be very large, but on the other hand an airport must be more than just a large field, or in no sense is it really an airport. Several years ago any large open pasture would have been considered a satisfactory airport, but we have long since passed over the pasture stage in airports, although there are a number of people who have not been able to remove this pasture conception of airports from their minds. Once the average layman sees an airplane landing or taking off from any type of field, that field, in his mind, becomes a satisfactory airport, and should that layman happen to see two or three planes operating from such a field, he would immediately think that he has before him a real first-class airport. Such, however, is not the case.

All of you will probably remember the flying which was done from that little section of Audubon Park on which the swimming pool is now located. True it is, those ships which were of the inadequate world war army training variety, did operate from that field for about thirty days without mishap.

However, from an aeronautical viewpoint, this flying from that inferior field was nothing short of disgraceful, and that particular venture and all such other hazardous flying from small, inferior fields, should be condemned and stopped by the city police.

Today's modern airport has a number of characteristics quite different from the ones you probably have in mind. To begin with, the modern airport is to a large extent a circus ground, where people congregate to see what are to them queer things. It is also a tourist camp, where a portion of the air-traveling public more or less camp in the open air. For others, it must be a hotel where reasonable hotel conveniences can be expected and obtained. It must also be an aero-repair plant where any type of aircraft may be rehabilitated by expert crews of workmen. It is surprising the distance from which fliers come daily and expect to be made thoroughly comfortable and have their ships put in first-class condition. Besides this, an airport should be a recreation center, where persons from the neighboring cities may congregate for amusement.

In its present stage of development, aeronautics should be made as popular as possible to the masses and everything should be done to encourage their interest and a closer contact with aviation. The airport, therefore, within reasonable limits, should be open to the public for their enjoyment, amusement, education and convenience.

Flying of today does not include only the sunlit hours; therefore, the personnel of an airport should be in attendance at all times and service of every kind should be available twenty-four hours out of every day.

The Templehof Air Dome in Berlin, Germany, is the best outstanding example of today's modern airport. It is excellently located near the center of Berlin, on a tract of land which was formerly the Kaiser's parade ground, and is probably the most active airport in the world. It is surrounded with amusement buildings of not great height, on the roofs of which are located restaurants, roof gardens and beer gardens, and it is customary for large numbers of people to congregate there daily, watching the operations and becoming familiar with the manner in which aircraft are handled. This not only

has a tendency to amuse, but it destroys the natural fear of flying, and has the greatest value in educating the people towards air-mindedness.

In my opinion, for several years to come, probably five or ten, in all probability an airport in the southern part of the United States operated as an independent proposition, will not pay its own way, but must to some extent be a public charge Unfortunately for our municipalities, after the world war, the agencies promoting aeronautics saw fit to convince the public officials of a great many of our larger cities that the maintenance of airports was the duty of the municipality, and after some time, municipal support of airports became the public vogue. Each city then without an airport felt the necessity of creating something as good as, or better than, its neighboring city, and airports generally became municipal propositions. Airports, therefore, until they can attract enough business to be self-supporting, must be viewed largely in the nature of public parks, and in order to keep any given municipality abreast of its neighbors, must receive the highest type of public and municipal support.

In the last several years large national corporations have gone into the airport business, but in my opinion, it will be several years before the airports which these corporations operate will be able to pay dividends. The immediate reason for these new businesses rests upon the necessity for larger and better airports in order to satisfactorily handle the largest types of aircraft which are presently being built, and the even larger types of aircraft which are at present designed, and it will be found, I believe, that the largest stockholders in these corporations are the manufacturers of aircraft themselves, who are feeling the necessity of creating better airports, in order that their better and larger aircraft may be disposed of. It is plain that the building of larger aircraft would be futile, unless satisfactory airports were available for their operation.

I have here three small loose-leaf booklets containing airway bulletins published by the United States Department of Commerce, and covering practically every airport in the United States, which I will pass around in order that you may look at

them while I am speaking. It is to be noted that with the exception of possibly fifteen or twenty other cities in the United States, the airport facilities at New Orleans compare most favorably. Many aviators landing at our airport tell us that it is the best airport they have seen since leaving the immediate vicinity of New York.

There are four usual types of airports, known as two, four, six and eight-way fields. Each straightaway naturally provides landings and take-offs in two directions, so each straightaway would be a two-way field. Four straightaways, each 500 feet wide, permitting landing in at least eight directions at all times, and converging at angles of not less than forty degrees, each straightaway being at least 2500 feet in length and with clear approaches, makes for the very best type of landing field. By straightaways I do not mean runways. I mean simply straightaways, but the entire field should be none the less available for landing. Such a field as I have described would bear an "A" rating as to size by the Department of Commerce.

The runway plan, where the entire field is not available for landing, is of a much less desirable type. Chicago has such a field, and it is not uncommon at a busy hour for aircraft to be forced to circle overhead for quite some time before being able to land, on account of the congestion below them. Probably all of you gentlemen have seen aircraft land and take off and have noticed the remarkably small area required. This is deceiving, for if our modern airports needed only to handle one plane at a time, much smaller fields would be entirely satisfactory, but the problem of the future, and in many localities, of the present, is the handling of a number of aircraft at the same moment, and, therefore, the necessity for large fields. Aircraft should be able to come into municipal airports in droves and to take off in droves, and in the near future we will see a great deal of passenger flying throughout the United States to an even greater extent than is presently to be seen in Europe, and in a city the size of New Orleans, in five or ten years it will not be an uncommon thing for two hundred passenger ships to come in and go out daily.

The next consideration which I would like to impress upon you gentlemen, particularly as engineers and probably designers of our future airports, is proper site selection. Any given site of sufficient area might appear ideal, whereas it most probably would be entirely inadequate for the purpose for various aeronautical reasons. It is obvious, of course, that the field must be firm and level, with suitable approaches well drained, and without obstructions or depressions presenting hazards in taking off or landing. It is preferable that the field be heavily sodded with Bermuda grass and kept closely cropped. Of course, roads should not cross any part of the landing area, but the entire landing area should be open and available for the landing and taking off of aircraft only, and used for no other purpose. The field should not have a maximum slope at any point of more than three inches in ten feet, which corresponds to grade of two and a half per cent. The mean slope of the entire surface should not be more than two per cent.

The site selected should be free from surrounding obstacles, for such obstacles will diminish effective landing area by seven times the height of such obstructions. For instance, obstacles fifty feet high along the border of a field will diminish the landing area along that side by three hundred and fifty feet.

The site selected should, of course, be located on a class "A" highway, leading to the city to be served.

Drainage should be of the very highest order. In order to establish the importance of this in your minds, I might say to you that I can visualize three distinct types of general drainage; let us call the first type farm drainage, which is entirely inadequate for the purpose, permitting water after a very heavy rain to drain from the farm within two or three days; but such drainage is entirely inadequate for airport purposes. We may call the next type golf course drainage, but even this, which permits water to be removed in one day, is not sufficient. The third type of drainage, which I shall call airport drainage, should carry water from the landing area as fast as it falls, and this feature is one of the very most important in selecting an airport site and constructing an airport. No amount of money

should be spared to accomplish this purpose, and a sufficient quantity of tile drains should be installed, no matter what the cost, for without the very driest kind of drainage, an airport may for thirty per cent of the time be valueless. Curtail embellishment in other directions, if funds are limited, in order to put the necessary amount of money into adequate drainage. It is impossible for me to stress this point too greatly.

In selecting an airport site, the direction of the prevailing wind is always important, as airplanes should land and take off directly into the wind. Cross-wind landings can be made by competent pilots, but this is contrary to air traffic rules, except in emergencies, or for instruction or test purposes, and should be avoided commercially wherever possible. It is easy to see that a landing or a take-off directly into the wind is most desirable, the purpose being to reduce ground speed on landing or taking off without reduction of air speed. This operation can be likened to a boat with a maximum water speed of five miles per hour, traveling up a stream of a speed of four miles per hour. With relation to the water the boat is traveling five miles per hour, but with relation to the land, the boat could only be traveling one mile per hour. Aircraft need good air speeds to insure stability, but at the moment of contacting the wheels of the aircraft with the earth, there should be a minimum of ground speed, in order to lessen the landing strain. It can easily be seen that a landing or a take-off with the wind would double the ground speed, and a landing or take-off across the wind would place the strain of landing on the side of the landing gear, instead of on the revolving motion of the wheels, and, therefore, anything but a landing or take-off into the wind is undesirable. When an airport is not available for landing in all directions, the longest landing strip should be a line with the direction of the prevailing wind, for a very long landing strip run across the direction of the prevailing wind might render such a site useless eighty per cent of the time.

Pole lines should be particularly avoided in site selection, for in addition to being obstacles, telephone, light or power wires carried on poles at the edges of fields constitute a serious menace. Pilots will usually attempt to glide in close to the

edge of the field, and often such wires are nearly invisible. The risk of catching the landing gear in such obstances is always present, and such an accident is apt to be serious. If the wires happen to carry high voltage, the danger is, of course, increased. All wires along the boundaries of flying fields should be placed under ground, or removed to safe distance; that is, at a distance greater than the ratio of seven to one.

One of the very greatest hazards in flying, and particularly night flying, is fog, and even expert pilots find great difficulty in flying through it. Landing safely under such conditions is practically impossible with present equipment, and a proposed site which lies in a section frequently affected by fog should not be chosen under any circumstances.

Smoke, too, creater a very serious situation, and, especially in industrial centers, the presence of smoke is a great menace to flying. The location of the site with reference to industrial plants and the prevailing wind is a matter for serious consideration. Birmingham, Alabama, for instance, has an excellent flying field, only four miles from the heart of the city, but, unfortunately, it is located in a hollow, to the windward of some very large steel plants, and it frequently happens that pilots are unable to locate the field on account of the presence of thick black smoke.

In selecting an airport site, the basic dimensions of 2500 feet by 2500 feet should be borne in mind, but as the altitude of the site above sea level is increased, the outside dimensions of the flying field must likewise be increased, as landings and takeoffs must be made at a higher speed, which necessitates additional space. Aircraft operating in high altitudes, and, therefore, in rarefied air, do not find the same supporting factor from the atmosphere as do aircraft at sea level, for of course the thicker the air, the better the supporting medium. This fact has been recognized by the United States Department of Commerce and airport sizes at altitudes for proper operation have been given as follows:

Starting, of course, 2500 feet square at sea level.

At 1,000 feet	2,600 feet square
At 2,000 feet	2,750 feet square

At 3,000 feet	2,900 feet square
At 4,000 feet	3,300 feet square
At 5,000 feet	3,600 feet square
At 6,000 feet	3,800 feet square
At 7,000 feet	4,250 feet square
At 8,000 feet	4,500 feet square
At 9,000 feet	5,100 feet square
At 10,000 feet	6,200 feet square

This table gives a clear idea of the supporting value of the atmosphere at various altitudes and should be always borne in mind.

An airport should be located with particular reference to its proximity to the city which it is to serve, for the advantage of air traveling is diminished if an unnecessary portion of the time saved by traveling by air is lost in getting back and forth between the airport and the city, and for this reason, no stone should be left unturned to establish airports as close to the center of cities as possible. The airport of today, and, particularly, the airport of tomorrow, ranks with our terminal stations for railroads in transportation importance, and should not be pushed off to one side merely to get it out of the way, but should be brought right into the center of the picture where it properly belongs. Particular attention should also be paid to the flow of air traffic to and from the given site, for if an airway approaches a city from a certain angle and leaves it at another angle, there would be one section which will be more advantageous for the location of an airport in regard to this airway. If the airport should be located on the opposite side of the city from that on which the airway approaches, this may cause added flying mileage, which can be eliminated by the choice of another site.

All airport sites should be selected with the possibility of expansion clearly in mind, for as it is quite impossible to prophesy what the future holds for aviation, it is likewise impossible to tell exactly what will be needed and demanded of an airport. It may be that inventive genius will permit aircraft to land and take off practically perpendicularly, but we who have flown have our serious doubts about this, and it appears that the tendency is towards larger aircraft of the pres-

ent type, requiring more and more space for operation. In connection with this, as well as in connection with the location of any airport, in order to insure that the approaches of the airport site will not be restricted by the erection of high buildings, it is extremely advisable to cover this phase of the matter with a zoning ordinance, to thus keep the approaches clear at all times in the future.

Where possible, airports should be located in sections which afford as many available open fields in the immediate vicinity as can be had, as, with other internal combustion motors, an aircraft motor has the bad habit even after being warmed up properly, of developing most of its trouble shortly after the load has been placed upon it, and they have the particularly nasty habit of going dead shortly after the take-off. This failure of motors, of course, has been reduced by many times in the past few years, but, nevertheless, for such an emergency open fields where straightaway landings may be made are extremely valuable.

After all of the above considerations have been taken into account, there is still one great point which should be carefully investigated. To the architect or engineer, or even to the aviator, a selected site may appear ideal, but as a matter of fact, there may be bad air-currents and eddies near the site or in the approaches which will add materially to the hazard of flying, and such a site should not be selected. In addition to meteorological reports on proposed sites, actual test flights over the suggested sites should be made under varying conditions to determine the existence and extent of such air-currents.

Bringing all of these considerations down to our own situation, we have here in New Orleans a rather difficult airport problem, and many objections may be raised to almost any site which we might select near the city. New Orleans, unfortunately, is situated on a narrow strip of land bounded on the north by Lake Pontchartrain and on the south by the Mississippi River. Available land near the heart of the city is, therefore, almost impossible to obtain, and on account of the position of New Orleans as a port, and on account of its location with reference to Central and South America, making it an

ideal base for seaplanes, the airport should be located near a suitable body of water. By reason of its peculiar shape, unless the airport is located very close to the point where Canal Boulevard intersects the lake, or Canal Street intersects the river, the site must necessarily be at a great distance from the center of the city. A lake site presents two very great difficulties, although having many advantages of one nature or another. The two great difficulties are, first, the presence of a great deal of fog in winter, and particularly on winter nights, and second, the almost entire uselessness of Lake Pontchartrain as a proper place for the landing and taking off, or anchorage of seaplanes. In order to render Lake Pontchartrain probably suitable for seaplane operation, a series of very expensive and elaborate breakwaters will be required, which would offer great obstruction to the navigation of water craft, and also might not satisfactorily serve the purpose. On the other hand, a lake front site has the advantage of being located on ideal soil, well and quickly drained; by being located far from high obstructions, either trees or buildings, and of being available for almost unlimited expansion. Such a site on the lake front, however, should be at the intersection of Canal Boulevard and the lake, not only because of its proximity value, but particularly because of its psychological value. Even considering the future importance of an airport to New Orleans, it is manifestly impossible to locate such an airport at the intersection of Canal and Royal Streets, but every effort should be made to have the airport at a point which can be reached in a nearly straight line from the business district. Twists and turns invariably add miles in the traveler's mind, and all of the larger cities are endeavoring to place their airports on some main highway or thoroughfare, coming into the city in as nearly a straight line as possible.

For seaplane operation, the Mississippi River has proven to be the best available waterway in this vicinity, and this lends great weight to the advisability of placing the airport on one of its banks. An airport on the east bank of the Mississippi River within reasonable distance of the center of the city is practically impossible to obtain on account of the cut-up condition of this area, and an airport on the west bank of the Mis-

sissippi River offers the disadvantage of having to be reached by ferry, and of necessarily also being quite a distance from the center of the city. The advantages to be found at such a location, however, are excellent drainage, opportunity for expansion, practically entire freedom from fog, the Mississippi River as a seaplane landing place, and excellent flying conditions in almost any sort of weather.

It is presently proposed by the Levee Board to create a field on the lake front of Lake Pontchartrain at a point on the east bank of the Industrial Canal at a cost for the field alone of an amount in excess of $611,000.00. On account of the great distance which this site lies from the main Post Office, being only one mile closer in a straight line than the municipal airport at Belle Chasse, I am of the opinion that it is not of sufficient merit to warrant the expenditure of $611,000.00 of public funds, for I believe that after it is constructed, it will be found to be not the airport which the City of New Orleans needs.

In my humble judgment, the only proper place for the location of a suitable airport for the City of New Orleans lies in the annex to the City Park, which provides sufficient acreage, and which lies adjacent to Canal Boulevard. This site is a reasonable distance from the center of the city, adjoins Bayou St. John, which could be made available for the anchorage of seaplanes, and which could even be made available for the landing of seaplanes under suitable conditions. Lake Pontchartrain could then be used under favorable weather conditions for the taking off of seaplanes. In every particular, the City Park Annex is the ideal New Orleans airport location, and no stone should be left unturned to obtain it. It is admitted that this tract will not be used for park purposes for the next twenty-five years, and it is of so much greater value to the City of New Orleans as an aero-park than as an extension to City Park as to be incomparable.

I have endeavored to give to you in a non-technical way the requirements for an airport, as well as a brief summary of the airport situation in New Orleans, and I trust that some forward-looking movement in the right direction will be initiated before it is entirely too late to recover from our lack of airport consciousness.

SOME BRIEF REMARKS ON SUSPENSION BRIDGES

By Ralph Modjeski

(Mr. Modjeski was present as a guest at the March meeting of the Society and was called upon for a few remarks.—*Ed.*)

It is a great pleasure to come to New Orleans unexpectedly and find a meeting of the Louisiana Engineering Society, and your Secretary, Mr. Muth, told me that I would be expected to say something tonight. Time is short, but I might say a few words about the thing that occupies my mind—suspension bridges. I think that probably there are very few bridge engineers in this assembly. Of course, we are now in a period of bridge building which requires very long spans. Spans that cannot be built unless they are of the suspension type. I have recently completed a bridge in Philadelphia, 1750 feet span. It is now considered a very moderately long span. There is being built a bridge in Detroit 1850-ft. span; and in New York 3500-ft. span, twice that of Philadelphia. These are all suspension bridges. We had a controversy some time ago as to whether eye bar chains or wire cables are the best means of supporting the flooring of a suspension bridge. The Menai bridge in England lasted nearly 100 years. This was an eye bar suspension bridge, only about 570-ft. span. It was taken down recently because of the rust between eye bar heads which could not be prevented. Brooklyn Bridge, built 40 or 45 years ago, is a wire cable suspension bridge. Since then, we have not improved the wire cable very much. We have examined the Brooklyn Bridge cables by driving wooden wedges between the wires to see if any deterioration of the wires had taken place, and none was found after nearly half a century of service. This shows the superiority of wire to eye bars. Besides that, in eye bar suspension bridges, the eye bars can be stressed to 50,000 pounds, not nearly as much as the wires, which can be stressed to 70,000 pounds per square inch. This results in lighter weight of the superstructure. The modern method of making wire cables for suspension bridges is to make them of galvanized wire. The Williamsburg Bridge in New York was made of wires which were not galvanized, and some traces of rust have

been found, yet not in sufficient amount to make it a serious matter, and the bridge will probably stand for a great many years. The important part, of course, of a suspension bridge are the anchorages. These are usually made by providing what we call strand shoes which are of a horseshoe type and which are attached to eye bars. These eye bars should be separated so that they can be repainted and not be subject to rust. We trust to concrete to protect most of the anchorates from rust indefinitely. We know that it has been proven many times that steel or iron imbedded in concrete will not rust, provided that the concrete is good. In the olden times anchorages were made accessible. Now they are simply imbedded solidly in concrete. There are various ways of protecting a suspension bridge against excessive oscillations from concentrated loads. The means formerly used in the New York bridges and the Delaware River bridge was a stiffening truss suspended from each cable and which also supports the floor. There have been things done on the Delaware bridge that are unusual. There are only two main cables. New York bridges were built with four cables. Unequal deflection of those cables under different conditions of live load cause distortions in the floor system, which are objectionable. Cables of the Delaware River bridge have 18,666 wires, each, a total for the two cables of 25,000 miles of wire. Perhaps it would be interesting now to say a few words about the method of erecting very large cables. It is impracticable to build these cables on land and hoist them to place. The towers are built first, then we lift from the river four or six smaller twisted cables to support the temporary walk; these twisted cables are later cut into hangers and used on the permanent bridge. After the foot walk is placed, we begin stringing wires. It is very important to get the wires all of the same length and all of the same sag so they will pull equally. For that purpose, we string what we call a guide wire which is very carefully calculated and its sag determined by instruments, and all other wires are strung to that guide wire. The wires are strung by a grooved trolley wheel about five feet in diameter which pulls what we call a bight or loop of the wire across the river where it is looped around a strand shoe. The wheel then takes another bight and pulls across in

the opposite direction. The process is repeated until a strand has been strung. Both cables were strung at the same time. The cable consists of a number of strands (61) of 306 wires each, and they are arranged in the cable in hexagon position, that is the cross section of the cable is a hexagon and is kept as a hexagon until all the strands are in place. Then we come to compressing the cables; it is done by hydraulic machines which compress the cable into a circular form under a very high pressure, but not high enough to injure the galvanizing. The cable is seized with wire temporarily to keep it in shape and then the cable castings are put on which are to support the hangers which are spaced very carefully by instruments. Then the cable is wrapped with No. 9 galvanized wire, close wrapped like the handle of a golf stick; when the cable is finished, there only remains now the suspending of the trusses and floor from the cables. It was possible to avoid any overhead bracing by bracing the top chord of the truss to the floor. The gussets or brackets brace the chords of the trusses so that there is no need for overhead bracing excepting at the towers. A few words about the towers. As you all know, the Brooklyn Bridge towers are built of masonry. But as we make progress in engineering in general, we have come to designing the towers of metal. The objection to masonry towers is that you have to place rollers on top in the towers to provide for motion of the cables. On the Brooklyn Bridge the temperature and load changes cause the cable to slip should the roller refuse to work, and that slips occurs with a jerk, causing a jarring in the entire bridge. In the case of the Delaware Bridge, the deflection of towers at the top between extreme positions is supposed to be in the neighborhood of 4 to 4½ feet; the tower is calculated to take that bending. Another thing which has been changed in modern bridges is the floor. In olden times it was considered quite sufficient to use plank flooring. Now it is quite essential to make the floor fireproof. This has been accomplished in the Delaware Bridge by building a concrete slab 6″ thick and covering it with 2½″ asphalt. Wooden floors have their dangers. Recently a bridge at Memphis was nearly thrown in the river because of fire starting in the wooden roadway. It battered and buckled the outer webs in the main chords and it is only

due to the design which provided four webs in these chords, one of which, the outer one, was twisted out of shape, that the span was saved. Three webs held the bridge up. It has been a great pleasure to have met this nice company of engineers, and I thank you for listening to me.

MR. MCWHORTER: I would like to ask Mr. Modjeski to what extent suspension bridges are suitable for railroad traffic?

MR. MODJESKI: Long suspension bridges would be very suitable for railway traffic, but should have at least four tracks. Two tracks would require extremely heavy stiffening trusses to distribute the concentrated heavy loads in such a way as not to produce injurious deflections in the structure. But a bridge of four or six tracks can be easily managed. We have provided two tracks for rapid transit and two tracks for street railways on the Delaware River Bridge, besides six lanes of vehicular traffic. These loads will always be well distributed.

PROFESSOR DERICKSON: Here in New Orleans we are very much interested in the subject of bridges, the construction of two Mississippi River bridges being contemplated at the present time. It would be interesting to know whether Mr. Modjeski considers this a suitable location for a suspension bridge. Our soil conditions being such as they are, it would seem that the question of anchorage might preclude this type of structure.

MR. MODJESKI: I am not familiar with exact soil conditions at the exact place where a suspension bridge is contemplated here. All anchorages in New York were built on gravel, or gravel slightly mixed with clay or sand; not on rock. In one case, some inclined piles were driven to resist the lateral pull. At one time in the Delaware Bridge construction, there was a thought of putting down some inclined caissons. It was afterwards decided to use solid masonry, two large caissons 100 to 120 feet long sunk to rock so that the resultant passes through the middle third of the base. Suspension bridges can be built on other ground than rock by taking such precautions as driving inclined piles or sinking inclined caissons.

MINUTES OF MEETINGS AND BUSINESS OF THE SOCIETY

Minutes of the Board of Direction, May 13, 1929

The meeting was called to order by President Fox and the following members were present: Messrs. O'Neill, Frost, Porter, Moses and Muth. The following members of the Society were present by request: Messrs. Young, Dusenbury, Gregory, Lanphier, Derickson, Coleman, Anderson, Earl, Klorer and Grehan.

The minutes of the previous meeting were read and approved, and bills on hand were ordered paid.

On motion, duly seconded, it was voted that the Finance Committee invest $1,000.00 of the Society's funds as the committee sees fit.

The report was made by Dean Anderson, representing the special committee appointed to investigate the feasibility of a public address system and of electric fans for the meeting room. The report indicated that the use of an amplifier system for public addresses was not practicable for our meeting room, and estimates were submitted for the installation of necessary electric fans, which report will be borne in mind for future reference. The committee was thanked for its work.

In connection with the foregoing report, on motion, duly seconded, it was voted that the President appoint a committee to investigate the feasibility of a meeting place more centrally located, also a place for housing the library where it can be of greater use to the members.

Considerable discussion took place with reference to editorial which appeared in a recent issue of one of the nationally known engineering magazines and on motion, duly seconded, the President was authorized to appoint a committee to draft the proper letter to the editor of the magazine and to furnish the New Orleans Association of Commerce with a copy of the letter. President Fox appointed the following committee: Messrs. George Earl, J. F. Coleman and John Klorer.

There being no further business, the meeting adjourned.

F. A. MUTH, Secretary.

Minutes of the Society, May 13, 1929

The meeting was called to order about 8:10 P. M., with President Fox in the chair, F. A. Muth, Secretary, and 64 members and guests present.

The minutes of the previous meeting were read and approved, and monthly report was received from the Chairman of the Employment Committee.

The technical exercises of the evening consisted of a most interesting and instructive address on: "The Layout, Design and Rating of Airports", by Mr. Raymond Saal, General Manager of the New Orleans Airport Commission. An interesting discussion followed the address, and a rising vote of thanks was tendered the speaker.

The Society was additionally entertained with motion pictures, showing modern railroad construction in the Rio Grande Valley, also scenic views taken on a trip from New Orleans to California. Mr. Pickens, representing the Southern Pacific Railroad, was tendered a rising vote of thanks for exhibiting these interesting motion pictures.

The meeting then adjourned to the usual collation.

F. A. MUTH, Secretary.

PROCEEDINGS
OF THE
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CONTENTS

EDITORIAL NOTES AND COMMENT

Cement and Concrete. Under this title this issue of the *Proceedings* carries a paper which was presented before the Society at the regular monthly meeting in March. The considerable delay in publication was due to the fact that Mr. Abrams desired to secure some additional data before putting it into print, which it was not practical to secure until quite recently.

In the introduction Mr. Abrams reminds us that the original patents for portland cement were taken out in England a trifle over a century ago. Over fifty years elapsed, however, before the artificial cement gained the ascendency over the natural material.

Concrete is the only important structural material which is actually manufactured on the job, and it is this fact that emphasizes the tremendous importance of the research work in which Mr. Abrams has played such an important part.

