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JAMES M. ROBERT, Editor, Tulane University,
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PRESIDENT FRED. N. BILLINGSLEY

PROCEEDINGS
OF THE
LOUISIANA ENGINEERING SOCIETY

VOL. XVIII. FEBRUARY, 1932 NO. 1

CONTENTS

EDITORIAL NOTES AND COMMENT

Our New President. Frederic N. Billingsley, Consulting Engineer, head of the Billingsley Engineering Company, New Orleans, was born in Bastrop, Louisiana, in 1887.

During the school-day period of his life he lived successively in Ohio and New York States. In 1910 he graduated from the Rensselaer Polytechnic Institute with the degree of Civil Engineer. An additional year was spent at the Institute in post graduate work in electricity. While a student he was elected to membership in Tau Beta Pi, an honorary society.

For nearly three years thereafter he was employed by the General Electric Company in the Testing, Research, and Consulting Engineering Departments at Schenectady, N. Y. and Pittsfield, Mass. A portion of this time was spent as an assistant in the private laboratory of Charles Proteus Steinmetz.

In 1914 he joined his brother, the late James W. Billingsley, in his engineering practice in New Orleans, later becoming associated with him under the firm name of J. W. Billingsley, Consulting Engineers. This association lasted until the past year when the Billingsley Engineering Company was organized. During this period Mr. Billingsley was engaged in general engineering work consisting of the design and supervision of reclamation projects, sewerage and water works systems, power plants, and industrial plants. He was identified with such local industrial plant construction activities as that of the Louisiana Oxygen Company, Lukens Steel Company, Flintkote Company and others. He has been extensively employed by local banks and financial interests for investigations and reports on various projects in connection with proposed financing and has represented them widely in the supervision of building work financed under construction loans. A considerable portion of his time has been spent in public utility engineering, and he is presently retained as Consulting Engineer by the Department of Public Utilities, City of New Orleans.

Mr. Billingsley was recently retained as expert witness and engineering advisor by the Special Counsel for the Louisiana State Highway Department in connection with the hearing before the Federal Appraisers in the Bonnet Carre Spillway Highway Bridge controversy.

During the war Mr. Billingsley served in France and Germany as an officer in the 301st Engineers.

In addition to the Louisiana Engineering Society, Mr. Billingsley is a member of the American Society of Civil Engineers and the American Society of Municipal Engineers.

Other Officers for 1932. Mr. J. H. O'Neill was elected vice-president for 1932 and Mr. Charles Wiggin, Jr., was elected to the Board of Direction to serve three years. Mr. F. A. Muth and Mr. Walter B. Moses were re-elected as secretary and treasurer, respectively.

Professor A. L. Dunlap and Colonel E. S. Bres are the other elective members of the Board who hold over for one and

two years, respectively. Mr. Frank G. Frost, as retiring President, automatically becomes a member of the Board, taking thereon the place of the preceding retiring President, Mr. James M. Todd.

A complete list of the standing committees is given on the title page of the *Proceedings.*

The Smoker. As usual the Annual Smoker was an enjoyable affair. Good entertainment, good spirits, good cheer, and extremely thick smoke were the order of the evening.

Jimmie Todd presided as the able toastmaster and he kept everything moving at a lively rate. The same old committee in charge—Walter Moses and Ole Olsen—made an extremely good job of the whole affair, in spite of Ole's untimely illness, which kept him away. He was roundly missed, too, because a smoker without the presence of Ole is like "pie without cheese or a kiss without a squeeze."

The guests of the evening were Dr. A. B. Dinwiddie, Commander Ray L. Schoppe, Commissioner Fred A. Earhart and Mr. Warren T. Hammer.

During the course of the evening the retiring President was presented with a piece of silver, and the incoming President was presented with a rosewood gavel.

Other presents of a ludicrous nature were given to several members present.

The American Engineer in Russia. An engineer's impression of present day Russia is given in the paper of the above title printed elsewhere in this issue. Whatever else the world may be doing it is watching the great Russian experiment. The present Russian regime is acting on the assumption that among the civilized nations of the world the distribution of wealth is too unequal—that is to say, the rich have too much and the poor too little to an unfair degree. With this assumption there can be little fault to find. But to correct these conditions is another matter.

This is what the present Russian system is attempting to do. How well they will succeed remains yet to be seen.

To make over what is tantamont to an established order of civilization is not a matter of years, but of generations.

Meanwhile the world is watching.

This paper of Mr. Davis is based on personal experience and is well worth reading. The reader will be introduced to a new viewpoint concerning relations that we in America will feel is unique.

This Terrible Depression!!! The nations of the world have overstocked themselves with machinery and manufacturing plants far in excess of the wants of production. On all sides one sees the accomplished results of the labor of half a century. What is strictly necessary has been done oftentimes to superfluity. This full supply of economic tools to meet the wants of nearly all branches of commerce and industry is the most important factor in the present industrial depression. It is true that discovery of new processes of manufacture will undoubtedly continue and this will act as an ameliorating influence, but it will not leave room for marked extension such as has been witnessed during the last fifty years, or afford employment to the vast amount of capital which has been created during that period—*the day of large profits is probably past.—Taken from the official report of the United States Commissioner of Labor, dated 1886, in the age of zinc bath tubs, Brussels carpets, kerosene lamps, horse cars, mud roads, red flannel underwear, cotton stockings, and Kikapoo Indian remedies.*

PAPERS AND DISCUSSIONS

THE AMERICAN ENGINEER IN RUSSIA

By A. C. Davis.

Read before the Meeting of the Society December 14, 1931.

You are all doubtless familiar with the Five-Year-Plan of the Union of Socialistic Soviet Republics, which is, briefly, to build up in five years ,enough factories, mines, farms and other enterprises to furnish all of the needs of the Russian people without requiring any imports, and more than that, to produce enough to build up a good export business.

In order to carry out this program it was necessary to use a great many engineers and other experts on construction of new plants and also in the operating of them. This required the employment of a great many foreign "technicians." It was my good fortune to be one of the American engineers selected for this work.

There are two kinds of contracts under which the American engineers are working. The first, which was the type of contract under which I was working, is a contract between an American engineering firm and the Russian government. In this case the American engineering firm selects such men as they deem necessary. Each man's record is submitted to the Russians, who weed out those they they do not want, either because of his technical record or because of his personal record, and allow the others to enter. It seems that the personal record carries quite as much weight as the technical record. The main thing they seem to be looking for is whether the man has ever previously been in Russia and his attitude toward their "experiment." After having been accepted the engineer then signs a contract with the American firm who guarantees his pay and working conditions.

The second kind of contract is an individual contract between the engineer and the Russian government. You understand that there are no private enterprises in that country. Various agencies of the government carry on the different lines

of work and they, in turn, have the foreign specialists to direct the work.

All contracts specify the allowance for transportation, the housing, the length of time covered in the agreement, the amount of salary, the percentage of salary paid in rubles and the other usual items covered in a contract of this nature. The allowance for transportation is not uniform. In our case we were given a fixed sum for the trip over and a like sum for the return trip. We were at liberty to choose the route, the ship, and the class of travel, and if the trip cost more than the allowance, we had to make it up or if it cost less we could pocket the difference. It is my belief that in most cases the engineer is given a first class ticket with a fixed amount per day for the time enroute. In this type there is usually a time limit set within which the engineer must make the trip. The amount of the allowance is generally ample for the trip.

Many of the contracts are for five years although most of them are for shorter periods, from six months to three years.

The income tax must also be taken care of in the contract. Our contracts provided that we be exempt from income tax, but most contracts make no such exemption. The Russian income tax is very heavy. Some American engineers pay twelve per cent. Whether this is a maximum or not, I do not know. Some contracts provide for the same income tax as that in the home country of the engineer.

In arriving at the amount of salary paid, the orignial intention was to fix the pay on a scale corresponding to that enjoyed by the engineer at home. This made the salaries of the American engineers much higher than any others. It might be well to mention at this time the cost of living which is much higher in Russian than it is here, and, of course, that means considerably higher than in any other European country. That is caused largely by the fictitious value given the ruble.

Dollars may be exchanged into rubles at any time but rubles are not exchangeable into dollars. For that reason, it is best to keep the percentage of rubles down as low as permitted. When we went over they allowed sixty to seventy-five per cent in dollars but on later contracts, the percentage of

rubles was increased greatly. One man I knew signed up for only thirty per cent dollars while another received all his pay in rubles. He was a former Russian who stayed over there so long that he lost his American citizenship and they had him where they wanted him.

The rubles are given to the engineer in Russia and the dollars are deposited to his credit in his bank at home, or sent to anyone he directs. No foreign money is allowed in Russia, but traveler's checks may be freely carried in or out. Should any rubles be on hand at the time of leaving they may be deposited at the border and be reclaimed within six months, upon re-entering that country.

Tourists entering Russia for less than two months may exchange rubles into dollars by showing their receipt given them when they made the original exchange from dollars into rubles.

The custom is to fix the salary at a satisfactory rate to take care of all expenses in Russia but in some contracts, such as the one we had, housing including heat, electricity and gas, was furnished gratis. Where this is not furnished gratis, a great many contracts provide a maximum amount that may be charged, usually equivalent to about $100.00 per month, anything over this being paid by the "Stroy."

In Russia the amount of rent paid depends on the salary as well as on the space occupied. The Russians are allowed a fixed amount of space and if they occupy more than their allowance, are liable to have someone thrust upon them. The rate is based on the allowed amount of space and for additional space the rate is six times the basic rate. Also they must show authority before being allowed any space at all. One of the Russian architects in our office was the son of an engineer who was tried last summer for sabotage, and since his father was disfranchised, his apartment was taken from him. It then became urgent that the son provide himself with a room and as the "Stromstroy" could not obtain a room for him he was compelled to quit and go to work for another "Stroy" who could provide housing.

Housing conditions in Moscow are very bad as the city has increased so much in population in the last few years. There is the story of a man who was able to find only one room and

that one was occupied by a girl. In order to get the room he married the girl.

In general the Russians live in large apartment buildings. One room is assigned to a family and a common kitchen serves for several families. Gas is so expensive that it is not used to a great xetent; the cooking is done on a one-burner Primus stove using kerosene for fuel. There must be considerable discord when several want to use the kitchen at the same time.

A number of new apartment houses have been built especially for the foreign specialists and are very similar to those at home. They are invariably underheated but the houses are well insulated, with double windows and doors. The cracks in the windows are puttied in the winter to keep out even the small amount of air that might filter past the two sashes.

Many things seem strange to the new arrival. He has already become accustomed to the use of the passport, for one must at all times carry it while in Europe and show it at the hotels. As the United States does not recognize Russia, the Russian visa cannot be obtained in this country. It is generally put on the passport in Germany. Upon arrival in Moscow the passport is taken up by the hotel, or perhaps by the "Stroy" and sent to the police department for the "police permit." Should this be delayed more than a week there is a fine for the delay in addition to the cost of the permit.

The next thing that strikes the newcomer is the change in the calendar. The Soviet Republic has abolished the week as we know it. Work goes on continuously without interruption except for the five revolutionary holidays during the year. The individual works four days then takes off the fifth. If his rest day comes on the second of the month, the seventh, twelfth, etc., will also be rest days. By having five different squads one will be off every day but the work will not stop.

After the continuous week was put into use it was found, in offices, that it was difficult to get things done that required the presence of more than two men. The system was then revised so that a whole office closed one day in five. Other offices have different days, and the work does not suffer any-

way, for no one can take up the work of an executive for a day.

The offices in general work a seven-hour day, with lunch time taken out of the seven hours. They do not, generally, go out for lunch as we do here but bring something to eat to the office. Hot tea is passed around to each person at his desk, the theory being that in that manner very little time is lost in eating lunch. In practice, it seems to me that more time is lost there than here, for they meet in groups and talk for more than an hour.

The Russians hold a great many conferences. We are in the habit of thinking of a conference as a meeting of a few executives to decide certain matters of policy. Since over there the workman is the boss a conference is a meeting of everyone in the place. At any one of the many conferences that I attended while in Russia there must have been at least a hundred and in some cases, well over two hundred and fifty persons present. They hold a conference to decide questions that a single individual would decide here and think nothing of it. Since they, as a race, like to talk, these conferences are long drawn out affairs. This is especially so when American engineers are present, for everything said in English must be translated into Russian and everything said in Russian must be translated into English. At one conference I attended in which some German engineers were present it required two interpretations for all talks so it was a tiresome meeting. They may start a conference at eleven o'clock in the morning and keep it up until eleven o'clock at night. They do not mind missing the meals, for they might not have anything to eat anyway. Of course, all work stops when a conference starts but that does not matter.

As all mail entering or leaving Russia is subject to censorship the newcomer at first writes only short notes to his friends at home and tries to tell nothing about the country. This feeling soon passes away however and he begins writing everything that happens and adds a few comments on what he thinks of such a country anyway. It seems to me that after having been there awhile they did not open all the mail. They prob-

ably have suspect lists that they check up pretty well and let the others go. Letters were opened by steaming so that they could be sealed again without showing. Newspapers and magazines were boldly opened and then tied up with a string. I remember a case of someone who took the Saturday Evening Post and who wrote to the postmaster when several copies in succession were held up. In this case it seemed that the papers were held up by someone who wished to read them, for a package containing six months' copies came with a single word "thanks" written on a sheet of paper and enclosed.

Before we entered we had heard rumors of certain magazines and papers that were forbidden there but found that these rumors were false.

There were twenty in our party entering and a great many rumors had gone around which we later found to be groundless. They were not all false, however, and if any of you are intending to go over there I would advise you not to discredit any statement because it seems fantastic. For instance, it is a serious offence to try to take rubles into Russia and if you are apprehended in attempting to smuggle them in, you might be refused admission if no worse sentence were imposed.

There seems to be considerable interest shown in the food that is available there. In that one item there is more misinformation than in most any other. In the first place, conditions change very rapidly. What is true today may be reversed within a month.

Then much of the information comes from tourists who have visited that country. We saw many hundreds in Moscow last summer. They buy an all expense ticket from "Intourist" before entering and are shown everything that the tour calls for and little else. They would come into the Grand Hotel and sit down to a meal that would be a banquet in the U. S. A. and, of course, thought that anyone could go in and get the same meal, providing that he could pay for it. The truth is that even the foreign specialists could not have gotten that meal, at any price.

The people are on rations and a famine condition prevails at times. Special consideration is shown foreigners and they

are allowed much more than the Russians allow themselves. Many of the leaders there of course are insincere, but I believe the majority of them to be almost fanatical in their belief in the principles of Communism. The Russians recognize that most of the foreign specialists are not Communistically inclined, but are only working there for the pay, and in order to keep them satisfied are willing to make many concessions.

When I first went over I stayed in the hotels for three or four months and ate in the hotel dining rooms. No food card is required to eat in the dining room but plenty of rubles are needed. Shortly after my wife and baby arrived we were given an apartment. That is when we began to understand what the food situation really was. We were given food cards. There are five classes of food cards and I received the worker's card, which is the best. My wife received a non-worker's card and the baby a child's card. A worker was at that time allowed—for instance: a fifth of a kilogram of butter and one and a half kilograms of sugar per month. A non-worker's ticket did not have any butter at all, and a child's ticket provided a half litre of milk per day and five eggs per month, which were not allowed on any other tickets. On alternate months the tickets allowed laundry soap, about a pound. At various intervals thread, stockings, cotton and woolen yard goods, and other commodities could be obtained. Only two pairs of stockings a year were allowed a person. I am not sure how often the other things could be obtained. A few days ago there was a news item in one of the daily papers here to the effect that, beginning January first only three classes of food cards will be used; the workers' card, the office employee's card, and the child's card.

These food cards allow a worker two pounds of bread per day and an office employee one pound per day. There are two kinds of bread in use, the white bread which is darker than our rye bread, and the black bread. The white bread is very good and when one gets used to the black bread it seems good also. It must be very healthful and probably makes up to a certain extent for the lack of fresh vegetables.

After we had been in the apartment a month or so a special store was opened for foreigners. We were then given order

books and at this store could buy much more than on the cards. For instance, instead of a fifth kilo of butter a month we were allowed a kilo per five-day week. At all times we were provided with more than the Russians, but there were many things that could only be obtained on occasions. There were many times when we were entitled to purchase things which could not be obtained because they did not have them.

Later on dollar stores were opened for other things than food, in which all purchases must be paid for in foreign money. We always tried to avoid making any purchase at these stores, for we had rubles to spart and were then, as now, short of dollars. In case there might be any misunderstanding I will say that the food cards are only authority to buy and anything so purchased must be paid for.

As a class we found the Russian engineer to be a poor workman as compared to the American. The present authorities do not trust any man who was grown before the revolution and since the men that they do trust are all young, it is obvious that real experienced help is scarce. When a man graduates there in engineering, he is an engineer and the years of experience of an older man do not seem to carry much weight. It seemed to surprise them to find that many engineers in America are not engineering graduates from a college or university.

There is class distinction there that is hard for an American to understand although other Europeans seem to have the same feeling as the Russians. An engineer would not stoop to do drafting, nor would a draftsman trace his work. The particular individuals that we came in contact with revised their ideas on this subject.

To the Russian a person is a person, whether he be male or female. One of the leading engineers, the chief of the mechanical department of "Stromstroy," was a young woman who had probably been out of college three or four years. Most of our engineers were men, most of our tracers were women, the draftsmen were about equally divided, and only one of our interpreters was a man, the rest being girls or women. A great many of the interpreters were from families

who were wealthy before the revolution. One of our interpreters was taught English, German and French in her youth.

A great many customs there seem strange to us. When assigning space on a train the men and women are all mixed up in the same compartment. As a rule no exception is made but when some of our party were out on a trip and the two women were put in the same room with some army men they asked to have their space changed so as to travel in the room with the Americans, as they felt safer that way.

We found the Russian engineers much more theoretical and much less practical than the Americans are. This is due partly to their training. The training, while it is not done by Germans is patterned after the German methods, but the people are not nearly as mechanical minded as the Germans are. They would make shear diagrams and moment diagrams of beams when an American would only concern himself with the maximum shear or the maximum moment. It was at times necessary to go to quite a lot of trouble to explain things and prove them where a mechanically inclined person would see the point at once. They like to argue and are well trained in theory.

Many things affect the design of structures there that we do not think about here. Structural steel is very hard to obtain and only certain people can get enough of it to use for structural purposes. As a result reinforced concrete is used to a great extent. Reinforcing steel is scarce and one is justified in going to great length in order to save steel. The reinforcing steel is in short lengths, mostly under 20′, and that adds to the difficulties especially since the exact lnegths available are not known and even the sizes called for may not always be obtained. A design is made as though the steel could be obtained as desired and the superintendent in the field makes laps as he sees fit in accordance with rules given him.

This brings up the question of responsibility. Should a structure fail from any cause the one liable for its failure may lose his life. That causes them to try to shift all responsibility to someone else. Here is where the foreign specialist comes in. He can take the responsibility with little danger to his life.

The Russians feel fully capable of doing anything that his friend from another country can do. Why should he not feel so? He is a graduate from a technical university. However, it is better to allow the foreign specialist to take the responsibility and if he refuses to do so unless his orders are carried out, why just do as he says. It is better to do that and then criticize than to do otherwise and be criticized.

The Russians do not seem to realize what sanitation is. Not only their persons but their streets and houses were as dirty and the odor as bad as it is possible to imagine. The new order is to keep things clean, but it takes generations, not years, to teach that to the people. One great fault, and to me a most surprising one, is their laziness. Laziness and cold climates had never been linked in my mind but now the two are closely connected. A great many propaganda moving pictures have been made in an attempt to educate the people and doubtless they have learned much but have still a long road ahead.

Regarding the religious question that has been so much discussed outside of Russia. A member of the Communist Party cannot believe in God. It is a reaction from the days of the Czar when the Greek Church was the State Church and the Czar was the head of it. They had so bullied the more ignorant and robbed them in the name of religion that the present condition is the violent reaction to be expected. When the revolution put the whole property of the former owners into the hands of the State, the churches also were taken over. While the Communists do not believe in God they do not prohibit anyone else from believing anything he wishes and allow him to hold services in a church which he has rented from the State, provided he follows the rules of the State in doing so. Their most drastic rule seems to prohibit the teaching of religion to a child under eighteen years of age. In the meantime, all the propaganda they have been able to spread to the youth has probably weaned him away from religion for good.

There were undoubtedly entirely too many churches there before the revolution and the old churches which have not been torn down are put to some peculiar uses. Of course, numbers of them are still used as churches, but more are used

as museums and for other purposes. There are many excellent museums in Russia and one of the finest collections of original paintings by the masters that I have ever seen, was an exhibit from the Leningrad Museum, which was sent to Moscow for a time.

I will close with my answer to the question that is most often asked me, "What will the future bring?" Of course, no one knows the answer and your guess is as good as mine, but I would say that I believe they will come out all right. They have an enormous country, nearly three times the size of the U. S. A., they have all the natural resources that any country has and they have a people who are trying to build for the future. I do not believe that Communism will succeed and hope that they gradually form a republic out of the country. Only if the change is gradual can they avoid another such catastrophe as that of 1917.

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A. F. BARCLAY, (1908), Chief Engineer Public Belt Railroad, 5670 Rosemary Place, New Orleans.

JOHN S. BARELLI, (1908), Boilers and Power Plant Equipment, 612 Godchaux Bldg., New Orleans.

WADE BARNETT, (1910), Engineer, Sewerage and Water Board, 6117 Loyola Ave., New Orleans.

CECIL N. BEAN, (1922), Supervising Inspector Steam Vessels, 10th District, 8012 Burthe St., New Orleans.

JAMES D. BECK, (1916), Consulting Engineer, 2331 Constance St., New Orleans.

BEN H. BELL, (1920), Operating and Electrical Engineer, New Orleans Public Service Inc., 4604 So. Derbigny St., New Orleans.

LEONHARDT W. BENZ, (1919), Vice-President and Chief Engineer, Harry Bros. Co., of La., New Orleans.

F. N. BILLINGSLEY, (1915), Consulting Engineer, 702 Interstate Bank Bldg., New Orleans.

A. MERRICK BLAMPHIN, (1908), Vonsulting Engineer, Box 897, 517 Audubon Bldg., New Orleans.

CLARENCE NICHOLAS BOTT, (1927), General Contractor, 608 Audubon Bldg., New Orleans.