The importance of research into the processes of manufacture of the cement itself is aptly illustrated by Mr. Abrams' description of the tests on concrete made from "High-Early-Strength Cement." These show how the modern manufacturers with their technical staffs and research organizations are able to meet the demands of industry for unusual requirements.

The general use of the 28-day test as a criterion of quality in concrete is based upon the old ideas that about one month was necessary for concrete to attain sufficient strength to permit its being placed in service. Now we find that this time has been gradually reduced until at the present day much concrete is placed in service after one or two days, and in many instances after a few hours.

Of all the factors entering into the making of good concrete probably the accurate control of the mixing water is the most important. Mr. Abrams notes that some recent tests show that the addition of one pound of water produces the same loss of strength at one day as the omission of three pounds of cement.

The building materials market is full at the present time of substances to be used as admixtures with portland cement to secure certain desired qualities in the concrete. It is Mr. Abrams' belief, based upon the results of tests on fourteen commercial admixtures, that "all the commercial admixtures tested must be classed as injurious adulterants due to excess water required to maintain workability."

The Place of the Engineer in the History of Civilization. The fear is often expressed in certain quarters that modern industry and the present so-called "mechanistic" age are going to prove fatal to our social institutions, to art, and to the general happiness of the human race. Is there real ground for such fear? It was the Editor's privilege and pleasure to hear this question answered in a most eloquent and inspiring manner at the recent annual meeting of the Society for the Promotion of Engineering Education. Professor Dexter S. Kimball of Cornell University chose as the subject of his Presidential Address on that occasion: "The Economic and Social Significance of Engineering." The address is being reprinted in

this issue of the *Proceedings* not only as an answer to the above noted fears, but also as a tribute to the engineer for his part in the orderly progress of civilization and as a prophecy and inspiration for the future.

Activities of Louisiana Highway Commission. At the request of the Highway Commission there is being published in this issue of the *Proceedings* a statement of their present activities. It is very encouraging to know that Louisiana is to have these improvements to her highway system. To those of us who live in New Orleans, and who pay such a large proportion of the taxes, both general and special, it would appear that most of those contemplated improvements will be of more benefit to the tourist who *passes through* Louisiana than to the citizens of New Orleans who make such extensive use of the highways leading out of the city.

When one takes note of the splendid system of roads radiating from cities all over this country, many of them smaller and of far less commercial importance than New Orleans, it is difficult to understand how we have tolerated for all these years a condition of affairs in which, with the exception of a short stretch of paved highway extending as far as the town of Kenner, there is not a really decent modern highway leading out of the city in any direction.

There is grave doubt as to whether the new Chef Menteur highway is being constructed in such a way as to adequately provide for the heavy traffic it will have to carry.

One might wish too, when travelling over our gravelled roads, that more adequate maintenance were provided and that many of the long stretches of dangerous loose gravel be done away with.

Wherever the fault may lie, certainly the citizens of New Orleans cannot point with pride to the highways which lead therefrom.

New Publication of U. S. Coast and Geodetic Survey. The U. S. Coast and Geodetic Survey, Department of Commerce, has just issued a new publication entitled "Manual of Second

and Third Order Triangulation and Traverse," which should prove of great value to engineers and surveyors throughout the country. The purpose of the publication is to provide a manual on second and third order horizontal control surveys which will conform closely to the modern requirements and approved practices of the Coast and Geodetic Survey. The only discussion of theoretical principles which have been included are those necessary to a proper understanding of field methods. The manual is not designed to take the place of textbooks teaching the basic principles of control surveys but is intended to supplement them.

The scope of the publication is shown by the titles of the six chapters of the manual: Reconnaissance; Second and Third Order Triangulation; Second and Third Order Base Measurement; Second and Third Order Traverse; Astronomic Azimuths; and Constants, Formulas, and Tables.

This publication, containing 226 pages and 98 illustrations, is sold only by the Superintendent of Documents, Government Printing Office, Washington, D. C., at the nominal price of 60 cents per copy. For further information apply to the New Orleans Field Office, C. & G. Survey, 314 Customhouse, New Orleans, La.

New Books. The following books have been donated to the Society by Mr. J. W. Billingsley:

American Institute of Electrical Engineers—14 volumes.

"Gas, Gasoline and Oil Engines"—Hiscox.

"Text Books of Science—The Steam Engine"—Holmes.

"Compendio de la Lengua Castellana"—Gregorio Hernando.

"Steam Power Plants"—Meyer.

"Substitution of the Electric Motor for the Steam Locomotive"—Stillwell & Putnam.

"The Cement Industry"—The Engineering Record.

"Reinforced Concrete"—Buel & Hill.

"Pumping Engines for Waterworks"—Hague.

"Disposal of Towns' Refuse"—Goodrich.

"Steam Engine Design"—Whitham.

"Dampf"—Babcock & Wilcox Co.

"Electric Power Transmission"—Bell.

"Gas Works: Their Arrangement, Construction Plant and Machinery"—Collyer.

"A Text Book on Roads and Pavements"—Spalding.

"Steam Boilers"—Peabody & Miller.

"American Steam and Hot-Water Heating Practice"—The Engineering Record.

"Annual Report, Commissioner of Agriculture & Industries, Alabama—1912-13."

"Yearbook of the Department of Agriculture—1916."

"Valve Gears"—Spangler.

"Manual of the Paymasters Dept.—U. S. Marine Corps."

"Pocket Companion — Carnegie Steel Co."— 1903 (2 copies).

"Dynamo-Electric Machinery"—Thompson.

"The Edge Moor Water Tube Boiler"—Edge Moor Iron Co.

"Official Handbook—Laws Regulating Construction of Buildings, City of New Orleans"—1905.

"Electric Lighting Specifications"—Merrill.

"Electrical Catechism"—Shepardson.

"Dynamo & Motor Testing"—Parham & Shedd.

"The Stirling Water Tube Boiler"—Babcock & Wilcox Co.

"Power Distribution for Electric Railroads"—Bell.

"Management of Electrical Machinery"—Crocker & Wheeler.

"Handbook of Cost Data"—Gillette.

"Baldwin on Heating"—Baldwin.

"Electric Transmission of Water Power"—Adams.

"Ventilation and Heating"—Billings.

"State Department of Health of N. Y. State."

"Chemical Technology"—Groves and Thorp.

PAPERS AND DISCUSSIONS

CEMENT AND CONCRETE

By Duff A. Abrams.

Read before the Society, March 25, 1929.

Historical Introduction.

To the present generation of builders cement means portland cement. The history of portland cement reaches back over one hundred years. In 1924 I had the privilege of participating in the celebration held in the Town Hall, Leeds, England, of the 100th anniversary of the patenting of portland cement by Joseph Aspdin. The infancy of this industry extended over 50 years and was extremely uneventful. It was in direct competition with the older natural cement which in general was satisfactory for the simple needs of those days.

As service requirements became more severe the demands for portland cement increased, slowly at first, then more rapidly until about 1890 it became apparent that portland cement had gained the ascendancy. Within the next 10 or 15 years natural cement practically disappeared from the market.

The history of portland cement is a record of unbroken progress. The early attempts produced cement which was probably little better than the natural cement with which it was in competition. As late as 1870 the crude strength tests showed a very inferior cement when compared with present standards; fineness was measured by means of a 50 mesh sieve, and quality was judged by the weight of the cement in pounds per bushel. Contract this with the present where a strength of several hundred pounds per square inch is required in a few days, and the 200 mesh sieve has been outgrown as a measure of fineness. While there have been only minor changes in the standard specifications for portland cement during the past 20 years, the more progressive cement manufacturers have been exerting every effort to improve their product.

Quality of Concrete.

It is to the credit of American road builders that they have been leaders in adopting the new principles of concrete making

which have been shown to exert an important influence in producing strong and durable concrete.

Concrete is the only important structural material which is actually manufactured on the job. Even with the best materials (cement, aggregates and water) extremely poor concrete may be produced, if we do not use the correct proportions and properly mix, handle, place and cure the concrete. We have over one hundred years' experience behind us to show that good concrete can be made from portland cement; hence if poor concrete results from the use of good materials, it is not accidental, but *because it is made that way*. We frequently speak of a *concrete failure*, however, the failures are generally *built in* at the time the work is done, due to faulty proportions or methods.

The most important factors in producing good concrete are:

(1) Limiting the quantity of mixing water to the minimum necessary to produce concrete of the required degree of workability.

(2) Proportioning batches with the minimum of cement, which will give concrete of the required quality.

(3) Allowing the concrete to harden under favorable conditions.

(4) Use of cement of highest quality.

These general principles apply to all types of concrete. The quantity of mixing water should not, in general, exceed 6 to 6½ U. S. gallons per sack of cement (94 lbs.) including the water carried by the aggregates. Under the best conditions, this quantity of water may be reduced to 5 or 5½ gallons per sack. In any case the smallest quantity of water should be used which will enable the concrete to be placed.

The control of mixing water is the most fundamental factor in concrete making; the use of an excess of water may give concrete of only ⅓ or ⅕ the strength which should have been obtained from the same materials—the reduction in strength is particularly marked at early ages. In tests recently carried out by the writer, the addition of 1 lb. of water produces the same loss in strength at 1 day as the omission of 3 lbs. of cement.

The second principle stated above, with reference to the proportions of batches, is closely allied to the control of mixing

water. With a proper recognition of the importance of quantity of water, it becomes possible to effect economies in the mix by adjustments of the relative quantities of cement and fine and coarse aggregates.

The third principle refers to curing of concrete under favorable conditions as to temperature and humidity. Low temperature will materially retard the action of the cement. Too rapid drying will rob the cement of water necessary for hydration.

It will be noted that I have placed the quality of the cement used as the last element to be considered. Unless the other factors are properly cared for, little will be accomplished by the use of a cement of higher quality. With intelligent proportions and workmanship, advantage can be taken of the quality of cement. The quality of the cement becomes of vital moment when time is an important factor in the completion of the work.

Time As a Factor in Concrete Work.

Until quite recently the whole tempo of concrete work was based on the idea that about one month was necessary for concrete to attain a strength which would permit placing it in service. This accounts for the general use of the 28-day test as a criterion of concrete quality. With a better understanding of the principles of concrete-making and improvements in materials and equipment, has come a recognition of the fact that concrete can be safely used at much earlier periods than 28 days. The time has been gradually reduced to 14 days, then 7 days; now we find that the demands of traffic and industry make it necessary to place much of our concrete in service 1 or 2 days after placing, and in many instances within a few hours.

As a result of the pressure of time and cost, we have found ways of producing concrete which will attain sufficient strength in a few hours to be placed in service. It is in accordance with sound engineering principles that a concrete structure be placed in service as soon as it has attained the strength required to resist the stresses to which it is exposed. When this time has arrived can readily be determined by field or laboratory tests. Cross-breaking tests of plain concrete beams made on the job are now widely used as a criterion for the opening of concrete roads to traffic. Concrete which gives a modulus of rupture of 400 lbs.

per sq. in. will carry the ordinary automobile traffic with ample safety; a modern concrete pavement which gives a modulus of rupture of 500 lbs. per sq. in. will carry the heaviest truck traffic with safety. There is need for a more liberal interpretation of highway specifications with reference to the time required before concrete roads and streets may be opened to traffic.

Special Cements.

During the past 5 or 6 years there has been considerable activity in the study and manufacture of special portland cements to meet unusual requirements. The Germans were among the first in this field; certain American manufacturers are now producing cements of this type; in general, they are of the perfected portland type or closely allied to portland cement.

There are many instances in the construction of roads, streets and bridges where it becomes extremely important that every day and every hour be saved in placing the concrete in service. The following cases may be mentioned:

(1) Intersections of heavy traffic highways.
(2) The last few days' work on long stretches of road.
(3) Busy roads and streets where satisfactory detours are not available.
(4) Industrial drives and areas.
(5) Construction of sections of pavements over new fills and at bridge approaches which were omitted in original construction.
(6) Concrete road repairs.
(7) Restoration of street openings and construction of manholes.
(8) Street railway track construction.
(9) Decks and floors of bridges.
(10) Piles and other foundations units.

During recent months entire buildings have been constructed with this type of cement.

Tests of Concrete Made From High-Early-Strength Cement.

Fig. 1 gives parallel tests on a high-early-strength portland cement and a standard portland, and is typical of the comparative values from these two types.

Compression tests were made on 1—4 concrete in the form of 6x12-in. cylinders, following standard methods of the A. S. T. M. except that the concrete was mixed by machine. This is about the same mix as that used in concrete roads and pavements. Expressed in terms of cement, sand and gravel, the mix was about 1—1½—3¼, using sand and gravel graded in size up to 1¼ in. All batches were mixed to give the same workability or plasticity as represented by a slump of 2 in. or a flow of 180%, using the 30-in. flow table and 15½-in. drops.

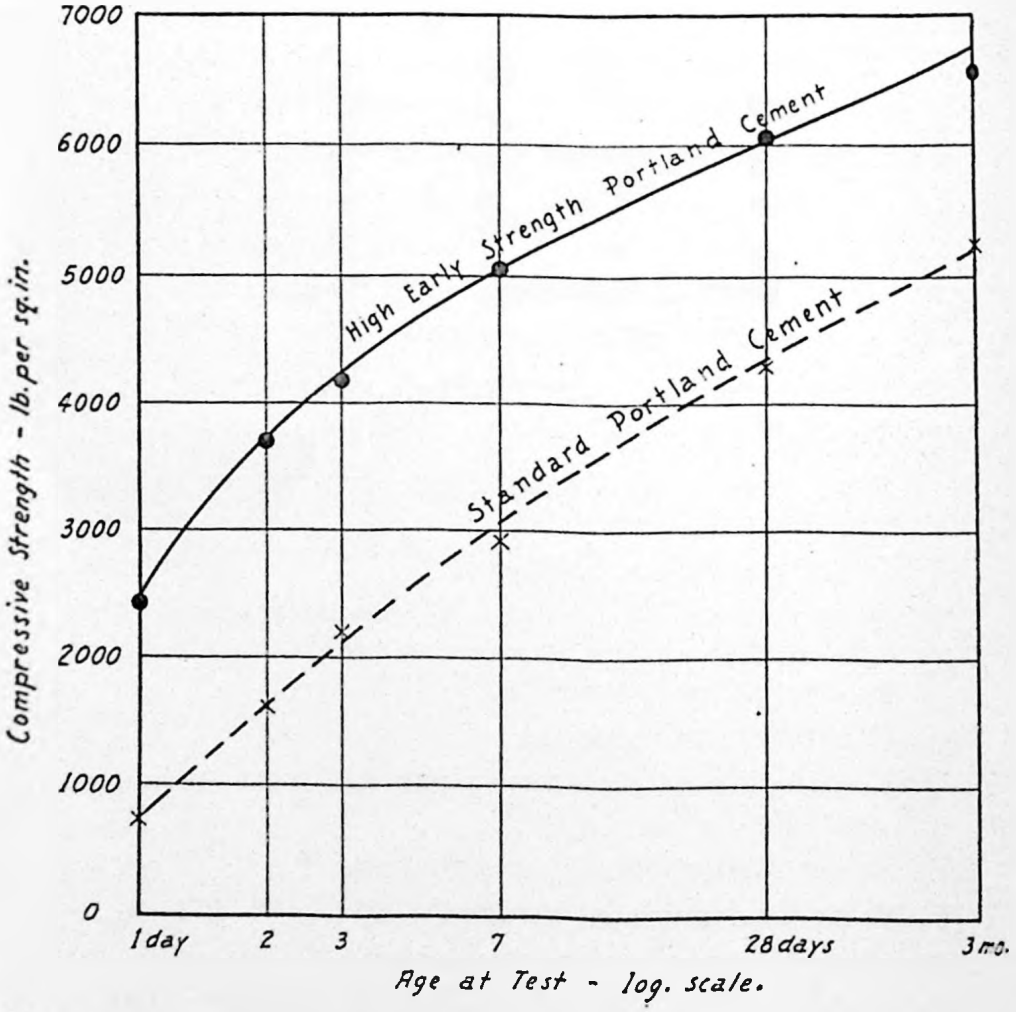

Fig. 1—Comparison of Standard Portland and High-Early-Strength Portland Cements.

Compression tests of 6 x 12-in. cylinders 1-4 concrete.
Flow 180% and slump 2 in.
Sand and gravel graded to 1¼ in.
Water-ratio 0.80, (6 gallons per sack of cement.)
Cured in moist room at 70° F.

The outstanding characteristic of the high-early-strength portland cement is that it gains strength very rapidly during the first 1 to 3 days. At 1 day the compressive strength of the concrete was 3 times that of the standard cement; at 2 days, 2.3 times; and at 3 days, 1.9 times standard cement. After 3 months' damp curing, the high-early-strength cement is about 10% stronger than the standard. The high strengths produced by both types of cement will be noted.

Extensive tests carried out by the writer at Lewis Institute, Chicago, and later confirmed by the reports of Gonnerman and others, show a close sympathy between the modulus of rupture of concrete and its compressive strength. For concrete of this type, the modulus of rupture is about 25% of the compressive strength at 1 day; in pounds per square inch it would be about 575 for the high-early-strength cement and about 200 for the standard cement.

Concrete having the characteristics given by the high-early-strength cements will meet the most severe service conditions at the end of 24 hours. Under summer temperatures, the hardening would be considerably accelerated over that which occurs at 70 degrees F. (the standard temperature for concrete tests). If we had used coarse aggregate graded up to 2 or 2½ in., similar to that generally employed in concrete roads, (and a corresponding water-ratio) strengths about 25% higher would have been obtained.

Specifications.

Several of the state highway departments have adopted specifications for high-early-strength cement. However, there is need for further unification of these requirements. The A. S. T. M. Committee on Cement has a sub-committee actively engaged in studying these cements; it is probable that they will recommend at an early date a specification which can be adopted as standard.

One manufacturer has announced the following specification:

> A perfected high-early-strength portland cement guaranteed to conform with all requirements of the Standard Specifications and Tests for Portland Cement of the United States Government and the American So-

ociety for Testing Materials, and to exceed the standard specifications in the following items:

FINENESS: The residue on a standard 200 sieve shall not exceed 10% by weight.

TENSILE STRENGTH: The average tensile strength in pounds per square inch of not less than three standard mortar briquets composed of one part of cement and three parts of standard sand, by weight, shall be equal to or higher than the following:

Age at Test Hours	Storage of Briquets	Tensile Strength lb. per sq. in.
24	In molds in moist air for 24 hours.	250
48	1 day in moist air, 1 day in water	350

"The average tensile strength of standard mortar at 48 hours shall be higher than the strength at 24 hours."

It will be noted that the 1-day briquet strength must exceed the present standard requirement for 7-day strength, and that the 2-day strength must exceed the 28-day strength requirement for standard portland cement. The time of setting, soundness, chemical analysis, etc., must conform in all respects to the standard specifications.

High-Early-Strength Cement vs. Richer Mixtures.

For concrete mixes falling in the ranges 1—4 to 1—2, the strength *at early periods* is closely proportional to the quantity of cement, so long as a uniform workability is maintained. If we increase the cement content 10%, we may expect an increase in strength of 10%; if we double the cement content, we may expect double the strength. In other words, a 1—2 mix has a strength at 1 to 3 days about double that of a 1—4 mix. A 1—2 mix represents about the limit of feasible mixes for road construction. With this mix we have doubled the concrete strength at early ages and doubled the cost of cement, whereas with high-early-strength cement we may readily obtain 3 times the strength of standard concrete at 1 day at a lower cost for cement.

Each user will be in position to compute the relative economies of concrete mixtures on the basis of local costs of materials.

The following comparison will call attention to the outstanding advantage of the high-early-strength cements.

It is in accordance with the pronounced tendency in all lines of industry to improve materials and equipment. The vast array of modern road building equipment exhibited annually at the Road Show is an inspiring reminder of the progress which has been made in building better roads with less expenditure of time and money. It seems apparent that improvement can be made in the quality of concrete materials, as well as in equipment. The cement manufacturers' contribution to the advancement of road building is the production of a perfected cement which will enable the work to be completed and put into service at an earlier period than is otherwise feasible.

Although cements of this type sell at a premium, the additional cost should not be considered an item of expense, but rather as a time-saving investment. We use larger and more expensive mixers, install batching devices and efficient concrete handling and finishing equipment, in order to improve quality and speed up production. High-early-strength portland cement is also an important factor in speeding up the work and reducing the ultimate cost of the project to the engineer, to the contractor and to the public. The progressive builder will find many applications for this type of cement.

We saw above how a generation ago portland cement replaced natural cement. The time may not be far distant when the perfected portland cement will largely replace the present standard portland cement.

Powdered Admixtures in Concrete.

An extended study of the effect of powdered admixtures on the workability and quality of concrete has recently been carried out in the Research Laboratory of the International Cement Corporation, New York, N. Y. The compressive strength of 6x12-in. concrete clyinders at ages of 1 day to 3 months was used as a criterion of quality; the "flow" of concrete as measured by the 30-in. flow table was the measure of workability.

The concrete was a 1—1.7—3.0 mix—about the type of concrete generally used in road construction. Fourteen different

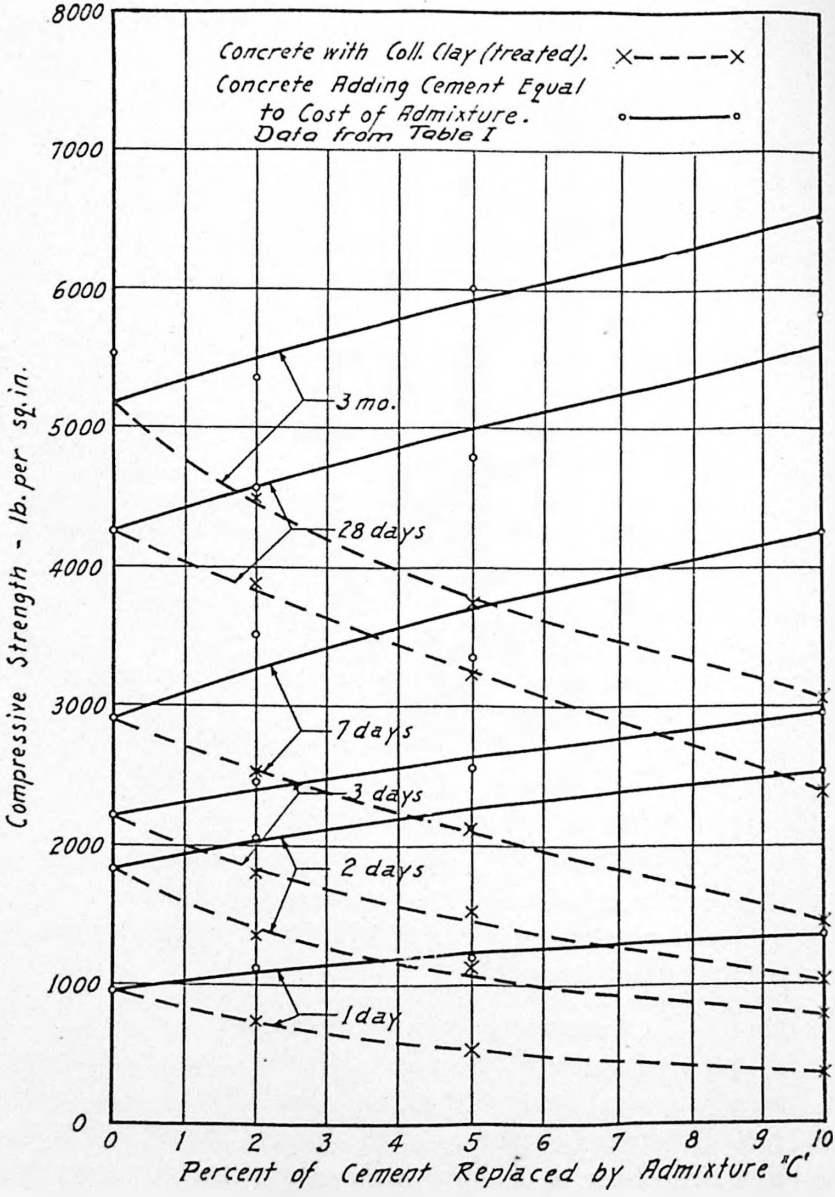

Fig. 2—Tests of Concrete with Admixture of Colloidal Clay (treated)

Compression tests of 6 x 12-in. cylinders 1-4 concrete.

Water-ratio varied to give uniform flow of 180%.

Dotted lines show strength when 0, 2, 5 and 10 admixture replaced equal weight of cement.

Solid lines show concrete strength when cement was added equivalent to cost of admixture.

admixtures were used; seven commercial materials and seven non-commercial.

Generally these admixtures were non-hydraulic although three of the samples showed a tendency to set and harden in the presence of water and cement. From 3 to 5 different percentages of admixtures were used to replace an equal weight of cement. Both standard and high-early-strength portland cements were used. The principal results of the tests are shown in Fig. 2, 3 and 4.

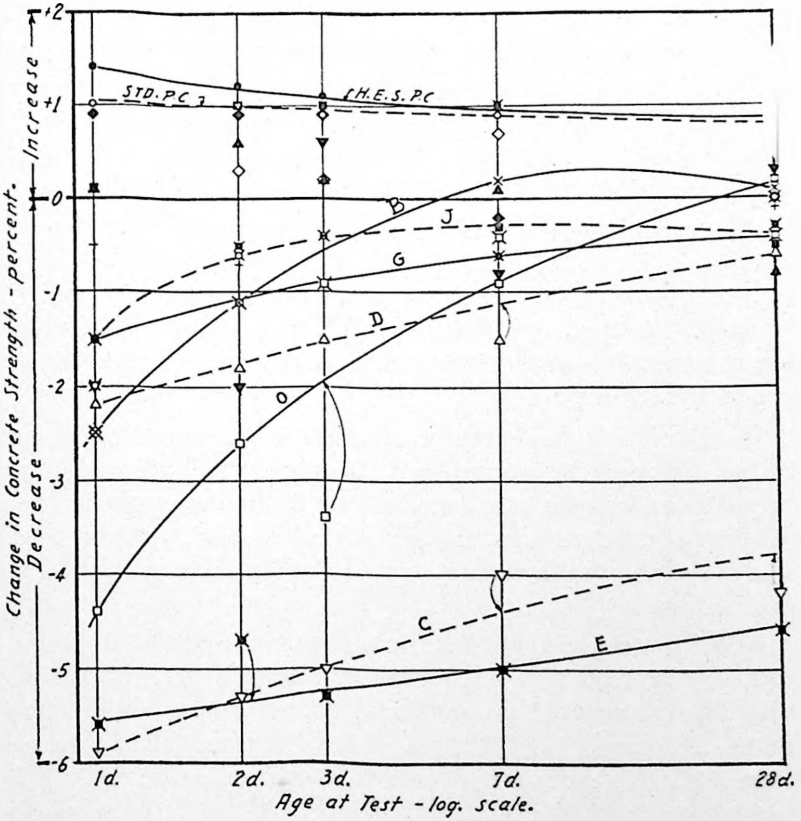

Fig. 3—Effect on Strength of 1% Admixture.