SHIRLEY C. BRASELMAN, (1919), Vice-President, American Creosote Works, Station F, New Orleans.

EDWARD S. BRES, (1925), Scott & Bres, Contracting Engineers, 1007 Maritime Bldg., New Orleans.

GEORGE ELMON BROWN, (1929), Representing International Filter Co., Chicago, Ill., and National Aluminate Corporation, Chicago, 2228 S. Gayoso St., New Orleans.

LOUIS M. BUJA, (1922), Engineer Globe Construction Co., Inc., 312 La. Bldg., New Orleans.

EDWARD W. BURGIS, (1919), 528 Bouny St., New Orleans.

GEORGE H. BURT, (1928), Chief Engineer, c/o Celotex Co., Marrero, La.

R. T. BURWELL, (1908), Manager New Orleans Department, Hartford Steam Boiler Inspection and Insurance Co., 1128 Hibernia Bank Bldg., New Orleans.

M. F. CANNING, (1931), Lighting Service Department, New Orleans Public Service Inc., 317 Baronne St., New Orleans.

C. GLENN CAPPEL, (1915), Vice-President, W. Horace Williams Co., Inc., Engineers and General Contractors, 833 Howard Ave., New Orleans.

CHESTER W. CARR, (1926), Vice-President, E. W. Carr, Inc., 807 Howard Ave., New Orleans.

D. B. H. CHAFFE, JR., (1920), Vice-President, Southern States Equipment Co., Inc., President, Rogers, Higgins Co., Inc., 1518 Tchoupltoulas St., New Orleans.

ROGER E. CHESTNUT, (1925), with Standard Fruit and S. S. Co., 323 Eliza St., New Orleans.

JAMES HENRY CHERRY, (1929), 1120 Hibernia Bank Bldg., New Orleans.

JOHN HENRY COATES, (1927), Assistant Engineer, Sewerage and Water Board, 302 S. Murat St., New Orleans.

E. H. COLEMAN, (1922), J. F. Coleman Engineering Co., 501 Hibernia Bldg., New Orleans.

JAMES HOWARD COLLINS, (1929), General Outdoor Advertising Co., 2120 Canal St., 1310 Short St., New Orleans.

SAMUEL CHAPMAN COLLINS, (1928), 1340 Camp St., New Orleans.

J. M. CRACROFT, (1927), Assistant Engineer, Bridge Department, City of New Orleans, 1473 Henry Clay Ave., New Orleans.

CHARLES C. CRAWFORD, (1921), 3227 Coliseum St., New Orleans.

W. H. P. CREIGHTON, (1912), Professor of Mechanical and Sugar Engineering, Tulane University, New Orleans.

HORACE E. CRUMP, (1912), Office Engineer, Dock Board, No. 2 Canal St., New Orleans.

DAVID L. CULLOM, (1916), Assistant Engineer, Board of Commissioners of the Port of New Orleans, 4032 Prytania St., New Orleans.

HENRY C. DAUBERT, (1928), Engineer, 1615 Bodenger Blvd., Algiers, La.

B. N. DAVIS, (1913), Engineer and Contractor, 1006 Tchoupitoulas St., New Orleans.

CHARLES DAVIS, (1925), Engineering Department, Board of Commissioners, 5407 Prytania St., New Orleans.

JOHN PAUL DEAN, (1932), Captain Corps of Engineers, U. S. Army, 2339 Octavia St., New Orleans.

DONALD DERICKSON, (1912), Professor of Civil Engineering, Tulane University, New Orleans.

JACQUES de TARNOWSKY, (1915), Structural Engineer, Room 25, City Hall, New Orleans.

J. L. DICKEY, (1915), Civil Engineer and Contractor, 1427 Carrollton Ave., New Orleans.

P. C. DOWELL, (1922), Manufacturers' Agent and Structural Engineer, 5820 Magnolia St., New Orleans.

WALLACE CAMPBELL DRENNAN, (1927), Field Engineer in Roadway Dept. of New Orleans Public Service Inc., 2235 Carondelet St., New Orleans.

GUSTAVE ROBERT DUBUS, (1927), Southern Kraft Corporation, Panama City, Fla.

PETER ARMAND DEBUS, (1927), President and Owner, P. A. Dubus & Son, Inc., 634 Louisa St., New Orleans.

ARCHIBALD LEE DUNLAP, (1925), Assistant Professor of Mechanical Engineering, Tulane University, 5524 Prytania St., New Orleans.

B. H. DUPUY, (1932), Designer Mechanical Appliances, 1421 Harmony St., New Orleans.

ALLAN T. DUSENBURY, (1909), Drainage and Reclamation Engineer, 1407 American Bank Bldg., New Orleans.

ANDRE C. DUVAL, (1926), with State Board of Engineers, 2206 Jefferson Ave., New Orleans.

RALPH EARL, (1913), Consulting Engineer, Earl Engineering Co., American Bank Bldg., New Orleans.

EDWIN ESSEX ELAM, (1928), Assistant Engineer, Orleans Levee Board, 4330 Elba St., New Orleans.

DANIEL STANLEY ELLIOTT, (1921), Professor of Physics, Tulane University, New Orleans.

JAMES P. EWIN, (1915), Vice-President and General Manager, Doullut & Ewin, Inc., 901 Queen and Crescent Bldg., New Orleans.

CHARLES A. FAVROT, (1919), 18 Richmond Place, New Orleans.

EDWIN J. FISHER, (1913), Proprietor of the Electrical Contracting and Engineering Co., The Electrical Fixture and Material Co., 518-520 Gravier St., New Orleans.

LIONEL E. FLOTTE, (1930), Distribution Engineering Dept., N. O. Public Service Inc., House J, St. John Court, New Orleans.

FREDERICK H. FOX, (1922), Associate Professor, Civil Engineering, Tulane University, New Orleans.

ROLAND WOODWARD FRENCH, (1924), with N. O. Public Service Inc., 3225 Ursuline Ave., New Orleans.

JOSEPH J. FRIEDLER, JR., (1930), Southern District Sales Manager, Ilg Electric Ventilating Co., 5820 Hurst St., New Orleans.

ALVIN M. FROMHERZ, (1915), Building Contsructor, 344 Camp St., New Orleans.

FRANK G. FROST, (1919), General Superintendent, Electrical Dept., New Orleans Public Service Inc., New Orleans.

JOHN V. GAUDET, (1927), Superintendent, Chalmette Petroleum Corp., Chalmette, La., 2133 Calhoun St., New Orleans.

WILL J. GIBBENS, JR., (1924), Secretary, Gibbens & Gordon, Inc., 532-534 Canal St., 1404 Octavia St., New Orleans.

DAVID W. GODAT, (1924), Assistant Engineer in charge of Bridges, City Engineer's Office, 7818 Birch St., New Orleans.

MAYER GODCHAUX, (1920), 2234 State St., New Orleans.

JOSEPH McCORMICK GONDRAN, (1924), Structural Engineer with Jones & Laughlin Steel Corp., Box 66, New Orleans.

ROBERT E. GOSA, (1929), Vice-President, Merritt Chapman-Williams, Inc., 833 Howard Ave., New Orleans.

REUBEN CHARLES GOTCH, (1928), with Ole K. Olsen, 8520 Apricot St., New Orleans.

ARTHUR A. GRANT, (1923), Marine Surveyor, 1543 Canal Bank Bldg., New Orleans.

WALTER K. GRANT, (1922), 1527 Audubon St., New Orleans.

W. B. GREGORY, (1907), Professor of Experimental Engineering and Hydraulics, Tulane University, New Orleans.

B. H. GREHAN, (1914), member of firm of Geo. J. Glover Co., Inc., 1670 Soniat St., New Orleans.

A. H. GUILLOT, (1917), Assistant Engineer, New Orleans Public Service Inc., 317 Baronne St., New Orleans.

ALLEN H. HACKETT, (1921), Consulting Engineer, 511 Whitney Bldg., New Orleans.

CALLENDER FAYSSOUX HADDEN, (1928), Supervising Engineer, Standard Supply & Hardware Co., P. O. Drawer 620, New Orleans.

DAN HALLORAN, JR., (1924), Assistant Engineer, Distribution Department, New Orleans Public Service, Inc., 1111 Elysian Fields Ave., New Orleans.

FARRAR PETRIE HAMILTON, (1915), 408 Walnut St., New Orleans, La.

GEORGE R. HAMMETT, (1920), Sales Engineer, A. M. Lockett & Co., 505 Queen and Crescent Bldg., New Orleans.

ALLAN J. HARRIS, (1924), President, Walter Castenado, Inc., 1105 Maritime Bldg., 7615 Jeannette St., New Orleans.

M. V. HAULARD, (1906), Superintendent, Municipal Repair Plant, 4154 Iberville St., New Orleans.

WILLIAM WALLACE HAY, (1928), Engineer, Inland Waterways Corp., 1435 Pine St., New Orleans.

ARTHUR C. HAYS, (1929), Sales Engineer, Neville and Cleary, Inc., 1118 Union Indemnity Bldg., New Orleans.

W. S. HENNING, (1919), Civil Engineer, 312 Elmeer Place, New Orleans.

ARTHUR WRIGHT HERBERT, (1928), Chief Engineer, The Flintkote Co., New Orleans.

LOYLESS HAMPTON HIERS, (1929), Gas Distribution Dept., New Orleans Public Service Inc., 317 Baronne St., New Orleans.

W. T. HOGG, (1913), Principal Assistant Engineer, Board of Commissioners, Port of New Orleans, 8000 Nelson St., New Orleans.

FRANK L. HOLT, (1915), Electrical Designer, Engineering Department, Board of Commissioners, No. 2 Canal St., New Orleans.

PAUL FROST HOOTS, (1927), Resident Engineer, New Orleans Public Service Inc., 1635 S. Carrollton Ave., New Orleans.

SAMUEL T. HOTTINGER, JR., (1932), with New Orleans Public Service Inc., 1903 Marengo St., New Orleans.

EDWARD C. HYATT, (1925), Civil Engineer, 2328 St. Charles Ave., New Orleans.

LYALL GIBSON IRELAND, (1929), Vice-President, New Orleans Public Service Inc., 1631 Robert St., New Orleans.

ALFRED F. JACOBI, (1922), Designer, Dock Board, 2211 State St., New Orleans.

HARRY JACOBS, (1919), Civil Engineer, 264 Audubon Blvd., New Orleans.

PAUL F. JAHNCKE, SR., (1908), President Jahncke Service, Inc.; Vice-President, Shipside Storage Co.; President, Brookhaven Gravel Co., 814 Howard Ave., New Orleans.

JOHN W. JENKS, (1920), with Dock Board, 500 Camp St., New Orleans.

CHARLES JOHNSON, (1925), Assistant Engineer, Sewerage and Water Board, 521 Lowerline St., New Orleans.

WARREN JOHNSON, (1903), President and General Manager, Johnson Iron Works, Dry Dock and Shipbuilding Company, Inc., P. O. Box 840, New Orleans.

C. LEONARD JONES, (1923), Structural Designer, with Dock Board, 2306 Wirth Place, New Orleans.

KARL P. KAMMER, (1931), with New Orleans Public Service Inc., 1503 Dufossat St., New Orleans.