Based on compression tests of 6 x 12-in. cylinders 1-4 concrete, uniform flow of 180%.

Fig. 4 gives the identification of the non-hydraulic admixtures.

The upper curves show the increase in strength produced by adding 1% of cement.

The dotted lines in Fig. 2 show the strength obtained when cement is replaced by 0, 2, 5 and 10% of colloidal clay (treated). The solid lines show the corresponding strength when cement is added equivalent to the *cost of the admixture,* keeping the flow the same. The prices were such that replacing 1% of cement by the admixture cost as much as adding 3.5% of cement.

At early periods the strength of the concrete with 5% of admixture was about one-half that of the cement only of equal cost. While this admixture proved to be the most harmful of those tested, (as shown also in Fig. 3 and 4) the results in Fig. 2 are typical of most of the other materials tested.

Fig. 3 shows the final summary of the admixture tests reduced to the effect of 1% of admixture on the strength of concrete at ages of 1 to 28 days. The identity of the admixtures can be determined by reference to Fig. 4.

The colloidal clays and diatomaceous earth were the most harmful, as shown by reduction in strength of 4.4 to 5.9% at 1 day. A number of other admixtures showed reduction in strength of 1.5 to 2.5% at 1 day. In most instances the reduction in strength was more pronounced at early periods than at ages of 7 to 28 days.

In calculating the effect of admixture we took into account the fact that cement was replaced; in other words we would have arrived at exactly the same conclusions if the materials had been added to a constant quantity of cement. Fig. 3 shows to the same scale the gain in strength due to adding 1% of each of the two cements.

All of the commercial materials required additional water to produce a given degree of workability as measured by the flow test. The quantity of water thus required by each 1 lb. of admixture is termed the "Excess water" factor. The values of excess water for the non-hydraulic admixtures, as determined by the concrete tests, are plotted in Fig. 4. This figure gives also the normal consistency of the admixture as determined by the Vicat needle as in the standard test for cement. It will be seen that there is a fairly well-defined relation between the normal consistency and excess water, also between these factors and loss in strength at 1, 2 and 3 days.

The admixtures which showed the highest normal consistency and the highest excess water factor also showed the greatest loss in concrete strength.

The following conclusions may be stated with reference to powdered admixtures in concrete:

The workability of the concrete as measured by the flow tests was not improved by any of the fourteen powdered admixtures tested.

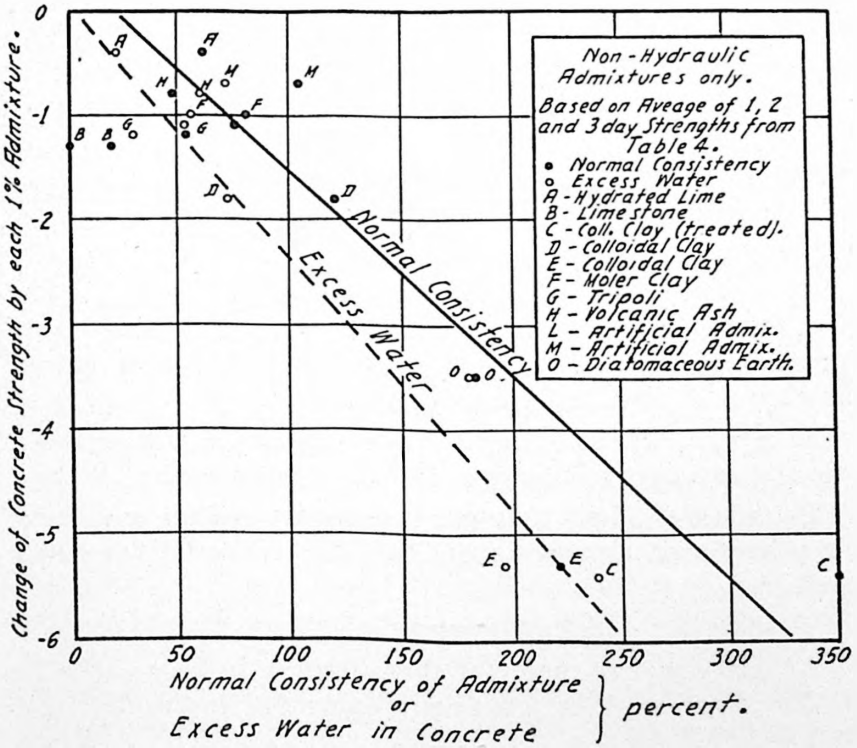

Fig. 4—Change in Strength of Concrete from adding 1% of the Non-hydraulic Admixtures, Compared with Excess Water Factor and Normal Consistency of Admixtures.

Based on compression tests of 6 x 12-in. concrete cylinders.

"Excess water" is the quantity of water which must be added (in percentage of weight) for each 1 lb. of admixture in order to maintain flow of 180%.

Normal consistency was determined by the Vicat needle as in standard test for portland cement.

The excess water required to produce same workability as similar concrete without admixture was approximately proportional to the normal consistency of the admixture as measured by the Vicat needle.

All the commercial admixtures tested must be classed as injurious adulterants, due to excess water required to maintain workability. The reduction in concrete strength was proportional to the excess water.

The colloidal clays of the Bentonite type were most injurious on account of large excess water required as reflected by their high normal consistencies. Loss in strength ranged from about 1.5% to 5% for each 1% of admixture in terms of weight of cement.

After the colloidal clays, diatomaceous earth was the most injurious to strength and workability. Although the serious loss in strength was confined to early ages.

The slightly hydraulic admixtures, powdered, slag (high calcium granulated) precipitator dust, and one of artificial admixtures showed slight increase in strength at early stages, but this benefit was doubtful after ages of 7 days.

In general, loss in strength due to admixtures was greater at ages of 1 to 3 days than at ages of 7 days to 3 months.

The effect of admixtures was independent of the quantity of admixtures used, although quantities higher than 15% were not considered.

A more complete report of these tests is in preparation for the June meeting of the American Society for Testing Materials.

Discussion

THE PRESIDENT: We have all enjoyed hearing Mr. Abrams and appreciate the new ideas presented. The subject is now open for question and discussion.

MR. MODJESKI: I will open the discussion by asking Mr. Abrams a question. As I understand it, the high early strength cement is obtained by crushing the materials to small particles and then baking or roasting. Is this correct?

MR. ABRAMS: The process which our company is using consists essentially of a triple grinding and a double burning. The raw material is burnt to a clinker; it is then pulverized into cement, goes back into the kiln, is re-clinkered and then ground to the finished product, 96 to 97% of which will pass the standard No. 200 sieve.

MR. YOUNG: How far do you think we should go in specifying time for mixing concrete? I believe that the strength curve, based on time of mixing, is fairly steep up to two minutes and after that, as I recall, it flattens out rapidly. Of course, in specifying mixing time, we must be practical; that is, while we want sufficient mixing time to insure good concrete, we do not want to place any unnecessary burden on the contractor. More time than necessary to insure adequate strength would be reflected in higher contract price, without corresponding benefit to the owner.

MR. ABRAMS: If concrete is *really* mixed for one minute in a properly designed mixer, you get about all the value you can economically from this feature of concrete making.

MR. MALL: I would like to ask Mr. Abrams a question with reference to the electrical conductivity of concrete. Due to a very wet and alkaline soil in New Orleans, we have incurred a great deal of difficulty from what is termed electrolysis. It is plain that excessive corrosion of pipe lines and conduits is due to current leakage from the direct current distribution system of the local street railway. Irrespective of the causes of excessive corrosion in local soils, we engineers of the Public Utilities have given a great deal of study to methods and types of construction that might check these conditions. We are very much interested in developing a type of track construction in paved streets that will minimize the roadbed leakage. In that direction, we have attempted to improve the homogeneous qualities of the concrete that we use, and have given considerable thought to the use of admixtures that might give the concrete greater resistance and thereby improve its water-proof qualities. We are now using Celite to accomplish this purpose. Celite has been selected because of its inert qualities and high silica content. The high silica content introduces an element that should produce a higher resistance, and this fact has been borne out in

preliminary tests. In attempting to affect the electrical conductivity of concrete, we have been unable to find any authentic or authoritative tests and investigations to guide us. I would like to ask Mr. Abrams therefore if he has any information or data applying to this condition.

MR. ABRAMS: I have not made any study of electrolysis in concrete. I am familiar with the experiments made by others. About twenty years ago, we heard a great deal about such electrolytic action, but the subject has only occasionally appeared during the last few years. Wet soil would present a more serious problem, particularly in the presence of reinforcing. The effect you would get would be determined largely by the type of return system on your lines. I cannot see how any admixture can be of advantage in that respect. So long as concrete is wet, its conductivity would be quite high, but admixtures would not change this property.

PROFESSOR DERICKSON: I should like to ask Mr. Abrams if there is a tendency at the present time in the design of reinforced concrete structures towards the use of concrete of greater ultimate strength with corresponding higher allowable unit stresses.

MR. ABRAMS: If you base your working stresses on the compressive strength of the concrete at 28 days (which is the method recommended by the Joint Committee) you will be able to use a much higher working stress with 6000-lb. concrete than with 3000-lb. In this respect, the building codes frequently form a barrier to any material increase in working stresses. You may be interested to know that a reinforced concrete arch bridge is now being built across the harbor at Brest, France, of over 600-ft. span in which a working stress in the concrete of 1000 lb. per sq. in. is being used; this is a much higher stress than most American engineers would consider proper.

MR. DEFRAITES: What effect has hauling of concrete from ready-mixed plant to job?

MR. ABRAMS: Concrete will be improved by such hauling if equipment properly designed for this purpose is used. Many specifications require that concrete which has been mixed more than thirty minutes should not be used. On the contrary, con-

crete would be decidedly improved if it were mixed and held for an hour before putting it into the work.

A MEMBER: What method would you recommend as most efficient in curing concrete?

MR. ABRAMS: The one thing that you want to accomplish in curing concrete is to keep in the water that is required for hydration of the cement. Generally, the most practicable method is to put water on top to counteract the tendency to evaporate from the concrete. The water should be applied as soon as the concrete is sufficiently hardened. In a climate like this, there is little danger of concrete being permanently damaged by improper curing, if it is kept damp for the first 2 or 3 days.

THE ECONOMIC AND SOCIAL SIGNIFICANCE OF ENGINEERING*

By Dexter S. Kimball,
President of the Society for the Promotion of Engineering Education;
Dean, College of Engineering, Cornell University,
Ithaca, N. Y.

(From the Journal of Engineering Education, September, 1929)

At one time we, in Cornell University, put out a questionnaire to the students in an endeavor to ascertain the reason for their choice of Cornell as the place to study. The answers were many and varied, but there was one that has always stood out in the minds of everyone because it was so heartfelt and sincere, and it was, "God only knows!"

That is the answer you would get when asking any economist or philosopher as to what the end of this industrial civilization may be. There are, however, certain outstanding accomplishments, such as we might call over-all dimensions, that are significant and to which I would like to call your attention.

The most ancient and the most insistent cry that has gone up from the human heart has been a prayer to be relieved of hard and unremitting toil; to enjoy some of the good things of earth, to be able to rear one's family in comfort, and to have at least some physical, mental and spiritual pleasures before departing this mundane existence. This thought is written on all his monuments from time immemorial and has always colored man's philosophy of life and of the life to come.

Denied, as most men have been, the comforts of life, they have always carried over, in their philosophy and religion, to the other world a hope at least that they might enjoy some of these things over there that were denied them here.

One of the most touching, and one of the most beautiful, things that has come to us from antiquity you will find in the Metropolitan Museum in New York. It is a little figure of a servant girl carrying a basket of food on her head buried

* Presidential address delivered at the thirty-seventh annual meeting of the S. P. E. E., at the Ohio State University, Columbus, Ohio, June 19-22, 1929.

with her master in order that she might come to life on the other side and serve him.

All the philosophies of life are tinctured with this same thought. It is a most amazing thing that people who have been so long on the face of the earth had not given more thought to this problem of making a living. I wonder what would have happened to us if the ancient Greeks had turned the searchlight of their keen minds on the problem of making a living instead of directing it on speculative philosophy. I have no doubt they would have done more for posterity than they have done through philosophy, great as that may be.

It remained for a comparatively small group of humble engineers to change all of this viewpoint. Suddenly out of a clear sky there came the Industrial Revolution, changing all of our ideas of production, opening up a vista of hope and promise hitherto denied to humanity. Just exactly what this means as yet we do not know, but it—the Industrial Revolution—has opened up a hope that had never been thought of or dreamt of up to that time. Truly, as Bertrand Russell has said, if there has been poverty and want since the Industrial Revolution it has been because of ignorance and selfishness. I do not need to tell you the results of the Industrial Revolution. You are aware of them as well as I. It may be sufficient to say that at this present moment, for the first time, we are producing more than we can use. That condition is new in the history of civilization.

The problems before Congress today are not those of finding enough to go around, but finding out, if they can, what to do with the surplus that we have. We grow more food than we can eat, and if we should turn all of our productive machinery to the task of producing the necessities of life we would not know what to do with it all, so changed is the situation. For the first time we are within striking distance of the abolition of poverty and want. We have also gathered enough of the world's goods so that we can supply the necessities for supporting other fields, such as medicine, the most noble of all professions, in such a substantial manner that we may hope to conquer our most dreaded enemy—disease.

A new vista dawns on all humanity. But, no sooner do we get within touching distance of this great accomplishment than we are greeted by a chorus of complaints, criticisms, wagging of heads and lifting of hands to high heaven! We engineers are reminded of this terrible machine civilization, and many insist that we are making the world worse instead of better, and it would be wiser to leave things as they were. The criticisms are loud and many. I do not need to tell you, you who have lived on great campuses, what they are like. All of you have lived through a period when such things as engineering were tolerated on the campus rather than invited. These complaints and criticisms may be divided into two groups:

First, those that are concerned with ethical and religious problems.

Second, those that are concerned with economic and social problems.

This is not the time, nor the place, to discuss the ethical and religious side of the influence of modern industry. However, there are two points that I would like to touch upon.

One of the important, outstanding complaints is that our modern methods are destroying religion and morals and thus the rising generation is all different and truth is likely to suffer.

I cannot get wildly excited over that criticism. Truth is not a delicate baby; she is a sturdy old lady. She has stood a lot of buffeting and she is not easily toppled over. All that we may do, perhaps, is to throw some light on truth and make truth, perhaps, a little clearer. But neither you nor I, nor all the scientists or engineers will ever upset truth. A great deal of nonsense has been said both by scientists and theologians and I cannot get excited as to the ultimate end of truth. She is competent to care for herself.

There is one other phase of the ethical discussion, too, that I would like to speak about briefly. That is the changing viewpoint in regard to worldly well-being, the production of wealth. I can remember when we were taught that wealth was a dreadful thing and that the possession of wealth was the

surest way to go to the devil entirely. We are now looking on that somewhat differently because it has dawned upon us slowly—and it has not dawned upon everybody—that only through the possession of the good things of this earth can we have some other things that we desire and that all men have desired from time immemorial. Perhaps there never was a time when wealth has been evaluated as carefully as it is at the present moment. And never before has wealth been so freely used for general education and uplift. Never before have the evils of poverty been so fully realized.

We turn now to the other class of criticisms of this industrial age. I can only speak of two or three of those because the list is too long and I wish to say only enough to illustrate my point. The first and most outstanding criticism is the one I have mentioned, that the world is no better than it was, but rather worse, that we engineers have built a Frankenstein that will destroy us and is destroying all the good things of earth.

They tell us that people are not as happy as they used to be, that the possession of all of these fine things, like radios, autos, movies, clothes, foods, and so forth, in abundance is not good for people, that the world is not as good as it used to be. I know many people who really believe that and who say that people are not as happy as they used to be. They point out that all of these new things that we have given them have made them restless, and so forth.

It stands to reason that you cannot take a great people, such as we have here today, and release them as they have been released, to a large extent, from toil, surround them with comfort, as they have never been nor their forebears, and expect to find no changes in manners. Of course things are different, and of course we have released many things that are pretty jazzy, if I may use the word, and there is a great deal of turbulence and noise throughout the world.

I am not so sure, however, about the young folks. You know as much about them as I do, but I am inclined to think they are just as good now as this generation was that is sitting before me, at their age. You cannot expect to make a reform

of any kind without paying the penalty in some way. That, again, is a problem of education and one that we need not be disturbed over. Necessarily, we are going to have some difficulties in bringing about all of these great improvements. Personally, I see nothing to be greatly disturbed over. Some of the new things we have introduced which are most decried —for instance, radio and the phonograph—I suppose are numbered among the greatest educational tools the world has ever known.

Another charge these same people make is that justice is as far away as when Plato described it as the essence of all virtues. They point out that we have not been able to distribute the fruits of our industry equitably, that want and poverty still stalk the land. That is true to some degree.

As far as justice goes, industrial justice, I do not believe there ever was a time when industrial justice stood on such a high level. Those of you who know what is going on in the egal mind know they are making great efforts to rewrite our ndustrial code, and in this there is great hope for the future. Never before has the public been so sensitive to industrial injustice. Certainly, it will take time to bring about any great change but there never was a time when lawyers or law makers—I might distinguish between the two—were so much concerned with this problem. Again, there is hope in that direction and those who have studied that problem carefully will agree with me, I am sure.

Then we have another group that is much concerned with other influences of this new age. I have in mind a certain group that is much concerned about art. They are quite sure that we are destroying all art. That, of course, is an old idea. It emanated a great many years ago from William Morris in England and still has a large following.

Here, again, you are dealing with something that is going through an evolution. It is not possible to release forces, such as we have released, to change all our ideas of life—or many of them—and to change our ideas of architecture and methods of living and not change art. After all, art is nothing more than an expression of people's ideas of life. That is too

long a story to go into. I only want to hold out one idea for your consideration. No man who has studied modern architecture for instance can fail to be impressed with what architects have done in the last twenty-five years. They have evolved, in many cases, a new type of architecture symbolic of our day and date, just as Greek architecture has visualized their mode of life and has expressed it in beautiful forms. In the same way other forms of art must find a way out, and they will.

Incidentally, I think artists themselves have done more mischief than all the engineers have, but you cannot convince them of that. Some of you might have seen the Independent Artists' Exhibit on the upper floor of the Waldorf last winter. You would have been quite convinced that what I say is true, that hope for art does not lie in artists but in those who are trying to apply it in all forms of life. I am not disturbed about art.

There is one favorite criticism: That the engineers and the scientists with their terrible weapons will destroy all human life. The next war is to be the last war and everybody will be wiped out. I have an idea that the first stone ax came in for the same criticism. They probably said, "Look what that fellow has. He has an ax on that handle; he will surely wipe us all out." May be he could, but in spite of that for centuries the race has made progress. It has increased in numbers, defensive methods all the time keeping pace with offensive methods. I cannot get wildly excited over that criticism. I am inclined to think if we make the progress we have been making in recent years that possibly even in your day we may evolve some ways and means of getting around that difficulty.

I could go on and name many other criticisms that you could answer yourself; that all can be answered and will be answered in the way the engineer and the medical scientist answer them. Not by saying, what is the use, let's quit. But, What is the solution and what is the cure?

Let us look for a moment at some of the people who make these criticisms. That is an important matter. They are to be found everywhere and on every college campus. The first

are those, as I say, who are much disturbed over these changed conditions. You will find among them people who firmly believe that the old ways were the best. They will tell you the old ways were the *natural* ways, that men were brought into the world to do certain things and that you cannot change that at all. Society was foreordained in good old Presbyterian fashion to have a certain form and therefore the natural old way is the proper one. That has been an old idea of humanity. Philosophers have held many different ideas of that sort, and if you go far enough back you will find that philosophers taught that life was not worth living at all. It is amazing the number of magazine articles that you will find tinctured with this idea, that it is not wise to change old ways, that they are all right, and that something is going to happen if you do.

One thing that these people are afraid will happen is something like this: They say it would not be a good thing to have man get too much money because something dreadful would happen to him. They have an idea that certain people are constitutionally so fitted that they can have money and spend it wisely; but it might not do for others to have too much money. They think some people might run amuck if they did have it, they might spend some of it for something foolish. I do not get that viewpoint. I have an idea that all people are capable of development, more or less, and that as we come along in this world, building as we will a higher, a richer, a fuller civilization, that people can be trusted to spend money. They are making it and spending it freely now, and that worries some good people.

To place one of the older persons in the new environment is confusing and in many respects terrifying for them. When anyone listens to a talk such as you heard last night, and is not acquainted with this field of engineering and science, it is puzzling and a terrifying thing, and it is little wonder they are afraid that something is going to happen. We are always afraid of the things that we do not understand.

Ignorance is one of the greatest difficulties under which we labor, ignorance of this great civilization, its background, ignorance of what engineers and scientists are doing and fear that something unknown is going to happen. That appears in amus-

ing ways in articles, solemnly written articles, in magazines in regard to automatons. One of these articles appeared a few months ago, solemnly and seriously, to the effect that the writer was afraid that engineers were going to make this world entirely automatic and that all the work would be done by automatic machines and that something terrible was going to happen to all humanity. Now if that man had experience in trying to keep automatic machines in order he would not have written that article. Every engineer knows that that is a fairy tale and that it is foolish. Yet it is written solemnly and we are held up as the monsters that are going to change the face of all creation.

Then there is a group of people whose personal comfort has been disturbed, that is to say, life is different, it is not as easy to live as it was and these personal comforts must come to them through other channels. That cannot be helped, there can be no progress without change. Change does not necessarily mean progress, but there can be no progress without change. All our methods of life will be changed and are being changed and the comforts of life will come in another way than through slavish personal service as in the good old days so much bemoaned. The iceman will not come to deliver ice. We are not doing that now in many cases. All of our comforts are to be given to us in new and different ways. When I look back and think that when I was born we were carrying letters across the continent by horse —in the good old way, the natural way and it was the natural thing to do—I am not surprised that these people are disturbed. The interesting thing is that if you take any of these persons aside and talk to them—and many of them to whom I have spoken have talked to me frankly—they will tell you of these terrible times. I say, "Let's see, you say you would like to go back to the good old simple days."

They answer, "Yes, life used to be comfortable on the campus then. There were no automobiles, no radios, etc."

"You are quite sure about that?"

"Yes!"

"Then you would be willing to forego the telephone?"

They are not sure about that.

"Would you forego the automobile, the street car, the telephone, pure water, etc., etc.?" And the more you enumerate

these things the less sure they are that they want to go back. They do not think of it in that light. They think of the change that has been made in their physical surroundings and they worry largely because of lack of mental adaptability to these new conditions of life.

Over against these changes stand certain accomplishments and certain outlooks that we should keep in mind as engineers and engineering educators. Modern industry took its roots in this country in the Connecticut Valley in the middle of the last century. The first attempts at modern manufacturing, as we understand it, were made in that Valley.

The census of 1850 gives the per capita wealth of this country as $383; the last preliminary census, in fact every census, shows that this has stepped up every year through good years and through bad years, through good times and through bad imes, until the per capita wealth of this country has risen to bout $4,000. The preliminary estimates of the census last year indicates that we are worth, in this country, over $400,000,000,000 and the national income last year was $90,000,000,000. No people have ever talked about such sums of money; no people have ever possessed such sums of money at such a rapid rate. Nothing like it has ever been known since time began. Not only that, but this wealth is more widely distributed than ever known before.

A German lady was visiting on the campus at Cornell last summer. She was an intelligent woman from among one of the groups visiting the United States, trying to find out the secret of this great growth of which people abroad hear and because of which they look upon us with fear, wonder and envy. They do not know what it is all about. They do not know and for that reason they fear our competition and with good cause. This lady was taken around the campus in the car of one of the professors. As they got into the car she said, "Do you own this car?"

"Yes." (Later he told me he did not tell her how much he owed upon it.)

"Do all the professors have cars?"

"Oh, yes, some of them have two."

"How many cars are there in the United States?"

He happened to know and told her there were 25,000,000. He said there was one for every five persons and also told her if every man in the United States next Sunday would load his car to capacity, the entire population could go for a ride. And that is true.

She thought for a while and then said, "One car for every five persons?"

"Yes."

"Including women and children?"

Note the social significance of that question. He said, "Yes, including women and children."

In other words, we count women and children as part of those who are to have happiness on earth. That is a new idea in many quarters as yet.

She said, "Ach Himmel! Ach Himmel! This is too much."

You can get the viewpoint of those people from abroad and you can get the viewpoint also, if you will pardon the personal reference, of others and it is a thing that we should weigh carefully in this country.

When I was twenty-two years of age I went to work for the Union Iron Works in San Francisco. They had just laid the keel of the Charleston, one of the very first of the new Navy. That vessel was not a big ship, even for her day; she was 3500 tons and designs were bought from the Armstrongs in England. I do not know whether we did not know enough and were afraid to design such a ship or what. However, the fact remains that the designs were bought from Armstrong. The Chief Inspector on the ship was Dr. Ira N. Hollis, whom so many of you know so well.

From that short time, 1887, we have assumed naval importance to such a degree that we challenge the command of the sea. If we wish to make fifteen cruisers, as we voted, we can build them, or we can build twenty-five, or forty-five, or fifty-five, or as many as we need. Therefore, you can well understand how these people on the other side wonder what it is all about. It is a thought to sober us. It does give us a position of tremendous power which we should consider very carefully and use wisely.

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Referring again to this great wealth that we have created it has, as I said, raised us to a level such as no other nation has ever attained and given us a promise and an outlook hitherto unknown. Already new ideals are beginning to take form in certain practices of ours. We assume, for instance, and it is the first civilization to so assume, that every child shall be educated. We can do it. Just as soon as you raise a man economically, you broaden his vision, you raise his ideals and that is what has happened to us. We assume that every child should have an education because we can give it to him. As we go along we shall have other assumptions and we shall assume other broadening viewpoints and just as we are permitted to do so economically we may raise ourselves to a higher civilization.

I think perhaps more important than any of these material things that have come to us is the idea of progress. The theologians and all the philosophy of the last century taught us, and I was so taught and many of you were so taught, that the age of wisdom lay back of us; that back of us somewhere there was a Utopian time, ancient Greece possibly or some other time when all men were wise and happy, and we should mend our ways and increase our wisdom by studying these old and reliable men who are long since gone; that there could not be anybody as wise as the ancients were. Now we know that in engineering and science that is not so. We are looking forward and not backward. The idea of progress has become firmly embedded in our minds. We expect to go forward and we expect to make progress. Already that viewpoint is taking hold in many fields besides engineering.

Economics, of which I spoke, is being radically revised and will be changed. Here is something that may interest you: Some time before Mr. Hoover was nominated he started an investigation, the result of which has been published under that name of "Recent Economic Changes." He asked a group of economists to study the modern industrial structure since the war. The National Bureau of Economic Research was called upon to direct the study. Funds were provided and they began a study of certain cross sections of this industrial era to see if they could lay out, in order, what had taken place. The com-

mittee in charge of this study called into consultation, and to write certain portions of that report, some engineers. Never before, as far as I am aware, have economists or any persons interested in economic studies, called on engineers to help them write such a report. It is the first recognition of the fact that our industrial basis is complex and changing rapidly in a manner best known to engineers.