JAMES P. KEMPER, (1909), Civil Engineer in Private Practice, Fordoche, La.

CHARLES MACDONALD KERR, (1914), Sales Engineer, 5831 So. Robertson St., New Orleans.

LEONARD FRANK KERSHAW, (1931), Superintendent, General Box Company, 2214 Broadway, New Orleans.

CHARLES KIRSCHNER, (1929), Engineer with Mexican Petroleum Co., 37 Neron Place, New Orleans.

LEONARD R. KIRST, (1928), Civil Engineer, Roadway Dept., New Orleans Public Service Inc., 8122 Birch St., New Orleans.

R. B. KOHNKE, (1911), Engineer, 932 Pichcloup Place, New Orleans.

JOSEPH J. KREBS, (1926), Assistant Engineer in Charge of Street Planning, City Engineer's Office, 4021 S. Derbigny St., New Orleans.

HERRICK J. LANE, (1922), Secretary and Treasurer, Merritt-Chapman, Williams, 833 Howard Ave., New Orleans.

EDWARD S. LANPHIER, (1918), Senior Lighthouse Engineer (Superintendent of Lighthouses), Room 224, Custom House Bldg., New Orleans.

FERD L. LARUE, (1919), 823 Esplanade Ave., New Orleans.

LEON LASSEN, (1926), Assistant Engineer, Water Purification Plant, 8218 Oleander St., New Orleans.

LEROY M. LAW, (1928), with New Orleans Refining Co., 7915 Plum St., New Orleans.

RANDALL FRANK LEGEAI, (1923), Industrial Gas Engineer, New Orleans Public Service Inc., 317 Baronne St., New Orleans.

ALBERT J. LEGETT, JR., (1919), Assistant Superintendent, Johnson Iron Works, Dry Dock and Shipbuilding Co., 5859 Catina St., New Orleans.

NEVILLE LEVY, (1929), President, Equitable Equipment Co.; President, Welded Products Co.; Vice-President, Equitable Dredging Co., 410 Camp St., New Orleans.

J. H. LEWIS, (1908), President, Lewis-Chambers Construction Co., 1743 Canal Bank Bldg., New Orleans.

RALPH E. LIND, (1930), Inspector, U. S. Engineers, 2000 Peniston St., New Orleans.

ROWLAND LINFIELD, (1923), Marine Surveyor, 2404 Joseph St., New Orleans.

GEORGE LEWIS LORD, (1924), Engineer, 2606 Prytania St., New Orleans.

JULES A. LORIO, (1921), 126 N. Genois St., New Orleans.

EDWARD B. LUDWIG, (1928), President, Canal Steel Works, Inc., P. O. Box 347, New Orleans.

THOMAS MICHAEL McCARROLL, (1926), State Board of Engineers, 1827 S. Dupre St., New Orleans.

W. T. McCAY, (1931), Sales Engineering, 109 Tchoupitoulas St., New Orleans.

H. L. McLEAN, (1930), Consulting Mechanical Engineer, 822 Maritime Bldg., New Orleans.

J. A. McNIVEN, (1922), Chief Engineer, Dock Board, No. 2 Canal St., New Orleans.

IVOR ORIN MALL, (1922), with New Orleans Public Service Inc., 526 Florida Ave., New Orleans.

ODON O. MELANCON, (1930), Member, State Board of Engineers, 2227 Jefferson Ave., New Orleans.

JOHN W. MONTGOMERY, (1924), Engineer with Jones and Laughlin Steel Corp., 417 Balter Bldg., New Orleans.

A. S. MONTZ, (1919), Architect and Engineer, 740 Poydras St., New Orleans.

HOWARD N. MOODY, (1926), Mechanical Engineering Contretor, 815 Perdido St., New Orleans.

EARLE B. MORDEN, (1928), Chief Engineer, Standard Fruit and Steamship Co., 1603 Pine St., New Orleans.

WALTER B. MOSES, (1912), Mechanical Electrical Engineer; Vice-President, Engineering Sales Co., Inc., 425 S. Peters St., New Orleans.

CARL G. MEUNCH, (1927), Vice-President, Charge of Engineering, Construction and Operation The Celotex Co., 193 Audubon Blvd., New Orleans.

ROBERT K. MULNIX, (1922), General Manager, North Rampart Lumber Supply Co., 525-31 N. Rampart St., New Orleans.

J. D. MURPHY, (1922), Civil Engineer, 4932 Venus St., New Orleans.

FRANK A. MUTH, (1915), Lighthouse Engineer, (Assistant Superintendent), Lighthouse Service, 7705 Willow St., New Orleans.

ROBERT A. NADLER, (1929), Engineering Dept., Celotex Co., 4503 Prytania St., New Orleans.

ARTHUR J. NAQUIN, (1924), Transportation Engineer, New Orleans Public Service Inc., 624 Audubon St., New Orleans.

BERNARD STANLEY NELSON, (1911), Chief Engineer, A. M. Lockett & Co., Ltd., 501 Queen and Crescent Bldg., New Orleans.

LAWRENCE KITCHENER NELSON, (1927), Engineer, 1026 No. Claiborne Ave., New Orleans.

LEROY J. NEWMAN, (1923), Superintendent of Distribution, New Orleans Public Service Inc., 317 Baronne St., New Orleans.

WILLIAM T. NEWTON, (1915), U. S. Senior Superintendent, 5352 Perrier St., New Orleans.

WILLIAM F. OAKES, (1918), 341 Camp St., New Orleans.

JOHN A. O'BRIEN, (1920), Engineer and Contractor, 913 Louisiana Bldg., New Orleans.

ROBERT M. O'BRIEN, (1916), Superintendent, Rolling Stock and Shops, New Orleans Public Service Inc., 5315 Camp St., New Orleans.

HOWARD NORMAN OLD, (1930), Sanitary Engineer, U. S. Public Health Service, 714 Masonic Temple, New Orleans.

BENJAMIN J. OLIVEIRA, (1926), Assistant Engineer, Office of City Engineer, 2300 Joseph St., New Orleans.

OLE K. OLSEN, (1905), Contracting Engineer, 833 Howard Ave., New Orleans.

JOHN H. O'NEILL, (1916), Sanitary Engineering, Louisiana State Board of Health, 637 Lowerline St., New Orleans.

ADLOE ORR, (1926), Civil Engineer and Surveyor, 316 Baronne St., New Orleans.

ALBERT B. PATERSON, (1923), President, New Orleans Public Service Inc., 2021 Jefferson Ave., New Orleans.

FRANK T. PAYNE, (1924), Engineer, Payne Engineering Co., Gretna, La.

JOHN L. PORTER, (1924), Consulting Chemical Engineer, 8407 Panola St., New Orleans.

PATRICK HENRY QUINLAN, (1926), City Engineer, 1141 Philip St., New Orleans.

HYMAN RABINOVITZ, (1911), General Contractor, 740 Poydras St., New Orleans.

GROVER CLEVELAND RACKERBY, (1926), Field Engineer, Board of Commissioners, 2217 Short St., New Orleans.

CHARLES FREDERICK RANTZ, (1924), Proprietor, Rantz Ice Factory, 436 Elmira Ave., New Orleans.

W. LAIDLAW RAYMOND, (1931), Assistant City Engineer, 4619 Iberville St., New Orleans.

LESTER H. RAYNER, (1929), Chemical Engineer, 2116 Canal St., New Orleans.

LYMAN C. REED, (1907), Electrical Equipment, 1230 Hibernia Bldg., New Orleans.

MAMPTON REYNOLDS, (1910), General Contractor, 831 Maison Blanche Bldg., New Orleans.

W. H. RHODES, (1927), Asphalt Department, Shell Petroleum Corp., New Orleans.

JOHN RIESS, (1906), Civil Engineer and Contractor, 807 New Orleans Bank Bldg., New Orleans.

OSCAR RIESS, (1916), Engineer, with John Riess, Civil Engineer and Contractor, 1423 Milan St., New Orleans.

GEORGE P. RICE, (1924), Consulting Engineer, Hibernia Bldg., New Orleans.

CLAIRE W. RICKER, (1928), Professor of Electrical Engineering, Tulane University, New Orleans.

GEORGE P. ROBBINS, JR., (1928), Member, firm Robbins & Robbins, 504 Howard Ave., New Orleans.

CORWIN P. ROBERT, (1928), Civil Engineer and Surveyor, 4833 Bienville St., New Orleans.

JAMES M. ROBERT, (1908), Professor of Machine Design, Tulane University, Director Night Classes in Engineering, Tulane University, New Orleans.

THOMAS H. ROBERTS, (1923), Mechanical Engineering, 1530 N. Broad St., New Orleans.

EVERETT G. ROESSLE, (1926), with W. H. Williams, Inc., 833 Howard Ave., New Orleans.

RAGUWALD P. RORDAM, (1920), Civil Engineer, 318 Carondelet St., 6322 S. Liberty St., New Orleans.

WALTER HOWARD SCALES, (1930), Southern Manager, National Lumber Mfgrs. Assn., 308 Interstate Bank Bldg., 2023 Broadway, New Orleans.

HUGO SCHLENK, JR., (1929), Research Engineer, Celotex Co., Marrero, La.

CARL SCHNEIDER, (1926), Mecanical Engineer, Dept. of Public Property, Division of Public Works, 7711 Plum St., New Orleans.

FLORANCE J. SCHWAB, (1931), with New Orleans Public Service Inc., 1938 Octavia St., New Orleans.

ARTHUR M. SCOTT, (1915), with Ole K. Olsen, Concrete Engineer, 833 Howard Ave., New Orleans.

HARRY D. SCOTT, (1920), Assistant to Vice-President, Standard Fruit and S. S. Co., Union Indemnity Bldg., 5424 Pitt St., New Orleans.

GEORGE ARTHUR SEAVER, (1920), Chief Engineer, George J. Glover Co., Inc., 1219 Eleonore St., New Orleans.

SOLIS SEIFERTH, (1927), Architect, Secretary-Treasurer, Weiss, Dreyfous and Seiferth, Inc., Maison Blanche Bldg., 608 Iona St., New Orleans.

HERBERT M. SHILSTONE, (1932), Consulting Chemist, 1662 Valmont St., New Orleans.

LESTER C. SMITH, (1920), Secretary-Treasurer, Doullut & Ewin, Inc., 901 Queen and Crescent Bldg., New Orleans.

CHARLES E. SNYPP, (1922), Engineer, with Southern Cotton Oil Co., Gretna, La.

LEROY AUGUSTUS STAPLES, (1931), Rice and Staples, Consulting Engineers, Hibernia Bank Bldg., New Orleans.

EDWIN GUY STARBUCK, (1927), Contracting Engineer, Virginia Bridge & Iron Co., P. O. Box 785, New Orleans.

REINHARD A. STEINMAYER, (1925), Assistant Professor of Geology, Tulane University, 7933 Oak St., New Orleans.

DAVID WHYTE STEWART, (1920), Chief Engineer, New Orleans Pubile Service, Inc., Market and S. Peters Sts., New Orleans.

ERNEST K. STRAHAN, (1929), President, E. K. Strahan, Inc., 816 Howard Ave., New Orleans.

JOSEPH L. SWANSON, (1922), President, Swanson-McGraw Co., Consulting Engineers, 425 Balter Bldg., New Orleans.

B. G. SYMON, (1932), Lubrication Engineer and Lubrication Sales Manager, Shell Petroleum Corp., 33 Neron Place, New Orleans.

JAMES M. TODD, (1923), Consulting Engineer, 818 Maritime Bldg., 1561 Exposition Blvd., New Orleans.

W. O. TURNER, (1931), Chief Engineer, Louisiana Power & Light Co., 142 Delaronde St., New Orleans.

JAMES F. TOMPKINS, (1932), Engineer, Carnegie Steel Co., 1030 Maison Blanche Bld., New Orleans.

EUGENE UNSWORTH, (1919), Assistant Chief Inspector, New Orleans Department Hartford Steam Boiler Inspection and Insurance Co., 1128 Hibernia Bank Bldg., New Orleans.

BRYSON VALLAS, (1925), City Engineer, Room 21, City Hall, 607 Clare St., New Orleans.

GEORGE E. VINNEDGE, (1927), Superintendent, City Park, 6303 West End Blvd., Lakeview, New Orleans.

LUCIEN T. VIVIEN, JR., (1926), with New Orleans Public Cervice Inc., Distribution Engineering Department, 1418 N. Tonti St., New Orleans.

GILBERT D. VON PHUL, (1916), Engineer, Contractor, Manufacturer; Office and Works, St. Patrick and St. Louis Sts., New Orleans.

GEORGE D. WADDILL, 1911), Assistant Engineer, U. S. Engineer Office, 7616 Hampson St., New Orleans.

J. D. WALKER, (1908), Engineer for Craven & Lang, Carondelet Bldg., New Orleans.

STEPHEN J. WALLBILLICH, (1926), Engineer, 1415 Adams St., New Orleans.

ALLEN E. WASHBURN, (1908), Civil Engineer, U. S. Engineer Office, Dauphine and Poland Sts., New Orleans.

VICTOR W. WEBB, (1929), Secretary-Treasurer, E. K. Strahan, Inc., 310 Pere Marquette Bldg., New Orleans.

ALFRED L. WEBRE, (1913), Specialist on Heating and Evaporating of Solutions, 348 Merion Road, Merion, Pa.

LEO S. WEIL, (1918), Mecanical and Electrical Engineer; President, Engineering Sales Co., Inc., 425 S. Peters St., New Orleans.

LEON C. WEISS, (1918), 600 Maison Blanche Bldg., New Orleans.

CHARLES WIGGIN, JR., (1927), Secretary-Treasurer, Walter Castenedo, Inc., 1105 Maritime Bldg., New Orleans.

ELMER WILLIAMS, (1927), Contractor, 118 Fairway Drive, New Orleans.

W. HORACE WILLIAMS, (1908), President and General Manager, W. Horace Williams Co., Inc., Engineer and General Contractor, Southern Bldg., 833 Howard Ave., New Orleans.

C. S. WILLIAMSON, JR., (1916), Head of School of Chemical Engiflneering, Tulane University, New Orleans.

ARMAND L. WILLOZ, (1922), Engineer, Orleans Levee Board, 4439 S. Miro St., New Orleans.

J. NORMAN WILSON, (1911), Assistant Technical Engineer, Mechanical Engineering Department, Sewerage and Water Board, 2425 Audubon St., New Orleans.

ROGER O. WINE, (1928), 690 S. Mason St., Hornsbourg, Va.

WALTER E. WINSHIP, (1921), President, Chalmette Petroleum Corporation, Union Indemnity Bldg., New Orleans.

A. R. WINGATE, JR., (1924), Engineering Department, Lukens Steel Co., 1731 Robert St., New Orleans.

ALBERT PARISH WOODY, (1929), Construction Engineer, Gas Department, New Orleans Public Service Inc., 3716 Louisiana Ave. Parkway, New Orleans.

ALLAN RAMSEY WURTELE, (1928), Consulting Engineer, 1917 State St., New Orleans.

ALBERT G. WYLER, (1927), Assistant Engineer in Charge of Field Construction of Bridges, 3123 Toledano St., New Orleans.

CHARLES J. WYLER, (1919), Principal Assistant Engineer, A. M. Lockett & Co., Ltd., 530 Jackson Ave., New Orleans.

LOUIS J. WYLER, (1922), Superintendent, Lukens Steel Co., 2234 Marengo St., New Orleans.

NON-RESIDENT MEMBERS

R. L. ATKINSON, (1920), Engineer, 312 Audubon Blvd., New Orleans.

JAMES R. ADAMS, (1911), Lake Providence, La.

LEWIS SCHERCK ALCUS, (1922), 7445 Maple St., New Orleans.

KENNETH McGRATH BAILEY, (1924), Engineer, General Electric Co., Union Indemnity Bldg., New Orleans.

CHARLES V. BAKER, (1931), Assistant State Highway Engineer, Louisiana Highway Department, Baton Rouge, La.

JAMES ALLEN BARKSDALE, (1926), Assistant City Engineer, Box 691, Gulfport, Miss.

CHARLES DREWRY BATSON, (1928), Manager, Republic Creosoting Company, Mobile, Ala.

DANIEL M. BEARD, (1926), 320 Magazine St., New Orleans.

JOSEPH P. BERANGER, (1915), Vice-President, Chief Engineer and General Manager, Cuban Dominican Sugar Corp., Room 2136, 25 Broadway, New York City.

MERRILL BERNARD, (1917), Consulting Engineer, Crowley, La.

PERCY L. BERNSTEIN, (1925), Engineer, East Beach, Gulfport, Miss.

ELDRED GRIFFIN BLAKEWOOD, JR., (1926), Resident Engineer, Bridge Construction (Steel, Conc. & Timber), Location Surveys for Bridges and Roads, Baton Rouge, La.

R. W. BRINGHURST, JR., (1912), Commissioner Parks and Streets, P. O. Box 706, Alexandria, La.

JACOB THOMPSON BULLEN, (1925), Caddo Parish Engineer, Box 772, Shreveport, La.

THEO. T. CHENET, (1922), Resident Engineer, Louisiana Highway Commission, Winnsboro, La.

JEAN EARL CHRISTIAN, (1929), with Graham Engineering Co., 208 Godchaux Bldg., New Orleans.

J. B. CONVERSE, (1921), President, J. B. Converse & Co., Engineers, Mobile, Ala.

HENRY BELL COOLEY, (1924), Civil Engineer and Attorney at Law, c/o Mrs. G. B. Cooley, Monroe, La.

HARVEY McL. COTTON, (1931), Vice-President of Sales Engineering L. S. Valley & Co., Second National Bank Bldg., Houston, Tex.

L. C. DATZ, (1906), Chief Engineer, St. Louis Public Service Co., 3869 Park Ave., St. Louis, Mo.

JOHN J. DAVIDSON, (1918), Engineer, Berwick, La.

ALBERT BAKER DAVIS, JR., (1928), 1101 23rd St., Galveston, Tex.

GEORGE H. DAVIS, (1909), Member Ford, Bacon & Davis, Inc., 39 Broadway, New York City.

PETER J. DROMGOOL, (1923), 5218 St. Charles Ave., New Orleans.

WILLIAM F. EBLEN, (1916), Secretary-Treasurer, Engineering Service Corp., 823 Post Dispatch Bldg., Houston, Tex.

L. P. ELBERSON, (1911), Chief Engineer, Louisiana Irrigation & Mill Co., Crowley, La.

S. W. ELBERSON, (1911), General Superintendent, Louisiana Public Utilities Co., Lafayette, La.

CHARLES H. FENSTERMAKER, (1914), Chief Engineer, Industrial Lumber Co., Engineer, Road District No. 5, Allen Parish, Elizabeth, La.

JAMES McC. FOURMY, (1916), Consulting Engineer, Hammond, La.

EDWARD GEORGE FREILER, (1926), Drainage Engineer, Hammond, La.

G. ACHEE FRICK, (1928), Chief Engineer, Henry A. Mentz & Co., Box 561, Hammond, La.

LLOYD GARNER FROST, (1926), Construction Engineer, Bartaw, Fla.

HERBERT M. GALLAGHER, (1921), Field Engineer, American Wood Preservers Assn., 111 West Washington St., Chicago, Ill.

MARCEL GARSAUD, (1905), Member Federal Power Commission, Washington, D. C.

CHARLES ROBERT GATES, (1929), Roadmaster, Southern Railway, (N. O. & N. E. R. R. and N. O. Terminal Co.), Hattiesburg, Miss.

CHARLES HENRY GREEN, (1931), Assistant Resident Engineer, Louisiana Highway Commission, Oberlin, La.

WILL S. GUEDRY, (1925), Contractor, Associated with Alexandria Contracting Co., Inc., Box 774, Monroe, La.

FLOYD HAMILTON, (1919), Lake Charles, La.

IRA G. HEDRICK, (1928), Consulting Engineer, Fayetteville, Ark.

HARRY B. HENDERLITE, (1929), Chief Engineer, Louisiana State Highway Commission, 403 Evergreen Drive, Baton Rouge, La.

JOHN LOVEJOY HENNING, (1919), 525 Kirby St., Lake Charles, La.

RUDOLPH HERPICH, (1925), Manager, Southern Banana Corp., Jacksonville, Fla.

SERGE POWERS HIGGINBOTHAM, (1926), Licensed Surveyor, Box 229, Baton Rouge, La.

SAMUEL A. HONAKER, (1922), Civil Engineer, Box 357, Sacramento, Calif.

C. A. IVES, JR., (1922), Construction Engineer, Louisiana Highway Commission, 940 Park Blvd., Baton Rouge, La.

FRANCIS MARION IVICHIEVICH, (1927), Sales Engineer, Box 788, Wood River, Ill.

ANDREW W. JACKMAN, (1913), 6025 Freret St., New Orleans, La.

HAROLD H. JAQUET, (1930), Geophysical Surveyor and Engineer, Shell Petroleum Corporation, 612 W. 6th St., Little Rock, Ark.

E. S. JARRETT, (1909), Consulting Engineer, 342 Madison Ave., New York City.

CHARLES E. JOUBERT, (1909), Asst. Maint. Engineer, Louisiana Highway Commission, Box 563, Monroe, La.

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

SAMUEL P. LANDRY, (1929), Field Engineer, Box 244, Plaquemine, La.

ROBERT P. LINFIELD, (1930), with Cuyamel Fruit Co., 7411 Maple St., New Orleans.

A. J. McCORKLE, (1930), General Contractor, Fargy, Henson & McCorkle, 2232 Elliott St., Alexandria, La.

HERBERT H. McGEHEE, (1920), 1917 Lamar Ave., Apt. 3, Memphis, Tenn.

RALPH G. MALONE, (1924), Oficios 12 Y 14, Deptos, 301-308, Apartado No. 607, Habana, Cuba.

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

RALPH H. MANN, (1921), Field Engineer, Am. Wood Preservers Ass'n, 111 West Washington St., Chicago, Ill.; Field Hdqrs., 1215 Graybar Bldg., New York City.

EMILE J. MARY, (1929), Refinery Superintendent, Box 1487, Big Springs, Tex.

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

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

ALLEN J. NEGROTTO, (1920), Engineer, 1917 St. Andrew St., New Orleans.