The next series of textbooks on economics will be different from those that were built on Adam Smith. That, again, is a realization that we are living in a new world.

I have spoken of education aside, altogether, from the assumption that everybody should be educated. I think the greatest change that has come in our system of education is the view that underlies all such institutions as this, where we are guests.

It is not so many years ago when education was conceived as referring to something that had taken place, and true education in many universities is still looked upon as the study of the humanities and the classics. No one will doubt the importance of these fundamental studies in the humanities and in the classics in the history of our race but we, at least institutions such as this—and it is representative of the group before me—believe also that education should be used for all manner of things, that it is not confined to any walk of human life, that it is all-inclusive, that research and study belong to everything imaginable that affects human welfare. All knowledge is for use and there is nothing common or unclean in education. That is a larger viewpoint and it has changed our educational ideas and the industrial aspect in this country.

You probably all remember the story of the Pied Piper of Hamlin and the interpretation given by the lame boy of his flutings,

> "For he led us he said to a glorious land
> Joining the town and close at hand,
> Where waters gushed and fruit trees grew
> And flowers put forth a fairer hue
> And everything was strange and new.
> The sparrows were brighter than peacocks here
> And their dogs outran our fallow deer
> And honey bees had lost their stings
> And horses were born with eagles' wings."

We scientists, engineers and engineering educators are the Pied Pipers of the modern industrial world. Where we lead all men will follow because only where we walk can there spring up an industrial background, fair and fertile, without which there can be no progress, without which the ancient prayer cannot be answered, and without which Civilization itself is a foolish dream.

May God help us to realize our responsibilities and possibilities!

ACTIVITIES OF LOUISIANA HIGHWAY COMMISSION

By R. G. Cook, *Statistician.*

The constructive program of the Louisiana Highway Commission according to recent announcement by Chairman O. K. Allen, not only contemplates the paving of hundreds of miles of highways with concrete, but includes the elimination, as far as practicable, of all the toll ferries on the more frequently traveled thoroughfares of the State.

Tourists passing through Louisiana, as well as those living within the borders of the State, will welcome this encouraging statement by the highway chairman. The elimination of toll ferries will not only mean a financial benefit, but it will prove a time-saver of no small importance. In these days of terrific speed, it is most annoying to reach the ferry landing just as the boat is "pulling out," or just in time to be informed that the "ferry is loaded to capacity now."

In either event it means an enforced delay of at least thirty minutes. On holidays and special occasions the delay may be for several hours, due to the increased motor traffic, thus most effectually preventing motorists from reaching their distinations on time.

The toll bridge building program, as proposed, calls for eight bridges, located as follows: Sterlington, Monroe, Harrisonburg, over the Ouachita River, Jonesville over the Black River, Coushatta and Moncla over the Red River, Melville and Morgan City over the Atchafalaya River.

The construction of these eight toll bridges was authorized by a Constitutional Amendment adopted at the Congressional Election held November, 1928. According to this law, $15,000,000 in bonds may be issued, predicated on the tolls to be charged and collected from those passing over the proposed bridges. The avails from the bonds are to be used in paying cost of the bridges. The amount that may be expended on any one bridge project is limited to $3,000,000. The cost of the bridges will not exceed fifty per cent of the total limit stipulated.

Preliminary surveys made months ago on some of the projects warrant the Engineering Department of the Highway Commission fixing the cost of each project approximately definitely as follows:

Morgan City Bridge	$2,000,000
Melville Bridge	1,250,000
Jonesville Bridge	600,000
Harrisonburg Bridge	400,000
Sterlington Bridge	400,000
Monroe Bridge	800,000
Moncla Bridge	400,000
Coushatta Bridge	400,000
Total	$6,250,000

Surveys, soundings and borings have been made at the location proposed for several of these bridges and it seems probable that actual construction may begin within a reasonably short time.

At the present time there is a bridge over the Ouachita River, at Monroe, connecting with West Monroe. During the daylight hours this bridge is free. After dark a small toll is charged. The bridge is old, and for several years the matter of building a new bridge has been under discussion. Tentative plans and specifications were made by a former administration, after surveys, but nothing was accomplished.

At present there is a toll ferry at Melville over the Atchafalaya River. Traffic at Melville is usually heavy at all times, and frequently the delays are prolonged, though apparently unavoidable.

There is a toll ferry at Morgan City, connecting with Berwick City on the Old Spanish Trail. Traffic is heavy at this point and it is certain that a bridge will afford relief from the necessary delays.

Toll bridges at Coushatta and Moncla will replace the toll ferries at these points on the Red River. Necessarily, travel by these ferries is slow. Those who must use the ferries will doubtless welcome a change.

At or near Jonesville three rivers meet or merge into one. The Tensas, the Ouachita and the Little Rivers become the

Black River at Jonesville where a toll ferry is now operated. A bridge at this point will be a great time-saver to those who travel that country.

For years there has been much agitation relative to building a bridge at Harrisonburg over the Ouachita River to replace the toll ferry at present in use. This bridge, when completed, will certainly facilitate highway traffic at that point.

At Sterlington on the Ouachita River a toll ferry is in use. A bridge will be a welcome relief it is believed, and will aid in the development of that part of the State, which now seems to be progressing rapidly. Sterlington is a very important place in the development of North Louisiana, as one of the largest light and power plants in the world is located there.

These bridges will pay for themselves. In other words, those who actually use the bridges will pay for their construction.

When the fact is considered that less than $7,000,000 will be spent in the construction of these eight bridges and not one cent will come from any source other than that from the charges paid by those who cross over the bridges, there does not seem to be any reasonable objection to their immediate construction. Besides this, picture just what the expenditure of $7,000,000 of "new money" during the next year or two means to the people of Louisiana. Practically all of this money will enter trade channels at home.

When the toll ferries at Morgan City, Melville, Jonesville, Harrisonburg, Sterlington, Monela and Coushatta are replaced by bridges, there will remain only three major toll ferries in Louisiana, all on the Mississippi River at New Orleans, Baton Rouge, Vidalia and Natchez. The ferries at these Mississippi River crossings seem to be adequate, at present, for ordinary traffic, though at times there is some congestion. However, the day is not far distant when bridges will be necessary to promote fast service.

This bridge building program, in connection with the paving program of the Highway Commission, now well under way, will give to Louisiana superior advantages in the matter of paved highways and adequate bridges. Louisiana highways

connect, at State-line points, with highways radiating in all directions, making it possible to reach almost any given point on the U. S. Highways System, by passing through Louisiana. All highways are marked and tourists have no difficulty in reaching destinations.

Within a few months the bridge at Vicksburg, Miss., connecting with Delta Point, La., will be open for traffic. By September, this year, it is expected the Chef Menteur Free Bridge will be completed, and a few months later the free bridge at the Rigolets will be open for traffic. These free bridges will replace free ferries now operated at the Chef and the Rigolets. Therefore, it is believed, the road paving and bridge building programs of the Highway Commission will certainly promote the progress and rapid development of Louisiana.

In addition to the work of paving and building bridges, the Highway Commission is now maturing plans to begin surface treating Highway No. 14, the Lone Star Route, between Alexandria and the Arkansas State Line. Sections of this highway, however, will be paved with concrete just as soon as possible. Concrete paving will be laid where the traffic is heaviest. The surface treating, to begin soon, will "lay the dust" and provide a hard, smooth surface for traffic.

MINUTES OF MEETINGS AND BUSINESS OF THE SOCIETY

Meeting of Board of Direction, June 10, 1929.

The meeting was called to order by Mr. J. M. Todd, Vice-President, and the following members were present: Messrs. Moses, Frost, O'Neill, Porter and Muth.

The Secretary announced that the President regretted he could not be present, as he was in the Tulane Surveying Camp.

The minutes of the previous meeting were read and approved and bills on hand were ordered paid.

It was with regret that the following names were dropped from the roll: Messrs. C. J. Hardy and E. T. Malloy. The resignations of the following were accepted with regret: Messrs. J. Callan, J. R. Guidroz, and H. M. Craig.

Communication from the President of the New Orleans Chapter of Mechanical Engineers relative to the preparation of a bill for registration of Professional Engineers in order to include the electrical and mechanical engineers in a way that the civil engineers and surveyors are now covered was brought before the board. After careful consideration the following resolution was duly seconded and carried:

RESOLUTION

Be It Resolved, That in lieu of the committee previously authorized by the Board that a committee of five members be appointed to study the matter of licensing or registration of professional engineers and that a suitable bill be prepared to this end.

The board requests that this committee submit a report at the October meeting, together with a tentative draft of the proposed bill. The Secretary of the Society is also instructed to assist this committee in secretary work, and the board authorizes him to attend the Tenth Annual Convention of the State Boards of Engineering Examiners at the expense of this board.

On motion duly seconded the following applications for membership were ordered to ballot:

Resident Members

G. E. Brown
J. Howard Collins
Robert E. Gosa
Robert A. Nadler
Hugo Schlenk
Ernest K. Strahan
Victor W. Webb

Transfer from Student to Member

Leonard K. Kirst
Leon Myers Reinach

Non-Resident Members

Jean Earl Christian

Associate Members

Perry Howes Beall
Frank C. Codifer
Otto S. Jessen
Gus C. Kraus
Philip T. Samuel

Junior Members

J. W. Havlicek
Charles E. Wuerpel
Stephen C. Horvath
Alfred Lippman, Jr.

Transfer from Student to Junior Member

Frank G. Stewart

Non Resident Junior Member

Brister Blake Pierce

Resident Student Member

Samuel P. Landry

There being no further business the meeting adjourned.

FRANK A. MUTH, Secretary.

Minutes of the Society, June 10, 1929.

The meeting was called to order about 8:10 p. m., Mr. James M. Todd, Vice-President, in the chair, F. A. Muth, Secretary, and fifty-eight members and guests present.

The minutes of previous meeting were read and approved.

Reports were received from chairmen of various committees.

On motion, duly seconded, following the usual custom, the Society voted to recess during the summer months.

The technical exercises of the evening consisted of a paper on "High Speed Recording Instruments," by Mr. Miles B. Hutson. This address was illustrated with interesting lantern slides. A rising vote of thanks was tendered the speaker.

The meeting then adjourned to the usual collation.

FRANK A. MUTH, Secretary.

Minutes of Special Meeting of Board of Direction, July 16, 1929.

The meeting was held at noon on July 16th, President Fox in the chair, and the following members of the board were present: Messrs. Porter, Todd, Frost, O'Neill and Muth.

The minutes of the previous meeting were read and approved and bills on hand were ordered paid.

Ballots were canvassed for new members, there being eighty-seven formal ballots, and the following were declared elected:

Resident Members

G. E. Brown
J. H. Collins
Robert E. Gosa
Robert A. Nadler
Hugo Schlenk
Ernest K. Straban
Victor W. Webb

Transfer from Student to Member

Leonard R. Kirst
Leon Myers Reinach

Non-Resident Member

Jean Earl Christian

Associate Members

Perry H. Beall
Frank C. Codifer
Otto S. Jessen
Gus C. Kraus
Philip T. Samuel

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Charles E. Wuerpel
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Alfred Lippman, Jr.

Transfer from Student Member to Junior Member

Frank G. Stewart

Non-Resident Junior Member

Brister Blake Pierce

Resident Student Member

Samuel P. Landry

The matter of encouraging membership in the Society from the standpoint of mutual benefit, especially in the grade of Student Member, was discussed at considerable length. It was brought out that Student Members are now elected in the Senior year, usually at a time when they have little opportunity of attending meetings or at least but few of them before the school year is ended, and they lose the opportunity of the advantages of attending more of the meetings of the Society. Therefore it was voted to extend the opportunity of Student Memberships and to permit Juniors in the College of Engineering to become eligible as well as Senior Students. This applies to Non-Resident Student Members as well as Resident Student Members.

There being no further business the meeting adjourned.

FRANK A. MUTH, Secretary.

PROCEEDINGS
OF THE
LOUISIANA ENGINEERING SOCIETY

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CONTENTS

EDITORIAL NOTES AND COMMENT

City Planning and Zoning. In a most interesting and instructive paper, presented at the September meeting of the Society, Mr. Charles A. Favrot, Chairman of the New Orleans Zoning Commission, discussed the above subject in its application to the City of New Orleans.

Very few cities have been so fortunate as to have been deliberately planned and laid out before any buildings at all were erected. As is pointed out in the paper, most of our American cities, even some of the most modern, had fortuitous beginnings. In pioneer days they grew from the camps of early settlers, from communities of small farmers who built their houses close together for mutual protection from savages, and from locations which enabled the early pioneers to take advantage of natural resources. Many reminders of the early days still exist in the crooked and narrow streets of some of our largest and most prosperous cities. In many cases municipal authorities have had both conviction and the courage of them and

have taken drastic measures to eradicate these defects by widening and straightening existing streets. No doubt, in some instances this has worked a hardship upon the individual and has caused temporary financial loss, but in the end the gain to the community as a whole has been so great as to vindicate the measure taken for relief.

Washington is the single example in this country of a city a definite plan for which was made originally, and which has since been consistently adhered to.

New Orleans, as implied in the term Vieux Carré, had an original plan of the simplest type. Its boundaries formed a rectangle and its street intersections were exactly at right angles. The subsequent growth of the city offers some very striking examples of the necessity for Zoning, which Mr. Favrot discusses under the divisions, Use, Area and Height.

The paper closes with a résumé of the activities of the City Planning Commission, to whose work Mr. Favrot has given so much of his own time and energy, and for whose services the City can never be too grateful.

Some twenty-five years ago the writer of this editorial was spending the winter in Berlin. A new suburb was being opened up in Charlottesburg, itself a handsome and aristocratic residence suburb of Berlin. New streets, new squares and parks were being laid out in all directions. Before any paving was done. adequate sewers, water mains, gas mains and electric conduits were placed in position under the streets, and connections carried inside the curb lines to take care of any buildings which might be subsequently erected. While this is only a detail of the whole problem of city planning and zoning, nevertheless it is one to which we could earnestly wish more attention might be given in the cities of this country.

Urban populations are growing to the extent that unless we plan adequately and effectively for the rapidly increasing numbers of people by regulations as to use, area and height, our cities are going to be very uncomfortable places of residence for future generations.

Registration of Engineers. This subject, always demanding more or less consideration on the part of the profession, has

again come actively to the fore and is being given careful study and consideration by the national societies as well as other associations of engineers. Our Secretary, Mr. Muth, who attended the recent annual convention of the National Council of State Boards of Engineering Examiners, contributes to this issue of the Proceedings a brief statement of his impressions of the meeting.

In addition to the written statement of his impressions of the convention, Mr. Muth sent to the Editor a pamphlet entitled "The Engineering Profession in British Columbia." This contains a very complete statement of the laws which have been passed in British Columbia for the regulation of the practice of engineering.

There is one statement in the pamphlet which seems to us to so adequately express one of the most important principles of any registration act or law that it is quoted here in full:

> "The very genius; the fundamental principle; the keynote of any Registration Act, be it law, medicine or chartered accountancy, architecture, pharmacy or engineering, is the prescribing and developing of a formal system of training for all who would become members of that profession. The actual issuance of a license to practice to the mature man should be of the nature of a formality. The real work should rest in the years of preparation as described. More, it is the primary duty of the administrators of any Registration Act, to educate the profession to accept such prescribed system of training as the only system. The system may have one or two variations, but generally, the statement stands; it must be the only system. The natural and logical inference follows, that positions suitable to the various grades of the students should be reserved to those students who are taking the system."

As a supplement to Mr. Muth's statement we are also publishing a preliminary draft of the report of the Committee on Engineering Registration of the A. S. M. E. Conference of Local Section Delegates.

This preliminary draft sets forth in succinct form the facts about registration which in the opinion of the Committee are worthy of consideration.

It is convenient to have these facts in this connection, particularly as the Louisiana Engineering Society is participating in the movement of registration to include other branches of the profession than civil engineers and surveyors.

Library Now Available at Night. For those who wish to use the reading room or library of the Louisiana Engineering Society, notice is hereby given that for a period of two months commencing November 1st, the library room will be available after 5:00 P. M.

At the present time members can secure admittance during the daytime from 8:00 A. M. to 5:00 P. M. by calling for the janitor. Arrangements have now been made to permit members to use the library from 5:00 P. M. to 9:00 P. M., by calling on one of the two night watchmen on duty in the office of the State Commissioner of Immigration, corner of St. Anthony's Alley and Chartres Street. This office is the one which is lighted in the State Museum Building at night, and members can make application to the night watchmen, who will open the library for use until 9:00 P. M.

All members are requested to register their names and the books they may take out in the Register provided for that purpose.

The Society appreciates this opportunity to make the library available to members at night, and all those who avail themselves of this opportunity are requested to conform to the rules of the building.

F. A. MUTH, Secretary.

PAPERS AND DISCUSSIONS

THE CITY PLAN FOR THE CITY OF NEW ORLEANS

By C. A. Favrot,

Chairman, New Orleans Zoning Commission.

Read before the Society, September 9, 1929.

There is no subject that has created more widespread interest in the United States within the past ten years, than that which relates to the planning of cities, particularly looking to their existing faults and to their future development in an orderly way. That this has been a sorely neglected study for the past century and one-half is probably not surprising.

The United States grew in a great hurry and started to grow out in the wilderness, with pioneers making small clearings in almost impenetrable forests, for settlers to establish small villages and posts for self-protection and to take advantage of the wealth of natural resources that older and overpopulated countries were begging for. Little by little, and still with rapid progress, these trading posts developed into towns, and then towns into cities, before there was full relization of just what was happening. Cities then, that had their beginnings on cowpaths and alleys, with a few cross-roads into surrounding territory, soon began to face serious problems for which there was apparently no solution. People were too busy; the greed for individual gain outstripped civic consciousness, and no thought was given to the chaotic development that must be the inevitable result of civic carelessness.

I cannot bring this more forcibly to your attention than by quoting the words of Hon. Elihu Root to the Regional Planners of New York in 1922. He told them this:

> "The individual human beings, in response to whose urge cities grow, never think about the conditions that are to be created by the bringing together of a great mass of other people like themselves. If we build a house, we build it in what we think is a convenient and a comfortable, pleasant place to have a home. A thousand others, ten thousand, a hundred thousand, all have the same idea, but nobody thinks

about the water supply; nobody thinks about the sewerage; nobody thinks about what it is going to cost to deliver coal there; nobody thinks how far it is going to be from market; nobody thinks about the multitude of difficulties that are created by a great aggregation of human beings within a small territory. As a result, the growth of a city is without any intelligent thought whatever regarding the great difficulties that a city has to meet."

It is fortunate, indeed, that capitalist, captains of industry, philanthropist, social workers, governmental agencies, began to visualize and foresee the grievous errors of haphazard growth and to crystalize public opinion into a sound, sane and economic trend that has revolutionized our method of approaching the city problems of the future. The net results of the intense thought applied to City Development in the past ten years cannot at this time be foretold; suffice it to say, however, that the studies and analysis applied to-day to future city growth is far more searching than has ever been attempted in the past, and it would be difficult to argue that beneficial results are not already attained and will not be the eventual outsome.

Our President, Mr. Hoover, recently uttered this telling arraignment:

"The enormous losses in human hapiness and in money which have resulted from lack of city plans which take into account the conditions of modern life, need little proof. The lack of open spaces, of playgrounds and parks, the congestion of streets, the misery of tenement life and its repercussion upon each new generation, are an untold charge against our American life. Our cities do not produce their full contribution to the sinews of American life and National character.

The moral and social issues can only be solved by a new conception of city building."

It is hardly necessary to take issue with these words, no thinking man can. If we accept these arraignments as being just, then the question resolves itself as to what we are doing and what we are going to do in the way of correction.

Already many of the communities in the United States, driven almost to desperation by accumulated errors, have

taken decided steps towards the correction of existing ones, as far as this is possible. The citizens of these communities have decided that they are unwilling to allow their children of the newer generation to arrive at maturity with the thought that their parents have entirely lacked the vision to foresee the greater problems that must be faced by them with future expansion and growth of urban and suburban communities. In such cities, the machinery has already been set in motion to anticipate the problems that must arise and as public improvements are made, to see that they shall be put into effect in such sequence that the most needed improvements are placed first and so that developments are planned with the idea of obtaining an ultimate solution of the problem. Civic consciousness has taken a new life and communities are seeking new ideals.

City Planning must not be conceived as an extravagance. No year passes in a city's life that some form of public improvement is not carried out. When such improvements are executed only to take care of immediate needs, they may lead to serious errors. If on the other hand the city has been properly planned to meet an anticipated population, within a given time, and the yearly expenditures are made to take care of the immediate needs, and in such a way as to co-ordinate with the future needs, then there will be an ultimate economic result, without greater expenditures or taxes. Our greatest problem to-day is to urge the citizen to fully appreciate just what this means. The average citizen has little conception of the duty he owes to himself, and particularly to his children. There is need to instill into his mind a patriotism that is not manifest in times of peace. Something must be done to make him conscious of his civic weakness. We must arouse him to the gravity of the errors being made by his lethargy and impotence, and a good foundation for civic strength is to start by demanding that the lion's share of public improvement be applied for the general welfare and not subordinated to the benefit of individual gain or corporate influences.

Without overburdening you with statistical information, you would probably be interested in a few progressive chronological facts:

In 1791 the City of Washington was planned by Pierre L'Enfant, as a whole; taking the scope of a major project and involving a large area which he conceived for the capital of a great country. It is to the honor of all of our technical societies that they have consistently maintained adherence to the original plan and have prevented private interests from taking advantage of sinister influences to lay the plan aside. While other cities of magnitude were planned in their early days, practically none were given the benefit of their possible expansion and growth and their planning was largely confined to the development of comparatively small limits.

Undertaking orderly setting and convenient correlation of functions with relation to grouping of buildings was wonderfully carried out in the World's Fair Grounds and Buildings at Chicago in 1893. It was not, however, until 1907 that the City of Hartford, Conn., grasped the idea of a City Planning Commission, looking to its expansion in an orderly way. This was followed by Chicago in 1909, and to-day an interest in the planning of cities has become a common occurrence. I will quote from the March, 1928, United States Department of Commerce report, but feel sure that their new records, to appear in October, will show a decided increase:

In 1928 there were 409 City Plan Commissions, 183 Zoning Commissions, and 14 Regional Plan Commissions. There were in Comprehensive City Plans, 75 plans started, 181 completed, and there were 170 where part of the work was completed in the field. In Comprehensive Thoroughfare Plans, 45 plans were started, 148 completed, and there were 62 where part of the work was completed in the field. There were in Parks and Playgrounds Plans, 83 plans started, 216 completed, and there were 68 where part of the work was completed in the field. There were in the Transportation, Terminal, Grade Separation Plans, 37 plans started, 14 completed, and there were 19 where part of the work was completed in the field. Twenty-eight states now have City Planning enabling acts.

New York was the first city to adopt Comprehensive Zoning in 1916, and the advances as of to-day in this major subdivision of City Planning work have been almost phenomenal. The

records for the United States show that in April, 1929, 754 cities and towns have the protection afforded by zoning regulations. To put this a little differently, more than 37,000,000 people are living in zoned areas in the United States to-day. It must be conceived, therefore, that there was a strong appeal afforded by this alluring panacea for the maximum enjoyment of life, liberty and the pursuit of hapiness, and to make for greater peace, health, comfort and the general welfare.

Since Zoning is to be the major subject of our discussion to-night, it may not be amiss to emphasize a few of the fundamental principles underlying its study, so that we may approach through the various processes of our analysis with the same grasp and the same conception assumed by the Zoning Commission before making its recommendation to our Commission Council. We will consider our subject therefore by breaking it up into its essential elements, that is, Use, Area and Height, and then note the purpose of each classification.

USE.

The restriction imposed on land as relating to its use is both sound and economic. "Use" is divided broadly into Residential, Commercial and Industrial Districts. It is reasonable to assume that an owner of moderate means or even of small income, searching through the vast areas of a city to build himself a home for the enjoyment of his family and himself, should be secure in the thought that his investment (maybe his all), the savings of half a lifetime, is not to be jeopardized by a shrewd speculator, who, by taking advantage of a forced sale, acquiring the adjoining lot for a mere pittance, and by commercializing the land area into a high apartment house, is able to take away from his residential neighbor the sunlight, the air and ventilation and to make his life miserable by the noises of automobiles or milkmen or what not depositing their wares at all hours of the day or night. Again, a further penalty may be imposed by the speculator or merchant putting up a market place, a filling station and store, a bakery or any other commercial pursuit that would immediately destroy the value and blight the very existence of the residential property owner.

Without use regulation, just such cases are the rule rather than the exception and are a curse to most of our cities. On

Federation, to the American Journal of Public Health, I think in October, 1928. Another most interesting article on Zoning and Health was read at a meeting of the City Planning Division of the American Society of Civil Engineers at Detroit in October, 1924, by the late Prof. Geo. C. Whipple, a recognized authority on Sanitary Engineering. Both of these articles so clearly demonstrate in a scientific way the value of open spaces, I would certainly recommend them to your attention.

Aside from the consideration of health, regulation of area determines definitely the density of population for certain sections of the city, and with this once fixed, our public utilities can be planned to adequately supply the present and future needs of the section. Transportation, water, gas, sewers, electric power, telephones and schools must all be considered as essential comforts to be extended into every section of a city. The predetermined density of population then permits of making proper allowance from the main trunks and avoids costly changes in the tearing up of streets for enlarging services due to lack of proper area regulation. Again, area limitations define reasonable street widths so that with a known density to be served, paving programs can be intelligently carried out. Again, rear regulations decrease fire hazards and make it possible to check its spread by reasonable isolation. No doubt you know that the fire loss in the United States is ten times as great as any country in the world. As I recall it, our per capita loss is over $5.00, where in England and France it is less than 30 cents. It would appear that this is an economic issue worthy of consideration, and area regulation is the first step towards betterment.

HEIGHT.

Regulations for height form probably one of the problems most widely argued because it is here that big business brings its pressure to bear and endeavors to force its individual economic viewpoints in opposition to the general welfare. No zoning ordinance has yet been put into effect without feeling this excessive pressure. Every imaginable argument has been forthcoming to defeat the intent and purpose of reasonable height regulations, but with it all the speculator has eventually

had to succumb. Some form of reasonable height regulation has found its way into 485 of the 754 zoning ordinances so far enacted. According to April, 1929, Report of the Department of Commerce, a greater height means a more intense use of land, and therefore the greater concentration of population. When this height is properly limited definite plans can be made for the maximum demand upon public utilities. The greater the population is in any one block, the larger must be the water mains, the sewers, the telephone conduits, and the wider the streets and sidewalks to care for this population. The complete absorption of underground spaces for public utilities has already taken place because of unlimited building heights in some of our large cities, and unless this is checked, an impasse must soon be created.