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

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

GUY OSBORNE, (1913), Logging Superintendent, Donner, La.

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, 730 N. 10th St., Baton Rouge, La.

LEON MYERS REINACH, (1928), Engineer, Ford, Bacon and Davis Corp., Dallas, Tex.

RENE H. REINACH, (1929), with Interstate Commerce Commission, Washington, D. C.

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

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

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

UNION SANDERS ROANE, (1926), with Louisiana Highway Commission, Box 1002, Baton Rouge, La.

W. B. ROBERT, Civil Engineer, Port Barre, La.

EDWIN J. H. RODRIGUEZ, (1918), care Johns-Manville Corp., 41st and Madison Ave., New York City.

RODNEY B. ROUGELOT, (1928), Engineering Department, Cuban-American Sugars Co., Delicias, Oriente, Cuba.

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.

ARTHUR F. SHUEY, (1928), Roseland Box Co., Roseland, La.

JOHN A. SILSBEE, (1915), Petroleum Engineer, 1923 So. Wheeling St., Tulsa, Okla.

B. E. M. SKERRETT, (1928), Personnel Director, Skerrett & Treleaven, 5594 Rosemary Place, New Orleans.

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

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

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

FRANK J. TRELEASE, (1928), with Ford, Bacon and Davis, Colorado Springs, Colo.

STEWART TICKNOR, (1922), Civil Engineer, Box 598, Baton Rouge, La.

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

A. H. WARDEN, (1931), Engineer and Surveyor, Delhi, La.

RICHARD CHARLES SANCHEZ WATSON, (1926), Civil Engineer, General Practice, 4901 Walker St., Houston, Tex.

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 Way and Structures, Southern Railway System, Lines West, 506 Southern Railway Bldg., Cincinnati, Ohio.

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

ASSOCIATE MEMBERS

JOHN A. ABELE, (1922), District Manager, Orton Crane and Shovel Co., 3215 Palmyra St., New Orleans.

RAYMOND P. BASSICH, (1923), Manager, New Orleans Blue Print & Supply Co., Inc., 826 Union St., New Orleans.

R. H. BAUMBACH, (1911), Manager, Eugene Dietzgen Co., 318 Camp St., New Orleans.

PERRY HOWELL BEALL, (1929), with Frank H. Chisolm, Consulting Engineer, 4632 Banks St., New Orleans.

JAMES P. BRODTMAN, (1932), Gulf States Creosoting Co., 901 United Fruit Bldg., New Orleans.

FRANK C. CODIFER, (1929), Contractor, Real Estate Development, 510 American Bank Bldg., New Orleans.

L. VILLERE CRESSY, (1930), Sales Engineer and Representative for C. A. Dunham Co., and Modine Mfg. Co., 1666 Abundance St., New Orleans.

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

D. F. DULION, (1932), with Fairbanks, Morse & Co., 1000 St. Charles Ave., New Orleans.

JOHN P. EGAN, (1931), Assistant Chief Engineer in Charge, Maintenance and Operation for New Orleans Public Service Inc., at Market Street Steam Electric General Station, 1127 Euterpe St., New Orleans.

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

WALTER J. FOLSE, (1930), Machinery Sales, 2181 Freret St., New Orleans.

ROBERT M. GALLAGHER, (1929), Sales Engineer, Ohio Brass Co., 1938 Audubon St., New Orleans.

JOHN F. GEIS, (1929), Sales Supervisor, Johns-Manville Corporation, 4518 Pitt St., New Orleans.

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

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

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

GUS C. KRAUSS, (1929), Assistant to Superintendent, Rolling Stock and Shops Dept., New Orleans Public Service Inc., 3223 Magazine St., New Orleans.

CHARLES LOB, (1927), Investments, 3309 St. Charles Ave., New Orleans.

ROBERT P. LOCKETT, (1931), Sales Manager, A. M. Lockett & Co., Ltd., 2130 Palmer Ave., New Orleans.

JOHN McINERNEY, (1920), Manager Construction, 200 Madison Ave., New York City.

SEBASTIAN V. MASSIMINI, (1931), Erecting Machinery, 8428 Pritchard Place, New Orleans.

WALTER A. NORTHINGTON, (1931), Sales and Telephone Specialist, 7734 Belfast St., New Orleans.

JOHN REINHARD, (1931), Industrial Engineer, Johns-Manville Corp., 3719 Camp St., New Orleans.

PHILIP T. SAMUEL, (1929), Affiliate Member, American Society of Civil Engineers, 2511 S. Carrollton Ave., New Orleans.

ALPHONSE J. SARRE, (1931), Superintendent of Industrial Relations, New Orleans Public Service Inc., 1503 Valmont St., New Orleans.

F. W. STEVENS, (1909), Manager, New Orleans District Sales Office, Allis-Chalmers Mfg. Co., 1124 Canal Bank Bldg., New Orleans.

LAWTON T. STEVENS, (1931), Sales Engineering, 588 Walnut St., New Orleans.

JULIUS SZODOMKA, (1931), Owner, Dixie Machine Welding & Metal Works, 4311 S. Roman St., New Orleans.

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

WILLIAM WALLACE, (1931), Contractor, 1403 Pere Marquette Bldg., New Orleans.

NON-RESIDENT ASSOCIATE MEMBERS

JOSEPH A. BRENNAN, (1920), General Contractor, The Brennan Co., 1813 Main St., Dallas, Tex.

NORMAN C. ESTES, (1930), Sales Engineer, Wallace & Tiernan Co., Inc., 1904 Jackson St., Monroe, La.

OTTO S. JESSEN, (1929), Draftsman and Inspector, Mississippi-Warrior Service, 4956 Music St., 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.

CHESTER A. WILLIAMS, (1931), District Sales Manager, The Union Metal Mfg. Co., 1508 Candler Bldg., Atlanta, Ga.

RESIDENT JUNIOR MEMBERS

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

JEROME C. BAEHR, (1930), Junior Engineer, U. S. Engineer Office, 908 Webster St., New Orleans.

A. L. BLACK, JR., (1931), with Louisiana Highway Commission, 3932 St. Charles Ave., New Orleans.

LEINHARD BLUMER, JR., (1931), Engineer, 258 Audubon St., New Orleans.

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

PHILIP HOPE CAMPBELL, (1925), Engineer, with Federal Barge Lines, 6041 Perrier St., New Orleans.

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

LIONEL J. CUCULLU, (1928), with New Orleans Public Service Inc., 317 Baronne St., New Orleans.

SALVADOR DI BENEDETTO, (1925), Assistant Engineer, Drainage Department, Sewerage and Water Board, 1810 Galliер St., New Orleans.

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

HERMAN G. ENGELHARDT, (1932), Assistant Engineer, Distribution Dept., New Orleans Public Service Inc., 317 Baronne 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.

JOSEPH W. HAVLICEK, (1929), Radio Electrician, 8th U. S. Lighthouse District, 6014 Catina St., New Orleans.

STEPHEN C. HORVATH, (1929), Graduate of Delgado Trade School, 1904 Coliseum St., New Orleans.

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

JAMES S. JANSSEN, (1932), Engineering, with New Orleans Public Service Inc., 1903 Short St., New Orleans.

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 Port Commissioners, 1729 N. Rampart St., New Orleans.

ALBERT E. MARKS, (1925), 3320 Palmyra St., New Orleans.

NATHANIEL LEVIN MARKS, (1925), Assistant City Engineer, 4131 Elba St., New Orleans.

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

F. ROBERT MENDOW, (1930), Engineer, 2900 Calhoun St., New Orleans.

HU B. MYERS, JR., (1927), Civil Engineer, 6229 Calhoun St., New Orleans.

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

CLAYTON L. NAIRNE, (1929), with New Orleans Public Service Inc., 1219 Valence St., New Orleans.

WILLIAM P. OSTER, (1928), Sales Engineer, 4651 Bassich St., New Orleans.

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

MARCUS J. ROUX, (1931), with Federal Barge Line, 1610 Ursuline St., New Orleans.

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

HENRY F. SIRGO, (1932), with Todd Dry Dock, Engineering & Repair Co., Inc., Engineering Division, 1215 St. Anthony St., New Orleans.

FRANK GURLEY STEWART, (1928), City Engineer's Office, Assistant Engineer, Bridge Department, 3816 D'Hemecourt St., New Orleans.

S. A. THEARD, (1920), Oyster Shell Products Corp., Berwick, La.

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

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

CHARLES EDWARD WUERPEL, (1929), with Bonnet Carre Spillway, 1520 Jefferson Ave., New Orleans.

NON-RESIDENT JUNIOR MEMBERS

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

G. C. BADGER, (1913), Grinnell Co., of the Pacific, San Francisco, Calif.; residence, 1838 Tacoma Ave., Berkely, Calif.

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

MARTIN CARBONNELL, (1927), 1723 Burdette St., New Orleans.

DONALD A. duPLANTIER, (1922), Assistant Professor of Structural Engineering, University of Alabama, Tuscaloosa, Ala.

FRED H. FENN, (1930), Graduate Student, Louisiana State University, 204 Church St., Baton Rouge, La.

ALFRED LIPPMAN, JR., (1929), Chemist, 2508 Nashville Ave., New Orleans.

JACOB F. MULLER, JR., (1912), Vice-President, Muller Furniture Manufacturing Co., Ltd., 7024 Hickory St., New Orleans.

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

HENRY W. PAGE, (1928), Assistant Testing Engineer, Louisiana Power & Light Co., Sterlington, La.

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

BRISTER BLAKE PIERCE, (1929), 841 St. Hypolite St., Baton Rouge, La.

STUDENT MEMBERS

ROBERT LANG ARGUS, 7725 Plum St., New Orleans.

WILLIAM PFAFF BARROW, 5357 Magazine St., New Orleans.

CHARLES ALBERT BENDER, JR., 1729 Marengo St., New Orleans.

JOHN W. BIERHORST, JR., 3116 St. Claude Ave., New Orleans.

WILLIAM T. BOARDMAN, JR., 2017 Peniston St., New Orleans.

LAWRENCE CLAUDE BRUNE, 2546 Conti St., New Orleans.

LOUIS CARON, JR., 1715 Napoleon Ave., New Orleans.

CHARLES E. CASSAGNE, JR., 164 Delaronde St., New Orleans.

RICHARD HARRISON CHURCH, 7901 Willow St., New Orleans.

AUBREY GEORGE CODE, 7814 Green St., New Orleans.

RICHARD HUTSON COLCOCK, 828 Burdette St., New Orleans.

ERNEST A. COULOHERAS, 2627 Peniston St., New Orleans.

WILLIAM H. CREIGHTON, 1446 Henry Clay Ave., New Orleans.

DANIEL VAN S. CRESAP, 5420 Canal Blvd., New Orleans.

MARCEL EMILE CRETTET, JR., 5580 Woodlawn Place, New Orleans.

CHARLES D. DAVID, Mandeville, La.

ARTHUR A. DEFRAITES, 620 State St., New Orleans.

LUCIEN DEVALL, 2124 Milan St., New Orleans.

CLAUDE E. DOLHONDE, 7008 Zimple St., New Orleans.

WILLIAM JOSEPH DRAWE, JR., 7918 S. Claiborne Ave., New Orleans.

PETER J. ERICKSON, JR., 4020 Burgundy St., New Orleans.