Unrestricted height regulation is a direct injustice to the land owner, since the building of one unregulated skyscraper immediately penalizes the neighbor's property. The neighbor's land may be just as valuable, his land assessment just as great, but he is then forced to realize that to do what his neighbor has done would eventuate in a penalty to both. A great portion of his building would be unfit for use and by the same token a great percentage of his neighbor's would go into disuse. Since it becomes a case of "dog eat dog," in self-protection the public must step in to impose restrictions on both, to avoid an abominable curse. Height regulations with the set backs all determined in relation to widths insures light and airy streets instead of damp, dismal canyons. Height regulations make it possible for the city to provide adequate fire fighting apparatus than can reach the ultimate requirements. Height regulations promote a more healthy condition for the thousands of workers who have no choice in the selection of the offices of their employer. The boss having selected the best rooms for himself, is often not inclined to think of the employees whose health he impairs. Height regulation minimizes street congestion and traffic deadlocks.

Just so long as the regulations are not destructive to the use of land, then their application may be considered reasonable. Some experts have gone so far as to say that the economic height for the best return on an investment creates a

building between 12 and 14 stories in height. Above this point it is agreed that the transportation, or elevation of the people frequenting the building, brings the cost of carriage beyond the possible economic return. I will not argue pro or con this question, but it is receiving more attention than any regulation looking to the future expansion of cities. Some engineers, architects and builders are working overtime to discover or invent some method of solving the building height problem so that it may still remain unrestricted and continue its life in the economic scale. Elevated sidewalks for pedestrians, surface streets for vehicular traffic and subterranean passages for the handling and delivery of tonnage, have all had their inning, but where vast sums have been expended for such purposes the solution is not a reality. The question is daily becoming more complex so that the endurance of many taxpayers in such cities has about reached the limit.

An alarmed New Yorker, Deems Taylor, discusses in the November issue of Vanity Fair what the skyscrapers are doing to his home town, which grew so rapidly. It is entitled "The City that Died of Greatness." The closing paragraph of his article is somewhat cynically to the point thus:

> "Perhaps the best thing to do, after all, would be to wait ten years, until New York is so hopelessly congested that no one can move at all. The population will then migrate in a body and New York can be set aside by the Government as a National Park—the city that was so prosperous that nobody could afford to buy real estate, that was such an ideal place of business that nobody could transact any business, the metropolis so greedy for population that it choked itself to death."

What is said of New York would apply to many cities, except that to-day there is a growing tendency for stricter height regulations. New Orleans, however, is a city of slow and even growth and should be easy to regulate, due to natural soil limitation plus the new height regulations.

Having now merely touched a few of the high spots in speeding over the pathway to our discussion, let us get more intimately into the experiment for planning and zoning in New

Orleans and into the work so far accomplished by your own City Planning and Zoning Commission for New Orleans.

In 1908 the Louisiana Engineering Society held a competition for an ideal city plan for New Orleans. It would be interesting now to see these old maps, which we have never been able to locate.

In 1915, the Association of Commerce, through Colonel James Edmonds, investigated the cost of a city campaign for publicity and for the financing of a complete survey of New Orleans. The agitation for City Planning slowly developed in strength, but was delayed by the World War. The chief exponents of the movement were found among the engineers and architects of the city. After the war, when the movement was revived, and as many of our own people were ignorant of the fundamental purposes of City Planning, it was necessary to resort to educational articles. In 1920 I was able to secure an appropriation from the Association of Commerce to put into action an Educational Campaign through the newspapers, which gave us their full co-operation.

We first intended to employ Owen Brainard, an eminen planner of New York, for the educational work, but while he was here on a visit to get a personal contact with the local situation, he became ill, and within two weeks of his visit died in New York. I then turned to my good friend the late Milton B. Medary of Philadelphia, and he undertook the work, carrying it to a successful conclusion; the series of articles were published over a period, August, 1920—1921.

I then turned my attention to the McShane Council, who had used City Planning in their campaign platforms, and I finally succeeded in having an ordinance passed in 1923, and the first City Planning Commission appointed. No appropriation was made with this appointment, so it was only by individual contributions that the work was caried on for the first six months. Then an appropriation of $3000.00 for the first year was made available, and this was later increased to $6000.00, but this was still so inadequate that all we attempted was to collect data, sponsor a better system for the enforcement of the many old piecemeal ordinances, and to recommend the passage of new area ordinances to simplify old laws and

to avoid the further blighting of many residential sections of our City.

When the Behrman administration came into office in 1925 we were able to impress them with the necessity of budgeting for 1926 enough money to put into effect comprehensive City Planning with the assistance of experts. Our Commission then employed the firm of Harland Bartholomew and associates to undertake the work. It must be said to the credit of the old Commission then in existence, and the present Commission, that the members of both worked assiduously and persistently at the problems presented. They have now presented to the Commission Council definite recommendations, some of which have become a part of our City laws. Upon our recommendation a State Enabling Act was passed by the Legislature in 1926, and under this Act the New City Planning Commission was created and the members were appointed soon after this.

The Commission Council retained seven members of the old Commission for reappointment at large on the new Commission, with three new members. One official representative was appointed from the Sewerage & Water Board, the New Orleans Belt, the Board of Port Commissioners and the New Orleans Levee Board, respectively. The City Engineer, by virtue of his office, becomes a member of the Commission, making a total of 15 members.

Nineteen Hundred Twenty-nine closes the fourth year of the Commission's intensive work, and it is our hope that the full City Planning report in all of its details will be presented to the Commission Council by the first of next year.

1st. The Major Street Report of 108 pages and 23 plates and statistical tables was completed and sent to the Commission Council on March 3, 1927. It was approved in principle by the Commission Council on October 18, 1927, and was printed.

2nd. The Railroad Transportation Survey of 200 pages and 15 plates, containing studies and recommenwations for freight and passenger facilities and grade crossing improvements was forwarded to the Commission Council on August 27, 1927, and copies were sent to the Louisiana Public Service Commission and to all railroad companies. Joint conferences have never eventuated and no final report has been made.

3rd. Comprehensive Zoning Ordinance was prepared and sent to the Commission Council July 7th, 1928, and was passed by the Council on June 1st, 1929. In doing this the Board of Adjustment recommended in the ordinance was eliminated. The need for such a Board, however, has become apparent, and one has now been created by the Commission Council.

4th. The Street Traffic Control Problem was undertaken and the work done in our office under special appropriation by the Commission Council, consisting of 283 pages, 20 plates and various tables, etc. This was received by the Commission Council Dec. 4th, 1928. This work was undertaken by Dr. Miller McClintock, co-ordinating with the Harland Bartholomew organization.

5th. The preliminary Transit report, 131 pages and 17 plates, was sent in revised in December, 1928, by the consultant. The report has been made available, confidentially, to the Commissioner of Public Utilities, is now in the hands of a sub-committee of the City Planning Commission, and should be presented to the Commission Council at an early date, the delay being occasioned by the death of Mr. W. H. Hudson, consultant, and illness within the special committee.

6th. Preliminary Reports on Recreation and Civic Art are in the hands of the Commission and will receive their early attention.

Beyond this, the scope of the General City Plan report will include Port Studies, Industrial Report, Regional Planning and a Legislative and Financial Program.

This completes a brief outline of the City Planning and Zoning Committee's activities, but does not attempt to cover the full scope of statistical matter, surveys, maps, and a large store of information collected preliminary to the actual discussion of the various branches of the work.

So far as the Commission is concerned, it has been entirely a labor of love, an appreciation of civic duty, and no words of mine could transmit to you the service that has been rendered to the community by this group of earnest, faithful citizens during the past six years. I realize the personal sacrifices that have been made, the untiring effort applied to the work, and

the only reward that they can expect to look for is the appreciation of the remainder of the community who will enjoy the benefits of their labor.

The message that I wish to leave with you is that you now put your shoulder to the wheel to see that this vast work is not forgotten and cast aside.

A city will only become as great as its people wish to make it. If we are a great people, why should not our cities reflect the greatness of the age in which we live? Every nation that has ever become great in the past has left the heritage in their cities, their public buildings and their monuments. Have we no desire to aspire to the same standard? Are we to continue forever to be a small cross-road country town? I cannot believe it. I am optimistic enough to feel that the lessons of the past have been too costly and that we are fast selling ourselves to the idea that we are a big city and that we must do the things that other big cities do.

Competition among cities is becoming more rife every day. Unless we prepare to meet this competition we will be outstripped and the natural advantages within our grasp will be snatched away from us.

I feel that the hour for concerted civic action has arrived, and we must consistently and persistently drive at all those betterments essential to putting our city in order and make it economically fit to take its place industrially and commercially with the most efficient cities in the world; and with it all let it continue to be the "Most Interesting City," where contentment and happiness shall always be a major consideration.

IMPRESSIONS OF TENTH ANNUAL CONVENTION OF NATIONAL COUNCIL OF STATE BOARDS OF ENGINEERING EXAMINERS

By F. A Muth.

The annual convention of the National Council of State Boards of Engineering Examiners is a means of getting together of representatives of the State Board of Engineering Examiners of each member state to exchange ideas on law enforcement, procedure and improvement. The writer attended the tenth annual convention, held August 25-29, 1929, and submits this report from notes taken in order to acquaint interested engineers with the work of this convention.

It is of particular importance to engineers interested in registration to know that there is a National Council and that it is made up of Examining Boards of States having registration laws. Furthermore, it is of importance to know that the National Council of State Board of Engineering Examiners is a clearing house of information on registration of professional engineers. Its interest lies in successful and effective operation of present registration laws and for better laws for the near future. Information can be furnished as to procedure of the various member boards and the annual convention serves to give all boards an opportunity to have personal contact with other boards.

The following States were represented at this convention: Arizona, Arkansas, Colorado, Florida, Indiana, Iowa, Louisiana, Minnesota, Mississipi, North Carolina, Oregon, South Carolina, South Dakota, Virginia and Wyoming. In addition, the American Engineering Council and the American Association of Engineers were represented.

Numerous addresses were given, followed by helpful discussions. An interesting paper, offered by Dean G. M. Butler of Tucson, Arizona, Chairman of the Committee on Codification, brought out the following points in connection with a questionnaire that had been submitted to all boards:

To sum up what was discussed, it is evident that the majority of Boards—

1. Grant registration to some applicants whose training, especially records and indorsements, are satisfactory, without compelling them to submit to formal examinations.
2. Require the indorsement of at least four persons to whom an applicant refers.
3. Give either entirely written or combined written and oral examinations which consume about 1½ days.
4. Make examinations from files of cards which each contain one question or have many sets of questions which are used over and over.
5. Divide examinations into two parts, one of which must be answered entirely from memory, while any desired reference work may be used in answering the other part.
6. Use both questions that may be answered quickly and complex problems in making up examinations.
7. Have a passing grade of 70 per cent.
8. Require candidates to assemble at one time and place.
9. Canvass the results of examinations only at meetings of the Board.
10. Hold only five meetings a year.
11. Require that each Board member devote about 11 days each year to registration duties.

The number of Boards that require applicants to attempt to answer all questions in the examination is the same as those who allow some choice of questions, and there is no majority action on the other parts considered herein.

Numerous additional points were brought out by the various speakers on the subject, and Colonel Doty, Chairman of the Committee on Forms, presented a suggested form for an application which was compiled as the result of the study of the forms of all state boards.

In discussing the subject of the written examination, the delegate from one state advised that the attorney-general of his state ruled that an application blank filled out can be considered a written examination.

A most interesting address was delivered by Mr. C. J. Ullrich of Salt Lake City, representing the American Association of Engineers, who brought out the idea that the present day

problem in registration is to look to the future and to see where registration will lead us. Much was said about registration at this convention and particularly as to the tide of registration which swept the country in about 1918-1922, resulting in registration laws being placed on the books in over 20 states. Perhaps another wave will sweep the country at this time, for improving our laws to get properly qualified men for public safety.

The greatest problem confronting the engineering profession to-day is of more importance than registration itself. It is the support of the profession from the standpoint of insuring competency. Originally there arose two schools of thought, one the proponent and the other the opponent of registration. Advocates of registration were mostly the younger men, and those opposed were the older men. However, there has been a change in conditions, and many who formerly opposed are now favoring registration. The problem has changed. Registration is an accomplished fact in a great many states and with it come new problems. These problems oftentimes have arisen because the laws were enacted as a compromise and did not at the time of passage cover the requirements of the situation. Where changes have been made, each state has improved its laws with amendments from time to time. Discussion expanded these ideas and developed the idea of uniform laws.

This brings up the question of uniform laws. While it is known that political boundary lines do not limit the practice of professional engineering, yet many of the state laws do limit or curtail the activities of the professional engineer. Some existing registration laws restrict the flow of engineering talent. The standardizing of these laws is paramount to the success of the profession as a whole. It was brought out that the next decade will see a registration law upon the statutes of every state in the Union. The question is: Will these laws be a hodgepodge of compromised legislation? Is every enactment of future laws going to be a continuation of compromising? Then the laws of the future will be little better than the laws of to-day.

The engineers throughout the country must support movements in the states which do not have laws, and in addition, all engineers should work toward uniform laws.

It seems to be incumbent upon the founder societies or some of the existing national engineering societies to draft a model uniform law for registration of professional engineers, and if this is not done by them, it is evident that some other engineering society will be formed for that purpose.

The confidence of the engineering profession in the founder societies is such that consideration given by them in collaborating in the drafting of uniform laws could at this time produce an acceptable uniform model law. Such a law when drafted can only be adopted by a state based on the duty of the engineer to safeguard life, health and public property. The legislature of any state could not pass a registration law for the benefit of the profession alone, as that would be class legislation.

The National Council of State Board of Engineering Examiners can be of mighty assistance in the preparation of a model uniform registration law, also in furnishing information as to the workings of the present registration laws in any and all states. Creation of the proper sentiment should result in dissemination of information as to the need of safeguarding the public by competent engineers. No matter how meritorious any proposed registration law, it cannot be placed on the statutes until it has the support of the engineering profession of the state in question. This support can best be gained by the activities of the local engineering societies and the local chapters of the National Engineering Societies. The engineering profession should not be satisfied simply to see the law placed on the books, but should ever be mindful to see that it is properly enforced and is backed by the profession in the future. The public will not regard the engineering law with any more regard than the engineer himself does.

The support of the public cannot be asked until the support of the engineering profession is obtained to the fullest extent.

Resolutions of thanks were offered at this convention for the interest shown by the American Association of Engineers and the American Engineering Council in sending representatives.

It is hoped that the collaboration of the founder societies with the American Association of Engineers and the American

Engineering Council will result in an acceptable model uniform law and that in its production sufficient sentiment will be created throughout the country to make the engineering profession "registration minded." (For additional information, see Appendix.)

With this idea of being registration-minded, engineers must see to it that a certain amount of education of the engineer must take place in regard to a code of ethics and a consequent practice of that code of ethics in order that the public may have the advantage of qualified engineers of a high professional type. Professional ethics practiced in the engineering profession will add mightily to the results desired.

Appendix

QUESTIONNAIRE

In order to secure an expression of opinion on certain tech nical points of procedure for existing Boards, and for general information as the attitude of the Council towards certain questions, the secretary of the Council prepared a number of questions, on some of which the writer has taken the liberty of indicating the answers in his own language as made from notes at the meeting.

Q. 1. What is the best procedure for securing the adoption of engineering registration laws in states not now having such laws and should the National Council take active part in such work?

A..1. It was decided that services of the Council and its records should be offered through citizens who are interested and should not be offered in an offensive way. The Council should act as a clearing house in furnishing information. Its part should be advisory. On motion, duly seconded, it was voted that the Council continue in the future in the same advisory capacity in assisting states not having registration laws. Motion carried.

Q. 2. Should State Board grant reciprocal registration only to those holding National Reciprocity cards issued in accordance with Articles of Agreement on Reciprocity of National Council?

A. 2. The Council favors the idea that State Boards should grant reciprocal registration except when the state laws provide to the contrary. Motion carried.

Q. 3. What is standing of those men holding National Reciprocity Certificates when state registration has been revoked for nonpayment of renewal fee?

A. 3. The Council favors the idea that one holding Reciprocity Certificate should be required to pay renewal fee in those states only in which he practices.

Q. 4. Does this Council endorse the suggestion that "a recommended uniform registration law for professional engineers" be compiled by the Committee of the American Society of Civil Engineers with the collaboration of Committee of National Council of State Boards of Engineering Examiners, American Society of Mechanical Engineers, American Institute of Electrical Engineers and American Railway Engineering Association?

A. 4. The Council endorsed the suggestion that a uniform model registration law for professional engineers be compiled by the American Society of Civil Engineers, in collaboration with this Council, also the American Society of Mechanical Engineers, the American Institute of Electrical Engineers, the American Railway Engineering Association, American Institute of Mining and Metallurgical Engineers, the American Association of Engineers, and the American Engineering Council.

Q. 5. Which is the best term: Registration or license?

A. 5. "Registration" was adopted by the Council as being most appropriate.

Q. 6. Should registration indicate classification, such as Civil, Electrical, Mechanical or Mining Engineer?

A. 6. The Council favors the registration of professional engineers showing classification. This means that a man may be registered as a professional engineer qualified in some particular branch of the main divisions of engineering, such as Civil, Electrical, Mechanical, etc.

Q. 7. Should all engineers connected with a corporation or large engineering organization be required to register or only the Chief Engineer?

Q. 8. Should engineers employed by the State Government or its various subdivisions be required to register?

Q. 9. Should employees of railroads or Interstate Public Service Corporations be required to register?

A. 7, 8, 9. All engineers, if in responsible charge of design or construction work, should be registered.

Q. 10. What are the best methods to use in the enforcement of registration laws?

A. 10. A discussion of this question brought out the fact that enforcement of registration laws will be most effective, first by seeing that competent engineers are placed on the Examining Board, and second, by securing the support of the Engineering Profession for the law. Third, for the profession to keep after the atorney-general or other proper enforcement officer, as the case may be.

Q. 11. What procedure should be used regarding delayed payment of renewal fees? What time should be allowed for payment and what penalties be added to this fee?

A. 11. The Council favors a penalty for nonpayment of renewal fees.

The following officers were elected for the ensuing year:

President—Mr. C. G. Massie, Lynchburg, Va.

Vice-President—Mr. John A. Whiting, Cheyenne, Wyoming.

Secretary-Treasurer—Mr. T. Keith Legaré, Columbia, S. C.

Preliminary Draft Report of Committee on Engineering Registration to A. S. M. E. Conference of Local Section Delegates, New York, N. Y., December, 1929.

While a complete study and tabulation of the data available on the subject of Registration is highly desirable, it would take the entire time of a secretary to accomplish this work.

Your Committee therefore has directed its efforts to fact finding only, in order to present to the 1929 Conference of Local Section Delegates such facts bearing upon the subject of Registration as in our humble opinion are worthy of consideration, in an effort to determine whether or not A. S. M. E. should or should not get behind the Registration Movement.

Referring to tabulation appendix I and I-A and II, it is noted that prior to 1917, only four states in the Union had enacted Registration Laws. Between the years 1917 and 1922 eighteen states enacted laws, and from 1922 to 1929 three states have passed such laws, making 25 states with laws, of which 23 are compulsory and 2 optional; and 23 states with no laws.

Twenty-two states have laws applying to Professional Engineering, 2 states have laws applying to Civil Engineers only, and Illinois Law applies only to Structural Engineers.

Three states have combination laws for Architects and Engineers, but in most cases, the Architects have separate laws.

The most recent law enacted is that of the State of Mississippi, which went into effect in 1929.

Unsuccessful efforts have been made in 9 states to pass laws relating to Engineering Registration.

A large number of states having registration laws have deemed it advisable to amend these laws, and in every case the law has been made more drastic by such amendment.

In the states having such laws, there are 27,618 registered engineers and surveyors. These same states in 1926 contained about *39,000* members of the Founder Societies, and (or) the American Association of Engineers. The 1920 U. S. Government Census showed about *90,000* engineers and surveyors living in these states.

They contain about *60%* of the population of the United States; about *55%* of the engineers listed in the 1920 Census,

and 70% of the members of the Founder Societies. These Societies have a membership of about 56,000 in the United States.

Classification of Engineering Registrants in eleven states where specific data is kept, embracing only 7,293 of the total number of registrants, shows 78% Civil Engineers (including Surveyors in same general group—otherwise 63%); Mechanical Engineers less than 9%; Electrical Engineers less than 5%; and Mining Engineers less than 3%. (See Appendix III.)

In addition to the time and effort of the various engineering examining boards (most boards receive no pay for such services), about one and one-half million dollars in original registration and renewal fees have been paid into state treasuries during the operation of these laws.

Reciprocal registration—or registration in any state by virtue of holding registration privilege in one's home state, has been adopted in 23 states.

Another point of interest is the fact that Mechanical Engineers are members of the Board of Florida, Minnesota, Oregon, South Carolina, and I believe Tennessee and New York, by law, and no doubt where the selection of Board Members is optional with the Governor of a state, Mechanical Engineers are appointed.

It is also worthy of note that in the states of North Carolina and West Virginia, full membership in the Founder Societies qualifies for registration.

In the States of Arizona, Florida, Michigan, Mississippi and New Jersey, Registered Engineers are required on all public work.

Louisiana has twelve Mechanical Engineers registered under the State Law, even though the law requires registration of Civils only.

Answers received to questions sent to the various boards show that two boards have refused registration to no applicants; four boards have refused 3% of applicants; three boards have refused 5% of applicants; four boards have refused 10% of applicants; two boards have refused 15% of applicants; and one board has refused 20% of applicants. This would seem that approximately 3,500 incompetent engineers have been

kept from practicing engineering, and exploiting the public over the period of operation of Registration Laws. Fifteen boards say that the law is being observed; there have been three arrests and one conviction for violation of the law.

There are nine boards that feel the Engineers Compensation has been increased, four boards believe it has, three boards say it has not (one of which says the law was not intended to increase the engineers pay); another says they "hope not," as law not intended for that purpose. All agree, however, that registration has raised the status of the engineer, has increased the volume of work for the engineer, and has been a real value to the public. One board, operating under optional registration, does not believe that the law especially helps the engineers.

Answer to questionnaire sent to Local Sections of A. S. M. E. college heads, and Consulting Engineers, do not show as conclusively as was hoped, the attitude of our own membership. Twenty-four sections, independent Consulting Engineers, shows the following:

(1) That, due support and conformity be given the members qualified for Registration in the several states where Registration Laws now exist.

The concensus of opinion is that it is a duty of the engineer to abide by laws that are already on the Statute Books, and therefore, the laws should be supported until repealed. This is indicated by the unqualified approval of all who answered the above memorandum.

(2) That, individually and in co-operation with other engineering and technical societies, due support be given to enact proper laws for Registration of all qualified engineers in the several States where Registration laws do not now exist.

The concensus of opinion is that this should be done with the added stipulation that the laws be uniform, permit of reciprocity, license the professional engineer, and not any specific branch of the profession, and above all fairly, strictly, and properly administrated; with registration fees a minimum, so as not to be a burden to professional men.

(3) That, through its Membership Committee the Council of the A. S. M. E. should give due consideration and weight

in its own requirements of qualifications for admission to the Society, to the certificate of Registration issued by law of the several states.

The concensus of opinion is that A. S. M. E. should recognize, as a qualification, Certificates of Registration, without permitting that to be the guiding consideration. Our present high standard of requirements for membership should be maintained, and because of the present political nature of some Registration Boards, too much weight cannot be allowed such certificates. On the other hand, the man who resides in a State where Registration does not exist, should not be handicapped when considered for membership, by the lack of a certificate of license.

(4) That, the operation of existing laws should be accepted as satisfactory.

The concensus of opinion is that the present laws, except in some specific instances, are not satisfactory. Remodeling of these laws to make for more satisfactory operation is highly desirable, and should be encouraged by our membership.

(5) That, the engineer is in favor of such a law.

The concensus of opinion is that engineers as a rule are in favor of registration and licensing laws—more particularly the engineers who are practising professionally. Those engineers, working for industrial interests, are rather luke warm, and do not see any great benefits to be derived. In the case of employees of engineers, there seems to be opposition to such laws, on the general theory that Registration and Licensing will tend to increase the demand for better pay by the Engineers in their employ.

Of twenty-four local sections, eleven voted in favor of registration, six made no reports, promising further reports later, four reported no definite action for or against, and three are opposed to registration and licensing in any form.

Of twenty-nine colleges and universities heard from, twenty-two are for registration, six against, and one reports no definite action.

Of the independent or consulting engineers heard from, all voted for registration and licensing, and none against.

(6) In so far as there is a public demand for such law, the concensus of opinion is that the public, while most certainly a beneficiary from the operation of such laws, is not much interested, hence there is no such demand from the public. The history of all registration shows no demand on the part of the public for such laws, yet the benefits that that public has derived from licensing of various professions cannot be disputed. Very few efforts at public welfare are initiated, demanded, and fought for by the public.

It is generally conceded that registration laws have not measured up to the predictions of their enthusiasts, but neither have they approached the shortcomings predicted by opponents upon their adoption. Laws are as effective as the respective examining boards and engineering organizations care to make them.

Many engineers feel that it is incumbent upon the founder societies, or some of the existing National Engineering organizations, to guide the wave of enthusiasm in registration spreading over the country. The confidence of the engineering profession in the Founder Societies is such that consideration given by them of the subject would mean better and more uniform laws throughout the country; and better enforcement of these laws. If the Founder Societies do not interest themselves in the subject, it is feared by many, that the number of engineers in the country who felt the need of Registration, warrants the organization of another Engineering Society to promote this Registration Movement. Leadership for successful and proper guidance should rest with National and State Engineering Organizations, and the time has arrived for concerted action in order that best interests of the public, the profession, and the engineers shall be conserved.

This Conference should take an aggressive attitude in order to definitely present the subject to council, in keeping with the desires of the general membership. A "hands off" attitude is very apt to lead to a condition very undesirable. Supervision of the movement would be far more desirable, because in that way proper guidance would be secured instead of being dragged into the movement by radical elements.

MINUTES OF MEETINGSC AND BUSINESS OF THE SOCIETY.

No meeting of the Board of Direction was held in September.

Minutes of Meeting of Society, September 9, 1929

The meeting was called to order about 8:10 p. m., Mr. James M. Todd, Vice-President, in the chair, and 48 members and guests present.

The minutes of the previous meeting were read and approved.

The technical exercises consisted of a most instructive paper on "Zoning in New Orleans," by Mr. Charles A. Favrot, Chairman, New Orleans Zoning Commission. This paper was followed by interesting discussion.

A rising vote of thanks was then tendered the speaker and the meeting adjourned to the usual collation.

F. A. MUTH, Secretary.

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LOUISIANA ENGINEERING SOCIETY

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The headquarters of the Society are in the State Museum Building, Jackson Square.

All business communications should be addressed to F. A. Muth, Secretary, 7705 Willow Street, New Orleans, La.

PROCEEDINGS
OF THE
LOUISIANA ENGINEERING SOCIETY

VOL. XV. DECEMBER, 1929 NO. 6

CONTENTS

EDITORIAL NOTES AND COMMENT

The Sugar Cane Industry of Louisiana. The October meeting of the Society was held in the Gold Room of the Roosevelt Hotel under the joint auspices of the local chapter of A. S. M. E. and of the Louisiana Engineering Society, Mr. George Hammett presiding.

Mr. David W. Pipes, Jr., presented a paper under the above title, which is printed in this issue of the Proceedings, and which should be of the greatest interest, not only to men in the sugar and allied industries, but likewise to any person thoughtfully concerned with the progress and welfare of the State.

Sugar cane was introduced into Louisiana by the Jesuits as early as 1751.

In 1795 the first sugar mill was erected and operated by Etienne de Boré, his plantation being on ground now occupied by Audubon Park and Tulane University. His first commercial crop is said to have realized the sum of $12,000.

Mr. Pipes then draws a very interesting picture of an early sugar plantation and the old open kettle process of manufacture. Judah P. Benjamin, afterwards to become so prominent in the government of the Confederate States, and as a lawyer of international fame, was one of the prominent planters of those early days.

In contrast to the plantation of those early days is presented a description of the plantation as it had changed and developed by the year 1910. It was soon after this period that the mosaic disease began to manifest itself with such harmful results in Louisiana.

The paper deals somewhat briefly with the subject of the tariff on sugar, one of the most keenly debated phases of the tariff problem now before Congress. Mr. Pipes believes that a tariff of 2.40c as against the present rate of 1.76c per pound is practically a necessity for the protection of the domestic sugar industry against the competition of Cuba, and that it will also be a guarantee against excessive prices to the ultimate consumer.

About 1919 the United States Department of Agriculture called attention to the prevalence of the mosaic disease in Louisiana. For a number of years the East Java Experiment Station had been experimenting on the breeding of canes resistant to diseases of various kinds. In the spring of 1923 Southdown Plantation secured some few specimens of three different varieties of this Java cane, which has come to be called P. O. J. cane, these letters being the initials of the Dutch name for the East Java Experiment Station.

From this point on Mr. Pipes' paper records the story, almost romantic in its interest, of the improvement of the cane crop in Louisiana, starting from these twenty-one specimens of P. O. J. which were planted at Southdown.

In 1926 the sugar crop in Louisiana was only 47,000 tons; in 1927, in spite of the flood, it was 71,000 tons; in 1928 it was 131,000 tons, and the estimated crop for 1929 is 218,000 tons.

It would appear that too much credit cannot be given to Mr. Pipes and his coworkers for the generous and unselfish efforts they have made toward the rehabilitation of one of Louisiana's greatest industries. While sugar is an agricultural product, it has the rather unique distinction of being almost the only such product which has to be harvested and then immediately manufactured into practically the form in which it goes to the ultimate consumer. This means for the future success of the industry more scientific study of the agricultural features and the more effective use of the land, more and better factories for the manufacture of sugar, more extensive development of the by-products and a fine spirit of co-operation among all the different agencies concerned with the problem.

While Mr. Pipes does not minimize in any way the difficulties, both present and future, facing the sugar industry in Louisiana, still he speaks in a spirit of well-informed and authoritative optimism which cannot but be encouraging to the men who are engaged in the development of this most important product.

Sodium Aluminate for Treatment of Boiler Feed Water. This subject was treated in a very interesting paper presented at the November meeting of the Society by Mr. George E. Brown, Jr., representing the National Aluminate Corporation and the International Filter Company.

In these days of high efficiencies and close economies the purification of a boiler feed water, whether by internal or by external treatment, is a matter of the greatest importance.

The subject is a highly technical one and is treated in great detail in the paper which is printed in this issue of the Proceedings. Its presentation before the Society was made particularly interesting by the use of a moving picture showing the reactions and effects produced by the employment of the material in question by means of ingeniously designed and constructed boilers of glass.

Discussion of Mr. Abrams' Paper. In the August, 1929, issue of the Proceedings there was published a paper by Mr. Duff A. Abrams, entitled "Cement and Concrete." One of the questions discussed in the paper was that of the effect of admixtures upon the concrete. Mr. Abrams makes this statement: "All the commercial admixtures tested must be classed as injurious adulterants, due to excess water required to maintain workability. The reduction in concrete strength was proportional to the excess water." Also: "After the colloidal clays, diatomaceous earth was the most injurious to strength and workability."

The Editor is just recently in receipt of a communication from Mr. Geo. A. Smith containing a discussion of these points. This communication is published in this issue of the Proceedings.

Registration of Engineers. This important subject came up for discussion again at the November meeting of the Board of Direction. Members of the Society should understand that the Committee on Registration is keeping actively behind this matter and that it is proposed to prepare a bill to be submitted to the Society for approval, and incidentally to determine whether the membership of the Society is really in favor of the proposition to license and register *all* engineers.

There can be no doubt in the minds of men who give it careful thought that the protection of the title "engineer", and the preservation of the standards and best traditions of the profession are very closely bound up with licensing and registration.

National and Local Honors to Our Members. It is a pleasure to record the following:

Mr. J. Frank Coleman, founder and honorary member of the Louisiana Engineering Society, has just been elected President of the American Society of Civil Engineers. This is the third time in the long history of this organization that this honor has come to a Southern man, one of the others, the late Major B. M. Harrod, having also been a resident of New Orleans.

Mr. Allan T. Dusenbury at the same election was made Director for the 15th District of the American Society of Civil Engineers. This district comprises the states of Louisiana, Texas and Oklahoma.

Mr. Ernest Lee Jahncke, honored by President Hoover with the appointment as Assistant Secretary of the Navy, was also elected a Vice-President of the American Society of Mechanical Engineers.

Mr. A. M. Lockett was elected to the very important office of President of the Association of Commerce of the city of New Orleans.

An Honor to Dr. Ralph Modjeski. Many members of this Society will doubtless recall with pleasure the several occasions upon which Dr. Modjeski has attended our meetings and made brief addresses thereat. It is a pleasure to record that he has recently been awarded the John Fritz Gold Medal "for notable achievement as an engineer of great bridges combining the principles of strength and beauty."

New Members. The following names have been passed upon by the Board of Direction as new members:

RESIDENT MEMBERS

Paul Andry, Jr., 1527 Fourth Street, with Engineering Department, Shell Petroleum Corporation.

James H. Cherry, 1120 Hibernia Bank Building, Concrete Engineer.

Lionel E. Flotte, House J., St. John Court, Distribution Engineering Department, N. O. Public Service.

Harold L. Guidry, 317 Baronne St., Gas Department, N. O. Public Service.

Loyless H. Hiers, 4004 St. Charles Ave., Gas Department, N. O. Public Service.

Lyall G. Ireland, 1634 Robert St., Assistant to Vice-President, N. O. Public Service.

Odon O. Melancon, 2227 Jefferson Ave., Member Board of State Engineers.

Howard N. Old, 4916 Carondelet St., Sanitary Engineer, U. S. Public Health Service.

Walter H. Scales, 2023 Broadway, Southern Manager, National Lumber Manufacturing Association.

Albert P. Woody, 3716 Louisiana Avenue Parkway, Gas Department, N. O. Public Service.

NON-RESIDENT MEMBERS

Charles R. Gates, Hattiesburg, Miss., Roadmaster, Southern Railway (N. O. & N. E. R. R.) and New Orleans Terminal Co.

A. J. McCorkle, 601 West Church St., Hammond, La., Contracting Engineer.

Harry B. Henderlite, 403 Evergreen Drive, Baton Rouge, La., Chief Engineer, Louisiana State Highway Commission.

ASSOCIATE MEMBER

Edgar C. Walthall, 588 Walnut St., New Orleans, La., New Orleans District Manager, Combustion Engineering Corporation.

RESIDENT STUDENT MEMBERS

All Junior or Senior students of the College of Engineering, Tulane University.

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Philip Antoine Weber, 3118 Magazine St.
John Wadsworth Wilson, 7916 Oak St.
Carroll Lee Wood, Jr., 819 Calhoun St.

PAPERS AND DISCUSSIONS

THE SUGAR CANE INDUSTRY OF LOUISIANA

By D. W. Pipes, Jr.

Read before the Society, October 14, 1929.

I greatly appreciate your invitation to attend this meeting and discuss the sugar cane industry of Louisiana. The industry is vital to South Louisiana and of great importance to the nation. With apologies for personal limitations, I will attempt to sketch its growth and point out some of its needs and possibilities.

There is going on today in Louisiana not a revival of the old sugar cane industry but, more properly speaking, a rebuilding of a new sugar cane industry; a more permanent and sounder structure than has heretofore existed will be built, fortified by sad experience, and using more co-operation and modern business and scientific knowledge.

Sugar cane was first introduced into Louisiana about 1751 by the Jesuits. The first plantings probably were made on their plantation just above Canal Street, what is perhaps now Barone Street near Gravier. Small plantings were made solely for eating purposes until 1795. In that year Etienne de Boré, grandfather of Gayarre, the eminent Louisiana historian, built a sugar factory six miles above New Orleans, where Audubon Park is today. He made the first commercial crop of sugar, reputed to have sold for $12,000, a considerable sum of money for those days. The sugar industry dates from that year. Sugar factories began to spring up all along the river. In 1815 Darby's "Emigrant's Guide" lists sugar as the most profitable crop in the state, and he states: "If all of the land in the state upon which that article could be made was cultivated in sugar, say 250,000 acres, at 8c per pound would give $20,000,000.00."

The alluvial soils along the river, Bayous Lafourche and Teche, were of incredible richness. Big crops were made. In 1845 Champomier, the statistician, reports 1,240 sugar factories, 630 operated by steam and 610 by horse power. The crop

was measured in hogsheads, each 1,000 pounds. The sugar factories were as modern as any then existing in the world. The great bulk of the sugar, molasses and syrups used in the United States came from Louisiana. For 1845 the consumption of sugar in the United States was 113,000 tons, nearly all produced in Louisiana. The consumption of the world was 840,000 tons. (From DeBow's "Commercial Review".).

Here is a brief description of a Louisiana plantation of 1829. A plantation and factory located on the Mississippi River was owned by an individual or a family group and worked by slave labor, 6,000 tons of cane perhaps being produced annually. Soil was very rich. Average yield of sugar cane per acre with two stubble crops was perhaps 25 tons. Cane was cut by hand as today, hauled to the mill, where it was fed by hand to three wooden or iron crushers or grinding cylinders or rolls. Not over 60% of the juice was extracted, the balance going out with the bagasse. The juice next ran into vats divided by iron or copper wire, which removed the grosser impurities, and then it flowed into open kettles. It was boiled over an open fire and tempered with lime in variable proportions to aid settling and clarification. The scum as it arose to the surface was skimmed off and thrown away. The loss by skimming was four or five per cent. The juice thus defacated was ladled from one kettle to another, the number of kettles being generally four or five. The last kettle was known as the battery, and there the juice was concentrated to a thick syrup. It was ladled out of this battery into large wooden vats called coolers. After being left in these coolers about twenty-four hours, the syrup crystallized. The masse-cuitte was taken out and placed in hogsheads in a drain room or purgery. The hogsheads had holes in the bottom and were placed over a cistern into which the molasses fell. The sugar, 80 to 90 pounds to the ton of cane ground, thus drained, was ready for the market in two or three weeks. Four hundred and fifty to five hundred hogsheads of sugar and molasses probably yielded $30,000.00, and was shipped by river to New Orleans for distribution all over the country. About two and one-half cords of wood were used for fuel to make each hogshead of sugar. This heavy demand for wood helped in

clearing the land. The bagasse was hauled to the swamps. The industry was profitable. The cane supply was bountiful. Direct consumption products were made,—sugar and open kettle edible molasses and syrups.

By 1850 radical mechanical and chemical improvements had been made, much information having been secured from French and German chemists working on beet sugar. Louisiana planters first adapted processes to cane sugar, improving them in many instances, and later the tropics adopted them. Steam boilers were now being used; inclosed defacators had been adopted, liming was done with more control. Vacuum pans with much saving in fuel came into very general use. Bone black as a filtration agent was being used.

Judah P. Benjamin, the great attorney and Confederate statesman, was a big planter of that day. About 1846 he wrote "The extent to which the production of sugar cane can be carried on in Louisiana is appreciated but by few, but those who reflect on the subject and feel an interest in all that concerns the property of our state, forsee with exultation the day not far distant when boundless tracts now covered by the primeval forests shall teem with plenteous harvest of the cane." The planters of this period were industrious and intelligent, were on the *qui vive* to take advantage of all modern improvements.

Occasionally there was a crevasse on the river, a storm, an early freeze or an outbreak of yellow fever which did great damage in some particular locality but rarely affected the district as a whole. There were no serious diseases of cane, and the crops were bountiful. Labor supply was good, intelligent and able supervision, reasonable prices, and direct consumption products manufactured. At this period the sugar factories were the best of their kind in the world and there existed a golden period until the outbreak of the Civil War.

You well know the violent disruption and destruction of life and of business during the Civil War, and the difficulty of rebuilding after that period.

From 1865 on there were brief periods of prosperity, but taken as a whole, the industry was declining. It was not in sound condition. There was a shortage of capital, labor was

not as good as formerly and as the lands were not as good, crops were not quite as bountiful. Sugar factories of larger size in other sections of the world were becoming more efficient than the Louisiana factories. The planters still maintained their business, but each unit was entirely and independently to itself. As agriculturists, I doubt seriously if even in this period they had a peer in the world. Bear this always in mind in considering the Louisiana cane industry:—It is now, and has been, mainly an agricultural industry. Few farmers in the history of the world have put their product into as final form for consumption and covered so well such a diversity of operations. But more of this later.

Louisiana during all of its history had been singularly free from serious cane diseases and pests; as a matter of fact, there were no serious diseases or pests, with the exception of the cane borer, which appeared in Louisiana possibly in the 50's. The production of sugar from 1880 to 1920 ranged from 175,000 tons to a maximum of 400,000 tons, worth with syrups and molasses an average of $30,000,000.00 annually.

Let us look at a sugar plantation and factory of 1910. It was owned still by an individual or a family. The factory was the survivor of six or eight sugar factories in the neighborhood. It was six or eight times as large as the one of 1850, but not nearly so efficient by comparison with world standards, and the manufacturing and chemical control was considerably more complex than formerly. The land was not so rich. Labor was inferior. The gang system of labor was used instead of the slave system and too little attention was being given to encourage the individual laborer. Jobs were done by the day instead of by piece or by task. Too little attention was now being paid to the earning capacity of the land. The foundation of the whole structure—Cane supply—was not so bountiful. The production averaged to the acre possibly 18 tons on a good plantation. There was a plant cane crop and one stubble crop. The factory was considered of more importance than the land. The cane supply came from the large plantation to the extent of say 40%, and the balance was bought wherever available, and many extra costs began to creep in, such as freights, weighing, etc. Not much attention was given to the fields as com-

pared to the factory. Each factory was run as a separate unit. There were 207 factories in the state. There was no standardization of products. The owner-manager as a rule was one of the hardest working men. He had to cover and have knowledge of a great variety of subjects. He had to know the fundamentals of agriculture, considerable about chemistry and machinery, as well as selling and financing, with all sorts of nic-nac combinations in between. The system was wrong. Very little experimental or research work was going on. Louisiana boys were given a technical sugar education at the State University and then they went to the tropics to get jobs. Louisiana could not afford to pay them. Dirt roads existed and prevented close intercourse. Raw sugar was the main product, direct consumption products had lessened. Raw sugar was shipped to New Orleans, and the refineries, forced to buy over a limited period, cut the market severely. Each planter competed against the other in selling his products, and the banks and commercial houses urged early liquidation.

An average factory grinding say 30,000 tons of cane, consisted of a six roller mill and crusher, brick, iron and wood construction, relatively little electricity being used. Most of the equipment, boilers, pumps, centrifugals, mills, etc., were generally antiquated. Production as a rule averaged 135 pounds raw sugar, balance went into magma tanks and was dried out the following summer, magma tank product being about 18 pounds of low grade sugar and 5 gallons blackstrap molasses to ton of cane. Other factory productions of this period were syrup, plantation granulated, clarified and edible molasses. Sulphur was used freely as the bleaching agent.

Here and there some individual owner, due to extraordinary ability or due to having very fine plant location and other natural advantages, made big money, but the industry was not progressing and was using unsound methods, and the sound earning capacity of the land was absent.

Again there came a war, and during the war Louisiana sugar was under strict control. The United States realized every ounce of this valuable food was needed for the safety of the country.

Let me digress here to discuss the tariff, which is essential at the present time to the Louisiana sugar cane industry.

There has properly been a tariff on sugar almost since the formation of our nation. A tariff on sugar is in line with the protective policy of the Republican party and also in line with the former principles of the Democratic party as a fair, widely spread producer of revenue. Just exactly what the principles of the Democrats are now on such a tariff it is hard to define. It also obviates taxes in other forms. There is another phase of the sugar tariff which is becoming more recognized and which is the soundest of all reasons for reasonable protection. Sugar is a vitally necessary agricultural food crop of the United States. In 1898 the per capita consumption of sugar in the United States was 59.30 lbs.; in 1898 the consumption was slightly over 2,000,000 tons. In 1928 the consumption per capita is over 110 lbs., and the total consumption slightly over 6,000,000 tons. Consumption is increasing about 2½% per year, or now about 143,000 tons annually. Of this six million tons, the beet sugar growers produce about a million tons, and Louisiana, until recently, has been producing several hundred thousand tons. A few hundred thousand tons come from corn sugar, mainly used in manufacture. Our territories and dependencies, Hawaii, Porto Rico and Philippines send about 1,500,000 tons. The balance, somewhat over three million tons, comes from Cuba, a tropical foreign country, which has cheaper labor and more favorable climatic conditions for cheap production than either the beet or the cane districts of Louisiana. Beets are a splendid rotation crop for the northern and western farmers. Both for beet and cane, enormous investments are requried for machinery and special equipment for the planting, cultivating, harvesting and manufacture into sugar of these crops, and millions of dollars annually go into United States home trade. The United States has then a great agricultural food crop, consumption increasing rapidly, a continental production of about one-sixth of requirements, separated by the ocean from Hawaii, Porto Rico and the Philippines, and dependent upon a foreign country for over 50 per cent of its supply of an essential food commodity.

With rubber recently we have seen what can happen to boost the price of a commodity in foreign hands. Since about

1903 the United States has given Cuba a preferential of 20% in the tariff as against the rest of the world. They have also handling and transportation advantages over other nations. This gives them a monopoly of foreign sugar entering the United States. We are on the friendliest of terms with Cuba, but I can't conceive a party, Republican, Democrat or Socialist, which would desire to put the United States entirely at the mercy of a foreign nation for their supply of an essential food crop. The present tariff, about 1.76c per pound against Cuba, is decidedly in their favor. All domestic producers have joined together in asking Congress for 2.40 against Cuba, and the issue is still pending. It will take this amount to fairly equalize costs. Living standards in Hawaii and Porto Rico are higher than in Cuba. Due to full utilization of lands, production in Hawaii and Porto Rico cannot expand much—so the future sugar supply of the United States must come from the United States or from a foreign nation. If eliminated, it would be nearly impossible to replace the hundreds of millions of capital invested in beet and cane machinery, irrespective of damage done to land values. It is quite logical to assume that Cuba would raise prices several cents a pound if she is given a complete monopoly. The tariff, protecting our domestic supply, is the very best insurance policy the housewives of the United States have against real high sugar prices, and sugar is now far too cheap for the ultimate good of all concerned.

The only real opposition to the reasonable tariff asked for has come from a few Wall Street barking interests who made heavy loans and investments in Cuba during the last World War and immediately thereafter. At that time they made large profits, and the production in Cuba was greatly over-expanded. During and just after the war they had a market in foreign countries for the surplus Cuban production. Since the war many of these countries have been building up their own production and putting on very high tariffs. They wisely realize it is necessary to have a large home supply of this essential food. Cuba today has a large surplus of sugar and in the last several years has persisted in dumping it on the United States markets, rule or ruin policy. As stated, Cuba has a 20% preferential in sugar tariff. Few domestic sugar producers be-

grudge the preferential which has been given Cuba, provided they use it wisely and market their sugar sanely. Dumping the Cuban surplus here destroys the 20% preferential which the United States gives them and it plays havoc with us domestic producers. Should this be allowed to continue without adequate tariff protection, the domestic sugar industry would be destroyed in the United States and seriously crippled in Porto Rico and Hawaii. Cuba, as a foreign nation, is not subject to the United States laws or control, and its sugar industry is largely owned and controlled by about a dozen big firms, and if given a complete monopoly, there is no reasonable doubt that prices would be raised far in excess of the protection asked for by the domestic industry.

Now to get back to the main story. Some time between 1910 and 1918, probably on some imported cane seedlings, there came to Louisiana a major cane disease known as Mosaic. Mosaic disease does not kill the cane. The chlorophyl in the leaf is destroyed and the plant cannot properly function, and thus weakened, is more subject to other ills. The symptoms are disguised to the casual eye, and the cane seems to be suffering from drought, lack of nutrition, faulty cultivation, etc. In favored spots and with a very favorable season, virulence of the disease is arrested and crops yield better. This confused an early and clear diagnosis. Mosaic disease is very mild in its first effects, especially during favorable seasons, but unfavorable seasons followed, and Louisiana planters were almost wiped out before they diagnosed the trouble. This disease made its appearance first on the east bank of the Mississippi River, and then gradually worked over to the Lafourche and Teche and into the west, leaving eventually devastation and abondonment in its wake.

Dr. E. W. Brandes, Chief of the Office of Sugar Plant Investigations, Bureau of Plant Industry, U. S. Department of Agriculture, first pointed out its prevalence in Louisiana in a bulletin published in 1919. Planters, however, did not know the disease, could not gauge its effect and paid very little attention to his warnings. He did not have sufficient funds at his command to carry on propaganda work. Other scientists visiting Louisiana mentioned the possibility of damage from the

disease. In 1921 Mr. Elliott Jones, General Field Manager of the Estate H. C. Minor properties, heard an address made by Dr. Wm. E. Cross, Director of the Sugar Station in the Argentine. Shortly after he went to Virginia on vacation and while there called on officials of the Department of Agriculture to see if he could get some more information relative to Mosaic disease, and perhaps secure some canes recommended by Dr. Cross as being resistant to its effect and reputed also to have more cold resistance. He secured from Dr. Brandes in the spring of 1922 80-odd eyes of P. O. J. 234. Twenty-one survived the shipment. In the spring of 1923 Southdown received a few seed pieces of P. O. J. 213 and P. O. J. 36. First plantings of the canes were made with considerable misgivings: the cane looked small and hard. We had not yet sufficiently studied Mosaic disease, we did not know enough about breeding work, disease control and varietal selection. We planted and hoped for the best. Possibly 98% of the three and one-half million tons of cane in Louisiana today came from these few cuttings.

P. O. J., by the way, stands for "Proefstation Oest Java" (East Java Experiment Station), and these canes had been bred by Dutch plant scientists who have demonstrated that nearly all cane diseases can be controlled by breeding. Cane of low sugar content, great vitality and extremely resistant to disease is crossed by pollinization upon cane of good sugar content and good mill qualities. Thus came P. O. J. canes, hybrids, a semi-wild cane first crossed upon a so-called "noble" cane. Scientific breeding has opened up an almost unlimited field for improvement of yields.

Let us go back into Louisiana history and trace the use of varieties, as now you can realize that breeding and varietal selection is most important.

The cane introduced by the Jesuit fathers was, according to the late Dr. W. C. Stubbs, the Bengal or Malabor variety, known over the world as the creole cane, a very soft, easily milled cane. In 1797 a better variety was secured, the "Otaheite". It also was very soft and easily milled. In 1825, John J. Coiron, a prominent sugar planter of that period, secured from his friend, Roswell King of Savannah, Georgia, a schoon-

er load of the Louisiana Purple (Cheribon) and the Louisiana Striped (Striped Preanger). These canes originally came from Java, and were more prolific and hardy, more resistant to disease, and resistant to frost; however they gave the planters some concern at first to properly mill them. They rapidly replaced the Otaheite cane and were the chief canes of Louisiana until 1898, when the Louisiana Experiment Station, under the late Dr. Wm. C. Stubbs, introduced the D-74 seedling from Demarrara, a very prolific and early maturing variety.

Until about 1884 it was not known that the seed of cane was viable. Incidentally, cane rarely goes to flower or seed in Louisiana. When we speak of seed cane in Louisiana there is meant a seed piece or cutting. Two eminent English scientists, Messrs. Boeval and Harrison, proved that cane would reproduce from seed. Prior to this time it was considered that cane seed was not viable.

In the early eighties the Java cane industry was visited by a severe cane disease, sereh. They were almost wiped out before discovering that its effect could be obviated by introducing, we will say, "new blood". They then started on a very extensive program of cane breeding, which they have kept up to this day. This work is the foundation of their whole industry, and today they are the cheapest producers of sugar in the whole world.

Breeding against sereh, Dr. Jan Kobus developed P. O. J. 234, P. O. J. 213 and P. O. J. 36, the canes now used in Louisiana. They were little used in Java as they mature too early. The breeding of canes to obviate disease has since spread over the world into a very wonderful and complex scientific development not only of breeding but of rapid testing and elimination. The constant aim being to secure canes of more tonnage, higher sugar content; in fact, the qualities best suited for the particular climate or soil conditions for which the cane is intended. Java today breeds annually 100,000 new varieties a year. They have increased their sugar production per acre in the last thirty to forty years, mainly in this way, from 200 to 300 per cent. Louisiana owes much to Java. The old canes, the purple and striped, came originally from there. A hundred years thereafter we secure the P. O. J. canes, and to-

day we are using many methods developed by them to breed and test quickly still better canes. Porto Rico, Argentine, South Africa, Hawaii, have gained wonderfully in production by using the same policy of breeding and intensive selection.

Now we will go on with the Louisiana story. Money as secured about 1922 by the U. S. Department of Agriculture for the formation of a cane breeding station at Canal Point, Florida. This site being chosen as it is one of the most southern points in the United States and permits flowering of the cane.

By the fall of 1924 the management at Southdown had been able to more clearly analyze their troubles. After studying the disease, conferring with scientists, particularly Dr. Brandes and the men of his department, and noting the differences in the yields, we felt convinced that the P. O. J. canes, tolerant to Mosaic disease, would grow and yield under normal circumstances and prices, a profitable crop of cane. During these years, we had tried without much success to get earning capacity from our lands in other crops. We have rich land, but hot sunshine and heavy rains. Cotton in a dry year will do nicely, but the dry years don't come often enough to give an average living. Corn and rice are overproduced, truck is variable, affected by high moisture, and it is difficult to compete with more favored sections like South Florida or the Rio Grande. We found out that it is almost a question of cane or weeds for South Louisiana. This is a strong statement but true at the present time.

The twenty-one eyes of P. O. J. 234 had grown by the fall of 1924 to four acres, and the few stalks of P. O. J. 213 and 36 were now represented by a few rows. This small stock represented possibly 98% of the total supply in the United States. No more canes could be immediately brought in on account of quarantine regulations and the danger of introducing other diseases or pests. The Louisiana industry in the meanwhile was rapidly getting in worse shape. The planters were in desperation and were in some instances being foreclosed on. Fortunately there was relatively little of this as very few wanted the property. Many planters still thought the climate had changed or that their failure was due to other causes than cane disease. Our immediate problem was how to quickly spread

information relative to the new canes and the disease. We feared that the industry would be completely destroyed before relief could be secured.