THEODORE LAWRENCE ESTORGE, 1510 S. 71st St., West Allis, Wis.

GEORGE FINLEY EUSTIS, 1469 Henry Clay Ave., New Orleans.

DANIEL D. EWING, JR., 3339 Richardson Court, New Orleans.

CHARLES J. FRITCHIE, Slidell, La.

JOHN B. GEIGER, 902 Eighth St., Gretna, La.

JOHN S. GENTILICH, 6436 Catina St., New Orleans.

MERRILL A. GERSTNER, 1001 Louisiana Ave., New Orleans.

EDWARD H. GESSNER, 119 Audubon Blvd., New Orleans.

JOHN J. GIDIERE, 1015 Eleonore St., New Orleans.
JOSEPH E. GUIDRY, JR., 1101 Henry Clay Ave., New Orleans.
JOHN M. GUILLORY, 5201 Magazine St., New Orleans.
JOHN A. HAASE, III, 115 So. Hennessy St., New Orleans.
ERIC J. HANNEMAN, 1126 Dumaine St., New Orleans.
W. T. HESS, 202 Rosewood Drive, Metairie, New Orleans.
ALVIN E. HOTARD, 829 Lafayette Ave., Gretna, La.
EDMOND F. HUGHES, 4502 S. Miro St., New Orleans.
F. LAWES KLEINPETER, 2210 Nashville Ave., New Orleans.
LOUIS I. KORN, 6030 Garfield St., New Orleans.
CARL V. LAZARONE, Kenner, La.
STANLEY M. LECOURT, 213 N. Solomon St., New Orleans.
JOSEPH EDWARD LEININGER, 920 Music St., New Orleans.
WM. P. LEVERICH, 2100 Pine St., New Orleans.
CLARAMON B. McEACHERN, 7103 Freret St., New Orleans.
FRANK M. McDONALD, 2820 General Pershing St., New Orleans.
E. P. MADDEN, 1228 N. Rendon St., New Orleans.
EVAN W. MAHONEY, 806 Belleville St., New Orleans.
GEORGE ELMER MAY, 1533 Broadway, New Orleans.
LEAL C. McLEAN, 1544 Henry Clay Ave., New Orleans.
JOHN K. MAYER, 1738 Carrollton Ave., New Orleans.
PAUL G. MERRITT, JR., 1931 General Pershing St., New Orleans.
JOHN J. METZGER, JR., 3126 Dauphine St., New Orleans.
ALBERT J. MEYERS, 5517 Prytania St., New Orleans.
EUGENE H. MIAZZA, 3424 Prytania St., New Orleans.
MICHAEL P. H. MICHEL, 327 Alix St., New Orleans.
CHARLES R. MONTIERO, 1817 General Pershing St., New Orleans.
HERMANN D. MYSING, 2115 Palmer Ave., New Orleans.
JENS C. NIELSEN, JR., 7468 Garfield St., New Orleans.
MYRTIS M. NORTON, 908 Lowerline St., New Orleans.
J. F. NUNEMACHER, 4915 Bassich St., New Orleans.
PASCAL PERETI, JR., 619 Bourbon St. New Orleans.
PHILIP FRANK PHILLIPS, 4424 S. Claiborne Ave., New Orleans.
CARROLL J. PIERCE, JR., 8217 Nelson St., New Orleans.
WALTER H. PRICE, 3001 Ursuline Ave., New Orleans.
RAYMOND C. PROUET, 5110 Freret St., New Orleans.
JAMES M. ROBERT, JR., 2141 State St., New Orleans.
ASHLEY H. ROBINSON, 1735 Palmer Ave., New Orleans.
EDWARD A. RODRIGUE, 1543 Calhoun St., New Orleans.
HENRY B. SARGANT, c/o Mississippi Power & Light Co., Jackson, Miss.
JOSEPH H. SAUCIER, 2616 Ursuline Ave., New Orleans.
BEN ZION SEGALL, Tester, New Orleans Public Service Inc., 520 Magazine St., New Orleans.
GEORGE JACOB SEGEL, 3022 Baronne St., New Orleans.
IRVING SIDNEY SELIGMANN, 2803 Jefferson Ave., New Orleans.
LEWIS M. SHELTON, 4915 Bassich St., New Orleans.

HERBERT M. SHILSTONE, JR., 7730 Jeannette St., New Orleans.

WALTER SUMNER SIMPSON, 19 Audubon Place, New Orleans.

CHARLES B. SPENCER, 7325 Hampson St., New Orleans.

DAVID STAYER, with R. C. A. Victor Co., 219 White Horse Pike, Audubon, N. J.

HOMER H. STOCKMAN, 5665 Ada Place, New Orleans.

BRUNO STOLLEY, 630 Napoleon Ave., New Orleans.

HERBERT C. SWAN, 6316 Magazine St., New Orleans.

JOSEPH F. THOMPSON, 139 S. Genlois St., New Orleans.

LOUIS M. TOGNONI, 4609 Arts St., New Orleans.

BERNARD J. TORTOMASI, with Orleans Parish School Board, 2461 Burgundy St., New Orleans.

NELSON W. TREMBLAY, 2025 Jena St., New Orleans.

DALTON H. TREPAGNIER, 2427 Calhoun St., New Orleans.

WILDAY TUDURY, 2522 Palmer Ave., New Orleans.

ERNESTO VENEGAS, 1006 Broadway, New Orleans.

RICHARD E. WAGNER, 1818 S. Gayoso St., New Orleans.

JOHN MORT WALKER, JR., 6039 Prytania St., New Orleans.

O. P. WALKER, 5918 Chestnut St., New Orleans.

PHILIP ANTOINE WEBER, 3118 Magazine St., New Orleans.

CLARANCE MOHR WILLIAMS, 7103 Freret St., New Orleans.

JOHN W. WILSON, 7916 Oak St., New Orleans.

CARROLL LEE WOOD, JR., 819 Calhoun St., New Orleans.

CHARLES LAFAYETTE WRIGHT, JR., Romeville, La.

SUMMARY

Resident Honorary Members	5
Life Members	15
Resident Members	225
Non-Resident Members	95
Associate Members	31
Non-Resident Associate Members	5
Junior Members	39
Non-Resident Junior Members	12
Student Members	96
Total	523

PAST PRESIDENTS

Sidney F. Lewis	1898	L. C. Datz	1915
Thos. L. Raymond	1899	Samuel M. Young	1916
Henry J. Malochee	1900	A. T. Dusenbury	1917
Frank M. Kerr	1901	John Klorer	1918
Alf. F. Theard	1902	Ole K. Olsen	1919
Alf. Raymond	1903	John Riess	1920
J. F. Coleman	1904	R. S. Manley	1921
W. B. Wright	1905	Donald Derickson	1922
W. H. Hoffman	1906	J. S. Barelli	1923
G. W. Lawes	1907	James M. Robert	1924
C. W. Wood	1908	Marcel Garsaud	1925
J. T. Eastwood	1909	Farrar P. Hamilton	1926
W. B. Gregory	1910	Edward S. Lanphier	1927
J. C. Haugh	1911	John L. Porter	1928
D. S. Anderson	1912	Frederick H. Fox	1929
A. M. Shaw	1913	James M. Todd	1930
W. H. Williams	1914	Frank G. Frost	1931

MINUTES OF THE MEETINGS AND BUSINESS OF THE SOCIETY.

Minutes of the Meeting of the Board of Direction, December 14, 1931.

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

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

The matter of amendment to the Constitution and By-Laws was brought up, and on motion, duly seconded, the following recommended by the committee was revised and recommended by the Board to the Society for ballot:

ARTICLE III.

Following Sect. 2, insert:

Sect. 2a. The President, with the approval of the Board of Direction, shall appoint a Nominating Committee of three (3) members of the Society, not later than the October meeting. The notices for the November meeting of the Society shall advise the membership of the personnel of this Committee and that the Nominating Committee will consider suggestions for nominations for ten days following the November meeting. This Committee shall report its nominations, in writing, at the December meeting of the Society, which nominations, together with any other additional nominations ordered to be included by vote at the December meeting, shall be submitted to the membership, for ballot as hereinabove provided.

Amendments to By-Laws

Sect. 4, page 15—top line of page:

After the words, "entitled to vote," insert * * * if additional nominations to those presented by the Nominating Committee are desired * * * "shall be by written ballot, etc."

Page 15, line 11:

Substitute "all nominees" for the present wording, "the nominees."

The matter of student memberships was brought to the attention of the Board, and on motion, duly seconded, it was voted to extend membership to the first and second year students in the Engineering Course, also to reduce the annual dues from $5.00 to $3.00 per annnum, to enable a larger number of students to avail themselves of the advantages of membership in this Society.

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

For Resident Members

Herbert M. Shilstone James F. Tompkins

John Paul Dean

For Associate Member
D. F. Dulion

For Junior Member
Henry F. Sirgo, Jr.

For Resident Student Member

William T. Boardman, Jr.	Wm. P. Leverich
Daniel Van Sweringer Cresap	Michael P. H. Michel
John Stone Gentilich	Jens C. Nielsen, Jr.
John Aloysius Haase	Edward Andrew Rodrigue
Louis Isaac Korn	Louis Milton Tognoni

Ernesto Venegas

There being no further business, the meeting adjourned.

F. A. MUTH, Secretary.

Minutes of the Meeting of the Society Held December 14, 1931.

The meeting was called to order about 8:15 P. M., President Frost in the chair, F. A. Muth, Secretary, and 101 members and guests present. This was the Homecoming Meeting, and a large number of "old timers" were present; therefore, due to the long program, on motion, duly seconded, it was voted to dispense with the reading of the minutes.

A number of announcements were made in regard to the Convention for the Association for Advancement of Science to be held in New Orleans the latter part of the month. Several committees submitted their reports.

Certificates of Life Membership were awarded to Messrs. John T. Eastwood and Ben Willard. Certificates for the following members who were not present were ordered mailed to them: Messrs. Will J. Gibbons, Sr., Ernest Lee Janeke, and Ira W. Sylvester.

Owing to the limited time, on motion, duly seconded, it was voted that a slate for nominations recommended by the Board be offered to written ballot with the understanding that any member present could make suggestions for any other names he desired in lieu of the names recommended by the Board for nominations.

For President.....Fred N. Billingsley
For Vice-President.....John H. O'Neill
For Secretary.....Frank A. Muth
For Treasurer.....Walter B. Moses
For Director (to serve 3 years).....Charles Wiggin, Jr.

A most interesting talk was made by Mr. A. C. Davis on "The American Engineer in Russia." This was followed by considerable discussion. A rising vote of thanks was tendered the speaker.

Mr. Carl Schneider made a short talk explaining the plans of the Committee for Relief of Unemployment, of which he is chairman. All members were urged to assist this committee in every way practicable in this good work.

The meeting adjourned to the usual collation.

F. A. MUTH, Secretary.

Minutes of the Meeting of the Board of Direction, January 17, 1932.

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

The minutes of the previous meeting were read and approved and bills on hand were approved with the usual provision for payment of smoker expenses.

Communication from Mr. B. R. Van Leer was read and the Secretary was instructed as to reply to be made.