While there was no obligation upon us as the cane had originally been secured as a free gift from the Department of Agriculture just as other seeds and plants are distributed, the owners of Southdown finally decided to give one-fourth of their cane (about twenty-six tons) to the Department of Agriculture, thinking they might spread it rapidly. The department stated they could not accept the gift but would be glad to buy at a nominal price several tons for free distribution. This was turned over to them and they sent out free several thousand 4-pound packages to any planter who applied. It was next decided to offer the seed to the American Sugar Cane League, a co-operative association of the planters. Provisos of the gift were that the seed be scattered throughout the State for planting and for observation. The title to the progeny was to rest in the League, and if the cane was deemed worth while, it was to be sold to the planters of the state by their own association, whose funds are dedicated solely for their benefit, and a portion of the proceeds was to be used for the building of a field laboratory for the use of the Department of Agriculture. At that time the cane was looked upon as a curiosity, and most planters considered it of very problematical value. The Mosaic disease, its virulence, and the cane as a remedy, was as yet not generally understood.

The writer had the honor of presenting the cane to an executive committee meeting of the American Sugar Cane League, and in offering stated it was considered quite a valuable gift. One of my fellow planters asked how valuable. I answered $10,000.00. He said: "twenty-six tons of cane is worth to the mill about $130.00, and you state a value of $10,000.00! You have the greatest imagination of anyone I ever heard talk!" I am proud to say that the twenty-six tons produced cane which was sold by the League for slightly over $30,000.00. A site for a Federal research station was chosen on Southdown Plantation, forty acres of land rented, and the field laboratory for the U. S. Department of Agriculture workers erected. The Estate H. C. Minor sold some seed cane also after

the League supply was exhausted, but we really preferred at that time to keep our supply rather than to sell it. Numerous meetings of agricultural workers, planters, business interests, etc., were held at Southdown during 1925 and 1926, to give ocular demonstrations and make comparisons.

The new canes did not come a bit too soon. In 1926 the crop of the state was at its lowest ebb. The production was 47,000 short tons, but in that year there began to be sufficient plantings of P. O. J. seed to increase production. The sugar production, of 1927, in spite of the flood, was 71,000 tons; of 1928, 131,000 tons; and of 1929, it is estimated at 218,000 tons.

In the meanwhile the American Sugar Cane League has carried on an intensive campaign of propaganda of incalculable value, pointing out to the state at large that the new canes would give at reasonable prices solid earning capacity to the land. Over a number of years of planting it has been fairly well demonstrated that P. O. J. 213 and P. O. J. 36 will yield an average of twenty-five tons of cane to the acre; P. O. J. 234 somewhat less. Fortunately in addition to lowered costs through the volume of production, the new canes have reduced expenses somewhat. Two to two and one-half tons of P. O. J. seed cane are required as against four and one-half to five tons of former varieties. With the old varieties it took approximately 14% of each crop for seed purposes. With the new varieties it takes approximately 4%. There is less hoe work, an earlier lay-by, an extra year of stubble, etc.

The land production today is probably as good as ever in the history of Louisiana. The big problem in late years in Louisiana was to get a cheap, dependable supply of raw material for the factories. Cane is bought on an equitable sliding scale—price rises or falls depending on the price of raw sugar. This problem has now been solved and will be improved upon with better varieties. It is realized now by all that these canes are but a stepping stone to better and heavier yielding varieties.

The American Sugar Cane League has increased its membership and secured appropriations, State and Federal, for further research and experimental work. They have erected a second field laboratory for the Department of Agriculture's

use at Southdown. From 6,000 to 8,000 canes are now being bred annually at the Florida Breeding Station, for Louisiana use, bearing in mind our soil and climatic conditions, resistance to frost and the pests and disease which we have here.

In recent years a great deal of knowledge has developed in the use of fertilizers, tractors, tractor implements and machine development. Strenuous efforts are now being made to quickly make available this knowledge for the sugar cane district. Scientific agricultural studies of all sorts are being utilized as never before.

Bear in mind that today most of the factories in Louisiana are very antiquated; modern factories would have greatly increased earning capacity. Several by-products, particularly bagasse and molasses, are coming more and more into prominence. Blackstrap molasses, a by-product, very rich in carbonhydrates, was formerly thrown away. Next in the main it was used as a stock food ingredient, worth around 2½c to 4c per gallon. Today it is being bought to be used primarily for the manufacture of alcohol at approximately 10½c per gallon. There are approximately 5½ to 6 gallons of blackstrap molasses made from each ton of cane. Bagasse in the early days was carted to the woods. Next it was burned. Then the Celotex Company, whose first plant, by the way, was installed at Southdown, started using it for board making. This year they will consume perhaps 30% of the total Louisiana production. Intensive research is being carried on to find other uses for bagasse. The new canes run about 13½% fiber, and with larger manufacturing units they give a collection of fiber of very considerable magnitude; for instance, a 200,000-ton mill will have at a given spot during the harvesting season approximately 20,000 tons of bone-dry fiber, or 54,000 tons of bagasse. Undoubtedly more mills of such size will be erected. A bountiful and dependable cane supply (raw material) will warrant their erection. They will be of steel and concrete, of infinitely higher efficiency than the average of today, mainly electrically driven, possibly 3,000 tons daily capacity. There are a number of mills now in the state with capacity in excess of 125,000 tons cane.

Above all, there has developed in Louisiana a wonderful spirit of co-operation among State, Federal agencies and plant-

ers. The lack of teamwork in the past was one of the biggest factors against development. Each individual planter was a small unit, absolutely and entirely to himself. Co-operation gives tremendous strength to the whole. The gradual evolution of the factories necessarily must be to bigger units. There again volume reduces expenses. The limit will probably be reasonable limits of transportation, perhaps 10 to 12 miles. Large mills will give opportunity to employ better technical men, and instead of sending to the tropics our trained men, shortly they will find profitable employment in Louisiana. There will develop with the increased volume of sugar a tendency to make again direct consumption sugar.

One of the big needs today is for a carbon cheap enough to be freely used as a decolorizing and filtration agent. This would give the opportunity to make white sugars and good molasses direct from cane juice with big savings in freights, handling costs, bags, etc.

The so-called "Sugar Belt" of Louisiana extends from a point just south of Alexandria, down the Mississippi River to the Gulf, and as far west as Vermilion Parish. Lands further north may be used profitably for syrup making. Transportation is furnished by the Southern Pacific, Texas and Pacific, Gulf Coast Lines, Illinois Central, and a net work of narrow gauge railroads, the Mississippi River, Bayous Lafourche and Teche, and numerous smaller bayous, and an excellent system of gravel roads. As stated, there are at the present time approximately 1,000,000 acres of clear open land which could go into sugar cane production. Save for capital, there is no reason why a crop of sugar of 750,000 to 1,000,000 tons, with reasonable tariff protection and prices, could not be profitably grown in Louisiana. More profitable molasses and bagasse utilization should make the crop worth in excess of $100,000,000.00. Additional capital will undoubtedly come into the business as soon as tariff assurance and profit capacities of the cane are more thoroughly demonstrated by time. The use of new varieties of cane, of more scientific agricultural knowledge, liberal co-operation between all agencies and business interests, should cut down, depending upon the intensive work done, the time of development. In the meanwhile business in-

terests should study the industry, banks and money lenders must further stretch their sorely tried patience. The wreckage of seven years cannot be cleared up immediately, and further money is needed for rehabilitation and for rebuilding, but the big foundation of a sound industry, namely, dependable producing capacity of the land, is established. The two other big factors, factory development and changes in labor system, will come in time.

DISCUSSION

MR. GRIFFEN: I came to hear Mr. Pipes, the speaker of the evening, and did not know that I was going to be called on to say anything, and, therefore, cannot say much about the by-products from sugar cane. You probably know that more industrial alcohol is made in the city of New Orleans than any other city in the United States. Over forty per cent of all industrial alcohol manufactured in the United States is made in New Orleans. I believe that no Louisiana blackstrap molasses is used in the manufacture of such industrial alcohol.

Nearly all the molasses used here for the manufacture of alcohol comes from Cuba or other West Indies islands. Some possibly comes from Hawaii and a little from Java.

There is used in the city of New Orleans, in the manufacture of industrial alcohol, probably something over one-hundred and twenty million gallons of blackstrap molasses yearly. This is much more blackstrap molasses than is made in Louisiana. If the use of industrial alcohol in the United States can be increased, as we believe it will, more blackstrap molasses will be used, and if there is a surplus of blackstrap molasses manufactured from sugar cane in Louisiana, it can easily find an outlet in the manufacture of industrial alcohol. It is my understanding that the blackstrap molasses at this time that is made in Louisiana is largely used for edible purposes and for feeding stock.

It is believed that additional consumption of blackstrap molasses will be found in the years to come and that there will be no difficulty for the Louisiana sugar cane planters to find a profitable outlet for all blackstrap molasses made from the increased production of sugar cane in this state.

MR. GREEN: Cornstalk Products Company has been pioneering for the past two and one-half years the development of farm waste fibers as raw material for pulp and chemical by-products. It has shipped considerable tonnages of bagasse to its commercial plant at Danville, Illinois, and has there worked out the details of a successful process for converting bagasse into high alpha pulp suitable for rayon and other chemical cellulose industries and into pulp of paper making grades, as well as into chemical by-products analogous to those which it is obtaining from cornstalks.

Sugar cane fiber is the longest of the fibers found in the group of annuals which includes also corn, sorghum, and broomcorn. For industrial use cornstalk and sugar cane bagasse are the most practicable because of their wide occurrence and great volume. While these two fibers have characteristics which caused research chemists to despair of ever processing them on a profitable commercial scale, their unique qualities also offer great advantages. The obstacles to their successful conversion have been definitely overcome by processes which Cornstalk Products Company has developed, and protected by more than 100 domestic and foreign patent cases, and these two raw materials are now on the way to becoming important sources of supply for the cellulose-consuming industries. Cornstalk and bagasse pulps introduce desirable qualities in blends with other fibers, but if necessity should require it, they could be used, in combination, without resort to other paper making materials now in general use.

Transportation costs for assembling fiber and chemicals, and distributing finished products, are among the economic factors which are being analyzed before additional plants are located.

TREATMENT AND CONTROL OF BOILER FEED WATER WHEN USING K. W. S. SODIUM ALUMINATE

By George E. Brown

Read before the Society November 11, 1929.

Internal Treatment for Pressures Under 250 Pounds

Coagulation. The primary reason for using sodium aluminate for internal treatment of boiler feed water is to obtain coagulation, or in other words, floc formation. Since it is necessary to use alkaline chemicals in boiler water and because of its chemical reactions as described later, sodium aluminate is used rather than alum or iron sulphate, both of which are acid. By coagulation is meant the bunching or gathering together of the finely divided suspended particles in the boiler water into larger and coarser particles. This is done by using a chemical which gives a loose fluffy solid, which takes on or absorbs the finer particles floating in the water.

A floc is like a sponge, floating in water which collects fine particles of sand, dirt and precipitates or mud thrown out by heat and chemical reactions.

Coagulation has a marked effect on the boiling of water. In the formation of steam, the bubbles which form in the water are simply the steam surrounded by a film of water. This film is like a skin or the film of a soap bubble. As the bubble reaches the surface of the water, the film breaks and the steam passes on as vapor. This breaking of the film occurs very easily provided there is nothing in the water which will toughen the film or skin which forms the bubble. However, finely divided particles such as calcium carbonate, emulsified oil, etc., gather in this film, toughen it, and consequently when the bubble of steam reaches the surface it does not break so easily, and in many cases becomes so tough that it forms a foam or lather, which is a collection of a large number of these bubbles. The finer and the greater the number of these finely divided particles, the tougher will become the film, which forms the steam bubble. However, by coagulating these fine particles together, thereby reducing the number and greatly increasing the size, the effect on the

toughness or "surface tension" of the steam bubble is such as to cause it to break easier and the boiling to be more smooth.

Coagulation also inhibits scale formation, in that better circulation of the suspended solids is maintained, whereas this is not true where finely divided particles are permitted to remain as such. If a sample of boiler water is taken that does not have coagulation, the suspended solids or mud will settle to the bottom of a bottle and tend to pack or cake. On standing for some time, it is rather difficult to shake the suspended solids back into a true mixture with the water. However, a sample of coagulated boiler water does not pack or cake in the bottom of a bottle, and the suspended solids flow very easily and are readily mixed with the water. In boiler operation, therefore, with coagulation the suspended solids are carried along with the natural circulation of the water and do not tend to pack or bake on the metal in the quiet spots of the boiler; do not adhere to the hot boiler tubes; and are more easily blown out with the blow off water. Also by having an equal distribution of the suspended solids throughout the water, a 10% blowdown will give a 10% removal of mud.

A secondary reason for using sodium aluminate is that it is also a softening agent. Sodium aluminate combines directly with magnesium to remove it from the water. There is no direct reaction between calcium and sodium aluminate except at higher concentrations than are usually encountered in boiling water. There is, however, a direct reaction between sodium aluminate and silica in water. Most alkaline waters have from 0.5 to 4.5 grains of soluble silica which when passing into a boiler water react with calcium and magnesium to form a calcium and magnesium silicate scale which is extremely hard. Also, many waters contain suspended silica, or fine sand, which is extremely hard to filter out. On internal treatment this finely divided silica passes into the boilers and is dissolved by the alkalinites encountered therein. Silica in boiler water is therefore either that naturally encountered in soluble form or that which is in a colloidal or finely divided state.

Sodium aluminate will react directly with the soluble silica to form a sodium aluminum silicate which is the formula for Zeolite. This sodium aluminum silicate then further reacts with either calcium or magnesium to form a calcium or magnesium

aluminum silicate. The aluminum silicates are very flocculent in nature and consequently the silica removal aids in floc formation. A silicate scale once formed is very insoluble and rather difficult to remove. However, if the silica is precipitated before forming scale, the boiler metal can be kept clean.

It must be remembered that softening and excess P. and M. readings can be obtained more economically and just as easily with other alkaline chemicals such as soda ash, caustic soda or phosphates, but they are not accompanied by coagulation as is the case when sodium aluminate is used. *Softening without coagulation is of very little benefit and it is for this reason that we place coagulation ahead of the softening value of K. W. S.*

Soda Ash. There are three important reasons for using soda ash in conjunction with sodium aluminate (1) removal of sulphate hardness, (2) economy, (3) to maintain a soda ash excess. Soda ash reacts directly with sulphate hardness so that if there is not sufficient sodium aluminate to react on all of the sulphate hardness, the soda ash will remove the remainder. One-quarter or one-half pound of K. W. S. per thousand gallons is sufficient to remove slightly less than one grain of sulphate hardness and still maintain good excesses, therefore soda ash must in most cases be used. Since soda ash is a much cheaper chemical than sodium aluminate the use of the combination treatment gives a more economical method of treatment. Also, as majority of the sodium aluminate is used up in obtaining coagulation, there is seldom sufficient alkalinity left to provide for excesses desired in the boiler water. Soda ash, therefore, furnishes excess alkalinity in the boiler water and gives the excess S. reading wanted.

Sampling (Boiler Water). Unless sampling pipes are arranged for at other points, samples of boiling water are usually obtained from the water column. The water column and gauge glass should first be blown down thoroughly to remove any condensate that might have collected. This will insure a sample of boiler water as it naturally exists therein. If the slug method is used, the sample should be taken just prior to adding treatment as such a sample represents the water at its point of lowest excess treatment and gives us the worst condition both as to scale forming properties and concentration of solids.

In drawing a sample of water immediately after blowing down the water column, considerable error can result due to flashing of some of the hot water into steam. This steam is pure water which passes off leaving in the sample a concentration of total solids which of course would include the chemical excesses. The effect is the same as though a sample of water were boiled and the steam allowed to pass off. The amount of water which may be lost due to flashing will range between 10 and 20 per cent. depending upon the operating pressure of the boiler. The error due to flash may be considerably reduced if, after blowing down the water column thoroughly, a wait of 15 to 20 minutes is made before the sample is taken. As the pipe leading from the water column is generally exposed to the air, no water in this pipe will in the 15 to 20 minutes cool down sufficiently to prevent little, if any, flash. Some plants are equipped with special cooling devices for cooling a sample of water before exposing it to atmospheric pressure.

Control of Treatment (Internal)

COAGULATION. The amount of sodium aluminate used is first calculated according to total hardness of the water and subsequently by observation of the boiler water. Floc formation should always be maintained. The aluminate dosage is not varied from the initial dosage recommended as long as the same amount of water is being evaporated.

In some cases, due to heavy suspended solids, or due to very soft water make up, floc formation is difficult to see. Hwever, if the water filters easily and clear, floc formation is present. Complete lack of coagulation, visible or invisible, makes the filtering of suspended solids difficult.

SODA ASH. Soda ash treatment is varied according to H. P. and M. readings of the boiler water. Soda ash treatment should be sufficient to give an S. reading of between 12.0 and 20.0 grains per gallon in the boiler water. Except in rare cases, there will be enough conversion of soda ash to caustic soda due to high temperature in the boiler to give correct O. and N. readings. The N. reading should always be equal to or greater than the hardness to prevent calcium sulphate scale. The O. reading should be positive. If the boiler water shows a deficiency of O. readings, it will be necessary to either increase the K. W. S., or if this is not

practical, to resort to the use of caustic soda in place of soda ash.

CHLORIDE RATIO. In regulating excess treatment, the chloride ratio should not be disregarded. A low chloride ratio means a high per cent of blow down and consequently a higher percentage of treatment is lost in the blow off water. The lower the chloride ratio, the more chemicals must be added to the boiler to keep an S. reading of 12.0. With very high chloride ratios it is much easier to carry a higher S. reading. If the M. and chloride ratio of a boiler water are both high, an increase in blow down will decrease both of them in proportion. If the chloride ratio was 25.0 and the M. was 25.0, a decrease in the chloride ratio of the boiler water would, without change of treatment, decrease the M. reading correspondingly.

The following table shows the relation of the chloride ratio to changes of treatment:

M. high	Cl. R. high	Increase Blowdown Do not change Treatment.
M. low	Cl. R. high	Increase Blowdown Raise treatment.
M. low	Cl. R. low	Increase treatment Decrease blowdown if possible.

REPORTS AND RECORDS. On internal treatment it is especially advantageous to keep a record of tests at a plant for your own reference. Since the tests recorded for M. or Cl. are usually above 10.0 or rather high, it is sometimes difficult to note a gradual change in the tests. A gradual change in the chloride ratio of a boiler water or a gradual change in the raw water might not be noticed unless the tests are columnized in your record book so that you can visualize the history of the plant. Any gradual changes that do take place in the alkalinity, chloride ratio, dissolved solids, or in the raw water, can immediately be noted and corrected. The K. W. S. method of internal treatment is capable of producing wonderful results if handled properly.

Excess Treatment (External)

GENERAL. Generally speaking the ideal water from softening plant equipment is one with as low hardness as can be ob-

tained, with as low a soda alkalinity (S.) as it is possible to safely carry. Such a safety factor, however, is rather difficult to determine, as it will vary with different types of equipment and water. The soda alkalinity (S.) must, of course, be sufficient to insure the reduction of incrusting salts (H.) to the lowest possible degree. This is especially important in respect to incrusting sulphates. Therefore, it is far safer to carry too much excess soda alkalinity rather than not enough.

This is also true in respect to the problem of foaming and carryover, as it is always desirable to replace potential suspended matter which exists in treated water as hardness, with soluble salts such as soda alkalinity. Such an exchange is conducive to better boiler operation, for the reason that the ratio of suspended solids to total solids is thus more favorably adjusted in the boiler water.

Excess Treatment (S.). It is difficult to set a fixed rule as to "O." (hydrate excess) and "N." (sodium carbonate excess) values that should be carried, as these must be adjusted to meet certain plant or water conditions. However, the "S." (total soda alkalinity) value should seldom be carried below 2.5 grains per gallon and it is neccessary under certain adverse conditions that the "S." be increased to 5.0 grains per gallon. The temperature of the water to be treated will generally influence the amount of excess "S." necessary, and the lower temperatures will require higher excess treatment to obtain a given hardness. Normally with an "S." of 2.5 a good balance would give an "O." of 0.5 and "N." of 2.0.

Incomplete Reaction. It is also important to ascertain whether at the operating temperature of the water being treated, sufficient sodium aluminate is being used, as both the hardness and magnesium may be materially reduced by the increase of sodium aluminate to the proper dosage. Such an increase in sodium aluminate will normally not increase cost of chemical treatment, as with complete reactions soft water can be obtained with sufficiently less lime and soda as to offset the cost of the additional sodium aluminate. However, if sufficient sodium aluminate is already being used, there is normally no advantage to be gained by increasing the dosage above the recommended amount.

Mechanical Softening Value of Floc. The fact should not be overlooked that the floc produced by sodium aluminate is of itself of value in obtaining soft water. Its consistency and irregular shape will absorb the very finely divided precipitates that might otherwise redissolve back into the water. This action might take place after the water has passed the filter beds. Thus in the intermittent type of softening plant, we find that unwashed tanks almost invariably produce a softer water than washed tanks, and the floc produced by sodium aluminate, which is already in the sludge, play no small part in this phenomenon, as it still has unused absorbing power.

Summary of Benefits of Sodium Aluminate

There is no question but that sodium aluminate has a very definite place in external water softening for boiler feed. The fact that clear water is being obtained with lesser amounts of sodium aluminate than those recommended, should not be interpreted to mean that sufficient sodium aluminate is being used. A clear water can sometimes be obtained without the use of a coagulate. In a few cases should less material than that recommended be used if full benefit is to be obtained in boiler opreation.

Sodium aluminate is extremely effective in reducing the magnesium content of water; in removing silica; in producing a softer water with less excess treatment, or permitting maintenance of sufficient excess to produce soft water without the consequent evils which otherwise accompany such procedure. When sodium aluminate is used in softening plant operations, a more fixed water is obtained which means that such water will withstand various heat changes which cause pipe line and pump deposits. Also finely divided or colloidal matter which otherwise passes through filter beds, and sometimes converts back to its original state, is definitely removed from the water. Filter operation can be definitely improved as the floc produced by sodium aluminate does not penetrate the filter medium as other coagulants do, therefore it backwashes easily, and does not carry the filter medium with it. The removal of finely divided suspended matter and calcium carbonate will inhibit growth of filter sand particles.

Sodium aluminate will eliminate sodium sulphate formed by acid coagulants, such as iron and alum.

Also because of the fact that sodium aluminate is more positive in its reaction than lime and soda ash, especially in the lower range of hardness, faster reactions can be obtained and plant capacity thus materially increased.

Carryover and Concentration Control

Definition of Carryover. There are several different names given to the phenomena of carryover of water and solids with steam. Violent frothing or carryover of water is usually called "foaming" and carryover of fine particles of water or mist with the steam, either due to chemical treatment or mechanical conditions, is called ordinarily "priming". For convenience we are classing both of these under the term "carryover".

Cause of Carryover. The main factors influencing carryover of boiler water are lack of coagulation, too high concentration of solids, oil and mechanical influences. The latter includes construction of boilers, character of steam demand, construction of steam separators, height of the water level in the boilers, etc. Refer to instruction sheets on internal treatment for lack of coagulation and for effect of oil. This instruction sheet will deal mainly with the concentration of solids in boiler water and their effect on steaming, carryover and treatment.

In the evaporation of water there are two types of solids left behind—suspended or insoluble solids and dissolved or soluble solids. The first is more commonly known as mud and can be removed by filtering through paper. The dissolved solids pass through filter paper and are not visible in the water. As these solids reach a certain concentration, foaming or uneven boiling of the water results so that steam does not pass off from the surface of the water easily, but carries with it a certain amount of water. It is therefore necessary in boiler operation to control the concentration of solids below a point where this carryover will result.

Violent foaming or carryover is easily observed at a plant by the appearance of excessive amounts of water in steam traps, at engines, etc. Usually a foaming boiler can be noted by observing the water in the water glass. However, if the amount of

carryover is small, there may be no visible signs on casual observance.

Gradual carryover clogs up superheaters, errodes or cuts turbine blades, impairs lubrication and also causes fuel loss or contamination of processes due to dirty steam. Gradual carryover to a certain extent can be noted by calorimeter readings and tests of condensate. However, the carryover is sometimes so small that, while superheaters may be clogged, calorimeter readings are not affected.

Chloride Ratio. The chlorides of the boiler water divided by the chlorides of the make-up water is called the chloride ratio. The chlorides are not affected by ordinary treatment, so we can assume that this chloride ratio is the best indication of the concentration of the boiler water. A chloride ratio of 10.0 means that there is ten times as much chloride in the boiler water as there is in the make-up water. Under normal operation, therefore, other materials entering with the feed water have also concentrated 10.0 times. Some of the materials entering with the make-up or feed water may change in form, but the total solids will remain the same as well as other solids which we will explain later.

The chloride ratio is the reciprocal of the percentage of blow down. To ascertain the percentage of blow down, divide the chloride ratio into 100. For instance, a chloride ratio of 10.0 indicates 10% blow down or, if the chloride ratio is 20.0, 5% blow down. This is assuming of course, that there is no appreciable amount of carryover.

Internal Treatment. The higher the suspended solids content of the boiler water, the lower the quantity of total dissolved solids that can be maintained without carryover. A water that contains very little hardness, such as natural soft waters or waters that have been treated with lime and soda ash, can have a much higher dissolved solid content in the boiler water than a make-up water that is very hard. In our concentration bulletin is shown a curve which gives an approximate ratio of the suspended solids to the total dissolved solids. This curve shows that the amount of dissolved solids that can be carried in boiler water drops very rapidly with small increases in suspended matter.

Control of Concentration (External). The best method for controlling carryover in plants with external treatment, is to determine the total solids present either by use of the hydrometer or other methods. In addition to this test, the H. P. M and chloride readings should be determined. The chloride ratio is determined the same as in internal treatment. In addition to this the alkalinity ratio should also be determined. This is done by dividing the total alkalinity of the boiler water by the S. reading of the treated water. If the chlorides of the treated water or raw water are very carefully determined, the chloride and alkalinity ratios should agree rather closely.

Suspended Solids (External). With water from the softener of an average of 1.0 grains hardness, the amount of suspended solids in the boiler water should be very low. If there is considerable suspended solids in the boiler water, immediately investigate for carryover of suspended solids from the softener, raw water contamination, or loosening up of feed line and heater deposits and old scale. Also investigate the possibilities of oil contamination. The presence of a small amount of suspended solids in boiler water that has been externally treated greatly decreases the amount of total concentration than can be carried.

Allowable Limits of Concentration (External). Under ordinary conditions and with the hardness of the softened water under 2.0 grains, a safe limit of concentration runs from three to four hundred grains per gallon at 150 pounds pressure, down to 100 grains at 400 pounds pressure. However, as in internal treatment, the amount of concentration depends upon mechanical operation, possible contamination, and type of steam load. The maximum limit must be determined after several months operation and observation of results. The tendency of plants using external treatment is to run at too high concentration.

Solids in Steam. As stated before, the higher the moisture content of the steam, the higher the amount of solids carried over with the steam. Under normal operation we can consider as a very good average a 1% moisture content in steam. Therefore, for each million pounds of steam evaporated there will be 10,000 pounds of water or approximately 1200 gallons. If the boiler water contains 200 grains per gallon of solids, then the 1200 gallons of water carried over will contain 240,000 grains of

solids or approximately 34 pounds. Should the moisture content increase to 2%, the amount of solids carried over would be 68 pounds per million pounds of water evaporated. These solids being carried over either plug up the superheaters or pass on out into turbines, engines, or with the process steam.

In most boilers using softening plant water, 200 grains or more of dissolved solids are carried and the moisture content is usually above 1.0% Consequently it can be figured that at least 34 pounds of solids go over with every million pounds of steam. This accounts for the icicles or white deposits noted at steam leaks, at valves, pipe joints, etc. It is therefore impossible to entirely eliminate small amounts of white incrusting solids at valves, etc., although the amount can be greatly reduced by careful control.

Solids which are being carried off with wet steam may be either suspended or dissolved solids as long as there is any moisture present. However, when steam passes into superheaters, the moisture content is converted into dry steam and all of the soluble materials are then in a solid or dry form. These small particles are like very fine sand and, being carried along with the rapid rush of steam, tend to cut or errode valves, turbines or any other projections in the travel of the steam. As soon as the steam has cooled down enough to again have some moisture content, the soluble particles re-dissolve and will either pass back with the condensate or are drained off at traps, etc.

While the chemistry of the treatment of boiler water requires much study and is rather intricate, the control of feed and boiler water by chemical test is rather simple. By making and reporting tests regularly to the Chicago office and with co-operation on both sides, good results are sure to be forthcoming.

DISCUSSION

Mr. Porter: As mentioned by Mr. Brown, to discuss sodium aluminate or to compare it with other coagulants goes so much into chemistry that I fear it would not appeal to engineers. One characteristic of sodium aluminate as a coagulant, is the rapidity with which it causes material in suspension to settle out. This property is of considerable value in cases where settling capacity of reservoirs is being overtaxed under existing conditions.

The cost of sodium aluminate, when used simply as a coagulant in water treatment, is considerably more than any other commercial coagulant and consequently it has not found ready acceptance by most cities.

It has certain marked advantages, however, in treating certain types of water, where its increased cost is offset by these advantages.

The character of the Mississippi River water at New Orleans, however, is such that we have not been able to see any advantages in its use as a coagulant, as against our present treatment with lime and sulphate of iron, which would compensate for its increased cost.

MR. WARNER: I would like to state that sodium aluminate has been used by the city of Denver for the past one and one-half years, and is standard treatment there. It is being tried out in one other large city, but has not been adopted there as yet as standard treatment.

I think the reason why it has not shown up more favorably in New Orleans, in comparative cost, is because you are getting a very good water here at a very low cost.

MR. HOOTS: Several samples of boiler water shown in the motion picture show sodium carbonate and tri-sodium phosphate used along with sodium aluminate for chemical treatment. Since sodium carbonate and phosphate are used in some instances, what especial advantages would the additional use of sodium aluminate have to offer? I might add that this question is asked particularly to learn what advantages might be possible with the use of sodium aluminate for internal boiler water treatment under conditions such as we have at the Market Street plant of the New Orleans Public Service, where boiled feed water of exceptionally high quality is used.

I should like to know more about the action of sodium aluminate on silica. In our conditions of operations we have introduced into the boiler feed water very small quantities of silica, this being due to slight surface condenser leakage where Mississippi River water is used for cooling purposes. The suspended matter in this river water contains a rather large amount of silica, and with any condenser leakage existing, this silica along with other dissolved and suspended matter is mixed with the

condensate in the surface condensers. Under certain conditions of boiler operation, we have encountered carryover of salts and solid matter with the steam which deposited out in the first pass of three pass interdeck superheaters. On examination of such deposits, they were found to be made up largely of silica, which is of course insoluble in water, making cleaning of the superheater difficult. I would like to know whether any action of sodium aluminate would tend to eliminate troubles such as have been explained and if so, in what manner this would be accomplished?

Mr. Brown made a statement concerning good practice in regard to percentage of moisture carryover with the steam leaving the drum of a boiler which I would appreciate having explained a little further. As I understand Mr. Brown, it would be considered good practice to operate with a moisture carryover of not greater than 1.0%. This to me would seem rather high, particularly for the modern power plant, and I believe that a carryover of as much as 1.0% will introduce much trouble. As an example let us take the boiler plant of the Market Street plant where an average steam evaporation of approximately 12,000,000 pounds per day is found. Let us also assume that the boiler water concentration of boilers producing this steam is 1000 parts per million, which is near operating conditions. With a moisture carryover of 1% in the steam leaving the boiler drums, there will be deposited out some place in the system, i. e., the superheaters, valves, pipe lines or turbines, a total of approximately 120 lbs. of solid matter per day. As will be immediately seen this is relatively speaking a very large quantity which would very likely introduce serious consequences. It is my opinion that 1% is far too high an allowable limit for carryover at least for the modern power plant. For this reason I would appreciate Mr. Brown's further comments in regard to this matter.

Mr. Brown: The use of sodium aluminate in your plant for the prevention of silicate deposits in superheater tubes would be very beneficial. The silica in suspension in the boiler water can be coagulated by a combination treatment of sodium aluminate and magnesium sulphate. The chemical reaction between the two chemicals will produce a floc of sufficient size and structure to coagulate all of the suspended matter, including the

silica. This floc and what is absorbed in the floc will not be carried over with the steam. The motion pictures showed how the floc was completely suspended throughout the boiler. Therefore a certain amount of blowdown will remove a certain proportionate amount of the suspended solids, and dissolved solids.

Silica, if in solution, usually as sodium silicate, will react with sodium aluminate to form sodium aluminum silicate, which is the formula for zeolite. In every case where careful analysis have been made we have found a marked reduction in the silica content with sodium aluminate treatment.

In most every plant where I have used the sodium aluminate internal treatment of boiler feed water, a very noticeable reduction of the amount of moisture in the steam has been definitely observed. This has been accomplished by the sodium aluminate floc, and careful control of boiler water concentrations.

One per cent of moisture in your case would seem very high. If you are experiencing any turbine trouble, cutting of turbine blades, clogging of superheater tubes, or an appreciable reduction of the superheat temperature, then you are having carryover. A one per cent moisture content of the steam at your pressures will cause a 15.8 degree Fahr. drop in the theoretical superheat temperature.

There is more than one method of determining the moisture content of steam. You can make careful calorimeter tests according to the A. S. M. E. and U. S. P. H. A. standard methods; by careful determination of total solids in a sample of condensed steam, before the latter enters the superheater; and careful determinations of the superheat temperature at particular ratings and CO_2 content.

Coagulation with the combination treatment of sodium aluminate and magnesium sulphate should show a marked reduction of suspended silica due to efficient coagulation and a reduction of soluble silica by direct chemical reaction. Careful moisture determination will show whether or not the sodium aluminate floc has a noticeable effect on the amount of carryover, and more even steam bubble formation. The motion picture showed that such might be possible.

DISCUSSION ON "CEMENT AND CONCRETE"*

Submitted by

GEORGE A. SMITH.

At the March meeting of the Louisiana Engineering Society Prof. D. A. Abrams used a very interesting paper on cement and concrete which later appeared in the August Proceedings. The published paper just recently came to my attention and though somewhat late, I wish to take this opportunity of commenting on that part of the paper relating to the effects of admixtures in concrete as summarized in the following conclusions:

1. "The workability of the concrete as measured by the flow tests was not improved by any of the fourteen powdered admixtures tested."

2. "All the commercial admixtures tested must be classed as injurious adulterants, due to excess water required to main workability."

3. "After the colloidal clays, diatomaceous earth was the most injurious to strength and workability."

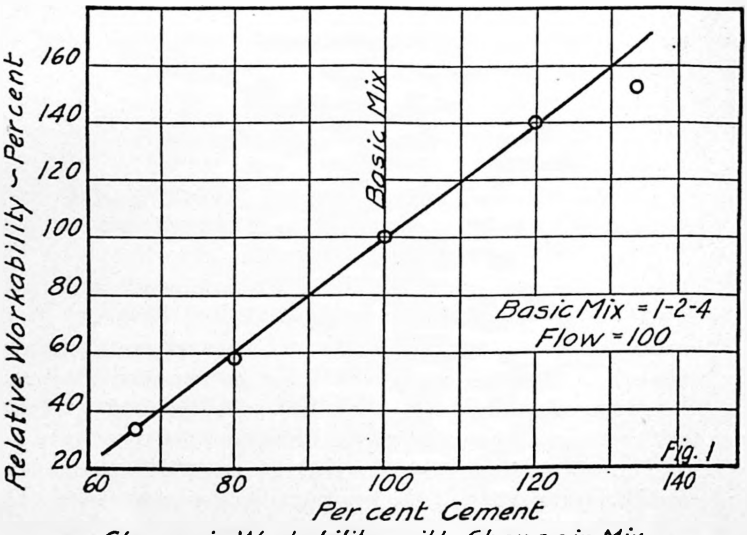
In arriving at the conclusion that admixtures are injurious to workability, Prof. Abrams has chosen to consider the flow test a measure of workability. This test which is similar in nature to the slump test is a test of the wetness of a mix or its relative fluidity. That these tests have their limitations when considering other properties of freshly mixed concrete is recognized by most of the foremost engineers and investigators. Messrs. Pearson and Hitchcock recognized that there were conditions existing in different mixes having the same flow which were not indicated by either the slump or the flow tests.† Any engineer or contractor will recognize that a 1—1½—3 mix having a five-inch slump is more workable than a 1—2—4 or a 1—2½—5 mix having the same slump.

For some time I have been interested in the question of the relative workability of concrete mixtures. In my studies of this

* See Proceedings Louisiana Engineering Society, August, 1929, Vol. XV, No. 4.

† A Penetration Test for the Workability of Concrete Mixtures With Particular Reference to the Effects of Certain Powdered Admixtures. Proceedings A. S. T. M., 1923.

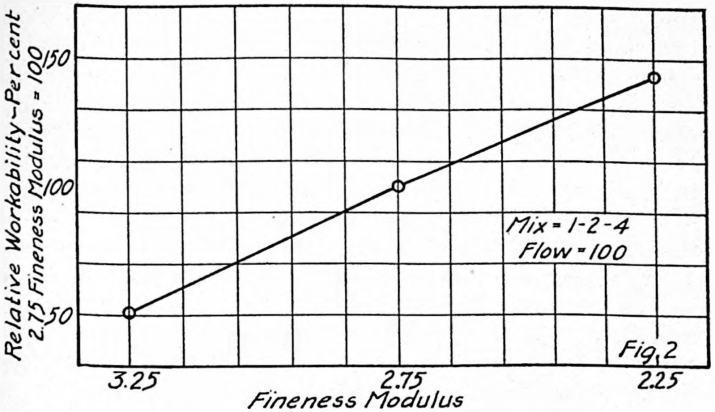
property of concrete I have used an improved penetration apparatus which has consistently given results which parallel field and laboratory interpretations of relative workability. Figures 1 to 3 have been prepared from data obtained with this apparatus. The results shown in Figure 1 were obtained with different concrete mixtures in which the cement content varied from 67 to 133 per cent by weight of the quantity used in a basic



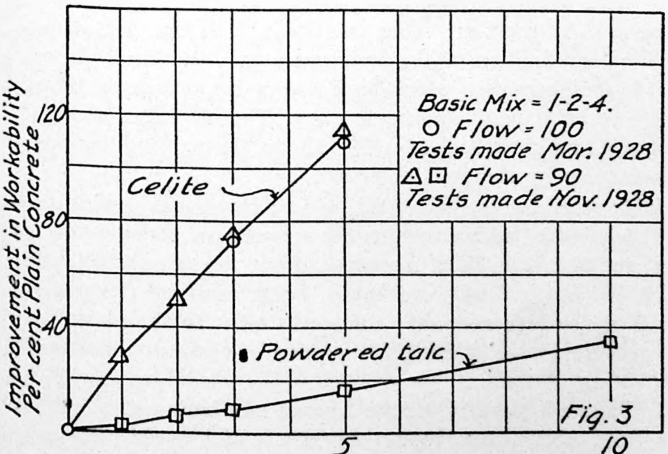
Change in Workability with Change in Mix

1—2—4 by dry rodded volume mix. The flow of each mix was measured on the flow table using fifteen 1/8-inch drops. The flow is expressed as the percentage increase in the diameter of the specimen. It will be noted that although the concretes were each gaged to give the same flow, there were marked differences in the workability and that the improvement in workability varied almost as a straight line function of the quantity of cement used.

Figure 2 is designed somewhat similarly to Figure 1 and shows how the workability varied when the fineness modulus of the sand was varied. The results are consistant with field obser-



Change in Workability with Change in Fineness of Sand



Change in Workability with Increase of Admixture

vation and indicate that the workability increased as the fineness of the sand increased although all concretes were gaged to the same consistency or flow.

Figure 3 shows how the workability was improved when different amounts of two admixtures were used. Although two flows were used in the two groups of tests indicated, it would be expected that if the improved penetration apparatus functions to indicate relative improvement in workability, the improvement in workability due to the admixture would be the same when compared with that of plain mixes at the same flow as was done in this case. It will be noted that within the range considered the workability improved in proportion to the quantity of the admixture used. An interesting comparison may be made by noting the improvement due to 33 per cent added cement in Figure 1 and that due to three pounds of Celite per sack of cement (3.2% by weight of cement) in Figure 3. In both instances the increase in workability was approximately 75 per cent. In other words, Celite was about ten times as effective in promoting workability as was cement.

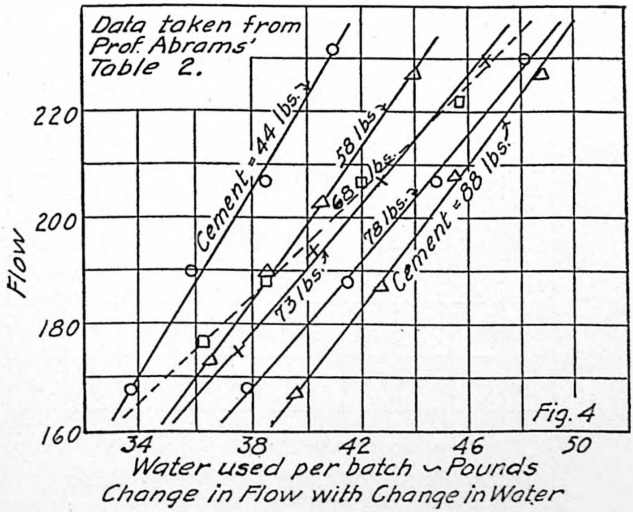
Summarizing the remarks relative to Figures 1 to 3, it appears that, although concretes may be gaged to give the same slump or flow, there are other factors such as the mix, the character and graduation of the aggregates and the kind and quantity of admixture used which have a very important part to play in the workability of a concrete mix. The effects of changes in character and quantities of materials on the workability are not determinable by the flow-table test.

With reference to the second part of my remarks which deals with the effect of admixtures on the strength of concrete, I would point out that since Prof. Abrams did not present all the data on which his conclusions were based when reading the paper in March, it has been necessary for me to refer to the paper which was presented later at the 1929 meeting of the American Society for Testing Materials.

In Figure 3, page 151 of the August number of these proceedings, Prof. Abrams has shown that the use of 1% of Diatomaceous Earth (Celite was used in the tests) resulted in a reduction of 4.4% in strength when tested at one day. The figure also shows that the effect of Celite on strength decreased until at 28 days

the resulting strength was greater than that of the plain concrete. In these tests the proportions were 1—1.7—3. The cement was replaced by the amounts of Celite used, which were 1.5, 2.9 and 7.4 per cent by weight of the cement in the final mix. Celite is not recommended to replace cement nor is it recommended to be used in such large proportions as were used in some of Prof. Abrams' tests.

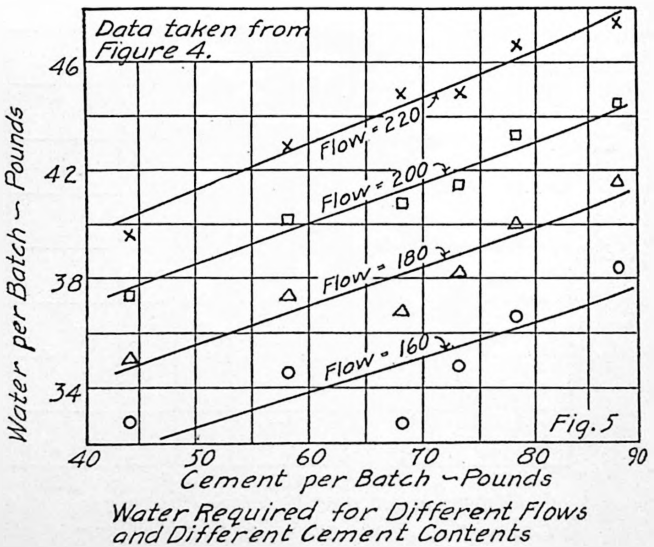
Prof. Abrams' conclusions to the effect that Celite is injurious to the strength were based on the strengths of the plain and Celite concretes supposedly gaged to the same consistency or flow



when the cement content was 68 pounds for the size of batch used.

In Figure 4 I have plotted the data from Prof. Abrams' tests to show how, with the various plain mixes considered, the flow varied with the quantity of water used. Figure 5 has been prepared to show how the water varied for a given flow as the cement content was changed. Both of these figures indicate that the basic mix, 1—1.7—3 or the 68 pounds of cement per batch was entirely out of line with the other mixes at flows of 160 and

180. It should be pointed out that Prof. Abrams' 180 flow is the ratio of the final to the initial diameter of the specimen expressed in per cent and would correspond to an 80 flow if expressed as percentage increase in diameter. It is quite illogical that a batch of material containing 68 lbs. of cement should require less water than one containing 58 lbs. to give the same flow as is indicated in both Figures 4 and 5 in the region of 180 flow. The deduction, then, is that had the correct quantity of water, as indicated by the trends of all the data, been used to give the same



Water Required for Different Flows and Different Cement Contents

flow (180) for all mixes that quantity should have been at least 38.5 pounds instead of 36.2 pounds for the basic plain mix.

Since Celite was used to replace cement in the mixes considered, direct comparisons cannot be made as to strength when Celite is added to the mix. It has, therefore, been necessary to correct the strength obtained for the Celite concretes to put them on a basis comparable with the plain mix, and to be consistent with the recommended practice of adding the admixture instead of replacing cement. In the following table are given

the probable strengths of the various concretes as would be indicated by Prof. Abrams' data had the correct quantity of water been used. For condition No. 1 the strengths were taken from Prof. Abrams' W/C ratio curves for the several ages when the W/C ratio was .85 or 38.5 pounds of water per 68 pounds of cement. Condition No. 2 gives the average strength for plain concrete determined from his table of results for all mixes in which the W/C ratio was between .80 and .90. Conditions 3, 4 and 5 give the corrected Celite strength obtained by using Prof. Abrams' correction factors.

TABLE SHOWING PROBABLE CONCRETE STRENGTH

Condition No.*	Celite %	W/C	COMPRESSIVE STRENGTH OF CONCRETE 1 da.	2 da.	3 da.	7 da.	28 da.	Avg.
1	0	.85	1950	3050	3500	4250	4950	3540
2	0	.84	1890	3030	3500	4280	4915	3520
3	1.5	.86	2026	3270	3583	4417	5371	3733
4	2.9	.90	1879	3076	3312	4369	5318	3591
5	7.4	1.00	1617	2715	3350	3919	5082	3337

From the above table it will be seen that when Celite is used in amounts not to exceed that recommended, the resulting strength may be expected to at least equal that of the plain mixture.

In conclusion I would point out that when concrete mixtures having variable compositions are considered and when the type and character of the materials used are also variable the flow-table test is no criterion for indicating relative workability. Consequently the flow-table data of Prof. Abrams do not warrant any conclusion that admixtures are injurious to workability.

As indicated by a fair and logical interpretation of the data presented by Prof. Abrams, the resulting strength of Celite concrete gaged to the same consistency as the plain concrete may be expected to at least be equal to that of the plain concrete.

On these bases therefore it cannot justly be said that Celite is injurious to the strength of concrete when used conservatively and as recommended by the manufacturer.

* 68 pounds of cement used per batch.

REPORT OF SPECIAL COMMITTEE ON TRAFFIC CONTROL

Board of Direction,
Louisiana Engineering Society,
New Orleans, La.

Gentlemen:—

Your committee appointed to study and make report on the Street Traffic Control Problem of New Orleans as embodied in the McClintock-Bartholomew report to the Commission Council through the City Planning and Zoning Commission has devoted considerable time to this work and desires to report as follows:

We believe that this report is especially comprehensive and specific on the conditions and requirements of New Orleans.

We further feel that, as far as our personal knowledge and experience enables us to judge, the facts presented, the conclusions drawn and the recommendations made are true and logical and should be accepted as a basis for the necessary action by the Honorable Commission Council for the improvement of the traffic situation in New Orleans and for the better protection of both the motorist and pedestrian.

We further believe that a traffic ordinance essentially in conformity with the one suggested in the above-mentioned report should be drawn and adopted by the Commission Council.

Your Committee feels that it should especially approve and concur in those recommendations having to do with the strict enforcement of existing and future traffic regulations, both by the police department and the courts, and especially recommends consideration of the suggested reorganization of both the police and court departments responsible for such enforcement.

Your committee also strongly approves that part of the report recommending the creation of an engineering division to advise and supervise the more technical phases of traffic control.

Your committee suggests the propriety of the Louisiana Engineering Society offering such assistance as its members may be able to give in furthering this movement for better traffic conditions in New Orleans.

Respectfully submitted,

J. L. PORTER, *Chairman.*
W. T. HOGG,
JAMES M. TODD.

November 8, 1929.

MINUTES OF MEETINGS AND BUSINESS OF THE SOCIETY

Minutes of the Board of Direction, October 14, 1929.

The meeting was called to order by President Fox, and the following members were present: Messrs. Moses, Muench, Frost, Porter, O'Neill and Muth.

Minutes of the previous meeting were read and approved, and bills on hand were ordered paid.

Letter from Col. A. M. Shaw was brought to the attention of the Board and on motion, duly seconded, letter was referred to the original committee, which acted on the subject in question.

Mr. James M. Todd, Chairman of the Special Committee appointed to investigate the possibilities of a new location for the library and meeting room, submitted verbal report. On motion, duly seconded, it was voted to have the Secretary make arrangements to have the present library room available to members until 9:00 P. M. for a period of two months.

The report of the Secretary in regard to the 10th Annual Convention of the National Council of State Boards of Engineering Examiners was brought before the Board and on motion, duly seconded, was ordered printed in the Proceedings for the information of the members of the Society.

President Fox brought before the Board the request of Prof. Derickson that the special committee appointed to draft a registration law confer with the Louisiana State Board of Engineering Examiners and on motion, duly seconded, it was voted to have this special committee get in touch with the President of the State Board at the proper time.

Col. E. S. Bres requested the Board to give consideration to the awarding of two scholarships in engineering colleges and on motion, duly seconded, it was voted to appoint a committee of three members to investigate and submit report with recommendations. The Secretary was instructed to write to the committee and secure necessary information. The committee appointed is as follows: Mr. Samuel Young, Chairman; Prof. Donald Derickson, Prof. W. B. Gregory.

There being no further business, the meeting adjourned.

F. A. MUTH, Secretary.

Minutes of the Society, October 14, 1929.

The meeting was called to order about 8.10 P. M. in the Gold Room of the Roosevelt Hotel, with President Fox in the chair, F. A. Muth, Secretary, and 111 members and guests present. On motion, duly seconded, the reading of the minutes of the previous meeting was dispensed with.

Reports from committees were received.

President Fox made the announcement that one of our members, Mr. John F. Coleman, had recently been nominated for President of the American Society of Civil Engineers.

The meeting was then turned over to Mr. George Hammett, Chairman, New Orleans Section, A. S. M. E. Mr. Hammett made an interesting address, then introduced Mr. David W. Pipes, Jr., the speaker of the evening, who read a most interesting paper on "The Sugar Cane Industry in Louisiana." This was followed by some instructive discussions.

A rising vote of thanks was then tendered the speaker.

The meeting was then turned over to President Fox, and the meeting adjourned.

F. A. MUTH, Secretary.

Minutes of the Board of Direction, November 11, 1929.

The meeting was called to order by Mr. James M. Todd, Vice-President, and the following members were present:

Messrs. Moses, Porter, O'Neill and Muth. The President had notified the Board that he would be unavoidably absent and begged to be excused for this meeting.

The minutes of the previous meeting were read and approved, and bills on hand were ordered paid.

The resignation of Mr. L. R. Jackson was accepted with regret.

Progress report was submitted informally by a member of the Committee on Registration of Professional Engineers. The report indicated that the committee had been making a study of the registration laws of all states now having laws for registration of professional engineers, etc., and that one of the members had prepared a complete digest of all of these laws for the committee to study.

The committee has also drafted a skeleton outline of the proposed bill, indicating most of the important points which should be included in a new bill, and a subcommittee is working on the wording of the proposed bill.

It was made clear that the result of the deliberations of the committee were not those alone of its members for a short time but that some of the members had been giving careful consideration to this subject for several years, and it is proposed to prepare a bill to be submitted to the Board and to the Society for its decision as to whether or not it desires registration of professional engineers.

Owing to the unnecessary surplus which has accumulated in the following funds, the Secretary was instructed to make the proper entry, transferring to the General Fund the following amounts:

From the Proceedings Reserve Fund to the General Reserve Fund $700.00.

From the Library Fund to the General Reserve Fund $200.00.

Letter from the headquarters of the National Committee for the Major Pierre Charles L'Enfant Memorial was read and the Secretary was instructed as to reply to be made.

There being no further business, the meeting adjourned.

F. A. MUTH, Secretary.

Minutes of the Society, November 11, 1929.

The meeting was called to order about 8:10 P. M., Mr. James M. Todd, Vice-President, in the chair, F. A. Muth, Secretary, and 58 members and guests present.

The minutes of the previous meeting were read and approved.

Reports of the committees were received and the matter of the Annual Smoker was brought up. On motion, duly seconded, it was voted to hold the Annual Smoker and Meeting on the third Saturday, or January 18, 1930.

Announcement was made that one of our members, Mr. A. T. Dusenbury, had been honored by being nominated without opposition as the official candidate for director of the 15th District of the A. S. C. E. This nomination is tantamount to election. The 15th District comprises the states of Louisiana, Texas and Oklahoma.

The technical exercises for the evening consisted of a paper on "Sodium Aluminate in Water Purification," by Mr. George E. Brown. The paper was followed by interesting motion pictures and some discussion.

A rising vote of thanks was then tendered the speaker.

The meeting adjourned to the usual collation.

F. A. MUTH, Secretary.