Communication from the Interstate Bank & Trust Co. was read and on motion, duly seconded, it was voted to refer the matter to the Finance Committee for action. The annual reports of the Treasurer and the Secretary were read and ordere published in the "Proceedings." Report of the Auditor was read and ordered filed, not to be printed in interest of economy due to reduced revenues.

The resignations of the following were accepted with regret:

Hugo Schlenk, Jr. E. W. Burgis
S. T. Adams Scott Thompson
F. J. Trelease

The membership of Mr. F. P. Hamilton was changed from Non-Resident to Resident Member. Mr. H. L. McCotton was changed to a Non-Resident Member.

There being no further business, the meeting adjourned.

F. A. MUTH, Secretary.

Minutes of the Annual Meeting of the Society, January 17, 1932.

The meeting was called to order about 8:10 P. M., Mr. Frank G. Frost, President, in the chair, F. A. Muth, Secretary, and 12 members and guests present.

On motion, duly seconded, the reading of the minutes of the previous meeting, also the annual reports of the Secretary and Treasurer, were dispensed with, as these will be published in the "Proceedings."

The annual report of the Board of Direction was read and ordered printed in the "Proceedings."

The following proposed amendment to the Constitution and By-Laws was brought up and approved for the first reading:

ARTICLE III.

Following Sect. 2, insert:

Sect. 2a. The President, with the approval of the Board of Direction, shall appoint a Nominating Committee of three (3) members of the Society, not later than the October meeting. The notices for the November meeting of the Society shall advise the membership of the personnel of this Committee and that the Nominating Committee will consider suggestions for nominations for ten days following the November meeting. This Committee shall report its nominations, in writing, at the December meeting of the Society, which nominations, together with any other additional nominations ordered to be included by vote at the December meeting, shall be submitted to the membership, for ballot as hereinabove provided.

Amendments to By-Laws

Sect. 4, page 15—top line of page:

After the words, "entitled to vote," insert * * * if additional nominations to those presented by the Nominating Committee are desired * * * "shall be by written ballot, etc."
Page 15, line 11:

Substitute "all nominees" for the present wording, "the nominees."

The ballots for new members were opened, there being 77 formal ballots, 6 informal ballots, and no scratch ballots. Therefore the following were declared elected:

For Resident Members

Herbert M. Shilstone — James F. Tompkins
John Paul Dean

For Associate Member

D. F. Dulion

For Junior Member

Henry F. Sirgo, Jr.

For Resident Student Members

William T. Boardman, Jr. — Wm. P. Leverich
Daniel Van Sweringer Cresap — Michael P. H. Michel
John Stone Gentilich — Jens C. Nielsen, Jr.
John Aloysius Haase — Edward Andrew Rodrigue
Louis Isaac Korn — Louis Milton Tognoni
Ernesto Venegas

The ballots for officers were opened, there being 82 formal ballots, 6 informal ballots, and no scratch ballots. Therefore, the following officers were declared elected:

President.....Fred N. Billingsley
Vice-President.....John H. O'Neill
Secretary.....Frank A. Muth
Treasurer.....Walter B. Moses
Director (to serve 3 years).....Charles Wiggin, Jr.

Mr. Frank G. Frost made a short address, thanking the officers, members and committees for the support they had given him during the year, and he requested that the same support be given the incoming President. Mr. Billingsley was then conducted to the chair and made a short address. The meeting then adjourned to the Annual Smoker, which was held at the Jung Hotel.

F. A. MUTH, Secretary.

ANNUAL REPORTS

ANNUAL REPORT OF THE BOARD OF DIRECTION

Year 1931.

New Orleans, La., Jan. 13, 1932.

To the Members of the Louisiana Engineering Soseiety:

Gentlemen- Your Board of Direction begs to report that during 1931 there were held 9 regular meetings and 1 special meeting, or a total of 10 meetings of the Board for the transaction of the business of the Society.

Accomplishments of Standing Committees—The Technical Papers Committee has given us a most excellent program of very high-grade papers. These papers are recorded in the ''Proceedings'' as a permanent record.

The Library Committee has done good work and some valuable accessions have been made to the Library during the year. A number of chairs have been recaned and the book shelves overhauled and cleaned.

The Committee on Employment has kept up its record for fine work in taking care of some members who desired employment or a change of employment. This committee is a valuable one to the members, also to the employers involved.

The Membership Committee has done good work this year. The increase in membership has been gratifying in that 33 members were admitted. Of course, as usual, there have been a number of resignations and adjustments, with five deaths, the net increase resulting in 12 new members. During the year nine members were transferred to the grade of Life Member after having paid dues for thirty years. Seevral students were transferred to higher grades.

The Publications Committee has given us six very excellent issues of the ''Proceedings'' during 1931. Professor James M. Robert, Editor of the Journal, deserves the highest praise for the quality and tone of the magazine, and the Board, as well as the members of the Society, recognize the fact that the ''Proceedings'' is a powerful factor in the interest and usefulness of our Society.

The Committee on Publications, Division ''B,'' has done good work this year in renewing advertisements. While there has been a decrease in the number of advertisements carried, as has been expected, the Board is hopeful that considerable gain will be made during the next year as the effective work of this Committee is necessary in order to maintain the high character of our publication.

The Motivating Committee has served as a reception committee in meeting the members at the door and in getting members acquainted. This committee did especially good work at the Homecoming Meeting, when so many of the old timers were present.

The Board of Direction authorized a Legislative Committee, which committee has been much needed. This committee will undertake to make a study of legislation which will affect the status of the engineer and the engineering profession. The committee is giving especial attention at this time to the registration of professional engineers.

Accomplishments of Special Committees—Much important work of the Society has been carried on by special committees, appointed to undertake the study of certain features, then submit recommendations to the Board. Some of the projects reported upon and carried out or completed are:

Arrangements for Golf Tournament.

Bridge Clearances.

Necessity for formulating rules and regulations concerning professional conduct.

Amending Constitution to provide for a Nominating Committee.

The following work is now being continued by special committees:

Student Memberships.

Status of registration of professional engineers since last meeting of the Legislature.

A. S. M. E. Boiler Code.

Bench Marks.

The Committee on Registration of Professional Engineers is preparing data and giving further study for introduction by the Society of a bill in the Legislature conforming to the bill approved by the Society and other engineering societies and organizations.

The Society has been pursuing as one of its activities of the year, the securing of adequate stable bench marks in this locality which can be used by the U. S. Coast and Geodetic Survey primary net work. Some encouraging progress has been made and this activity should be actively continued next year.

Scholarships—Scholarships were awarded to R. M. Dreyfus of Louisiana State University and Dan Cresap of Tulane University.

Junior Memberships—The Society also continued to award Junior Memberships, which are awarded to outstanding students in engineering. This year the awards were made to Jerome C. Baehr of Tulane University and Lienhard Blumer of Louisiana State University.

Homecoming Meeting—A Homecoming Meeting was arranged for the December meeting. This was a most successful affair and the largest attendance at a regular meeting in recent years resulted. Special effort was put forth to have many of the "old timers" present. Certicates of Life Memberships were awarded to five members at this meeting. It is hoped that the Homecoming Meeting will be made an annual affair.

Golf Tournament—A very successful Gold Tournament was held at the Colonial Country Club and the committee left nothing undone to make this a pleasant and interesting function of the year. A number of trophies were secured and awarded at this tournament, which was

self-supporting. It is hoped that a golf tournament can be staged each year.

Student Memberships—In order to stimulate the interest of students in engineering in memberships in the Society, and to enable them to have a longer time to contact with the Society membership during their college course on a practical financial basis, student membership has been extended to the first and second year students at a reduction in cost of dues to all student members. Formerly only upper classes were eligible to become student members. The annual dues have been reduced from $5.00 to $3.00 per annum. It is believed that this opportunity extended to a larger number of students will be mutually advantageous to students and to the Society. Other advantages to the students are being investigated by a special committee.

The Society financed a contribution of $20.00 to Mechanical Engineering Students in Tulane University and a similar contribution to Louisiana State University, to assist in depraying expenses of Mechanical Engineering Students who attended the Spring Meeting of the A. S. M. E. in Birmingham.

Boat Ride—In addition to the Annual Smoker, arranged by the Committee on Entertainments and Outings, a most instructive boat ride was taken upon invitation of the Orleans Levee Board, at which time members had an opportunity to visit and inspect the construction work in progress at the Pontchartrain Sea Wall. Refreshments were served by the committee.

Unemployment Relief—The state committee of the American Engineering Council on Unemployment Relief is made up of members of this Society, with Mr. Carl Schneider as chairman. The committee has outlined its plans to the Society and all members are urged to assist in this worthwhile cause.

Reports—Attention is called to the financial condition of the Society. The financial statement shows that the Proceedings Fund has decreased $71.66. Our investments are well placed and amount to $9,407.49. The Treasurer's report shows a cash balance on January 1, 1932, of $1,561.70.

Conclusion—It is believed that the Louisiana Engineering Society is justified by its accomplishments of the year. It has been a most trying year on the members. The Board appreciates the support of the members which has so generously been given. In conclusion, the Board wishes to thank the various committees and members of the Society for their co-operation and interest in helping to carry on so successfully the work of the Society.

Respectfully submitted,

FRANK G. FROST, President,
F. N. BILLINGSLEY, Vice-President,
FRANK A. MUTH, Secretary,
WALTER B. MOSES, Treasurer,
JAMES M. TODD,
JOHN H. O'NEILL,
A. L. DUNLAP,
E. S. BRES,

Board of Direction.

ANNUAL REPORT OF THE SECRETARY

Year 1931

New Orleans, January 2nd, 1932.

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 1931:

During the past year, the Board of Direction has held 9 regular and 1 special meeting, a total of 10 meetings; the Society has held 10 regular meetings, one boat ride and one golf tournament, with an average attendance of 62 at regular meetings, maximum 101, minimum 56. This was in addition to the Annual Smoker.

The membership shows a steady increase from year to year. This year there has been a net increase of 12 members, although there was a total of 33 members elected and reinstated.

GRADE	On Roll Jan. 1, 1931.	Elected	Reinstated	Transferred to	Transferred from	Dropped	Resigned	Failed to Qualify	Died	On Roll Jan. 1, 1932
Honorary Members..	5	....	....	....	....	....	....	....	....	5
Life Members.....	6	....	....	9	....	....	....	....	....	15
Resident Members....	235	8	2	1	14	5	....	1	1	225
Non-Res. Members....	95	1	....	9	1	3	3	....	3	95
Associate Members..	27	7	....	1	2	1	....	....	1	31
Non-Res. As. Mem...	3	1	....	1	....	....	....	....	....	5
Junior Members.....	38	3	....	1	1	2	....	....	....	39
Non-Res. Jun. Mem.	11	....	....	1	....	....	....	....	....	12
Student Members.....	91	11	....	....	5	....	....	1	....	96
	511	31	2	23	23	11	3	2	5	523

It is with regret that the deaths of Messrs. T. H. Sampson, E. G. Sandoz, J. W. Billingsley, J. A. Salmen and E. C. Walthall are recorded.

The Treasurer's report is submitted, and shows a cash balance of $1,561.70.

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

Total Receipts	$6,004.20	
Total Disbursements	4,442.50	
		$1,561.70
Checking account in New Orleans Bank & Trust Co		$1,561.70
1—Union Title Guarantee Gold Note	$1,000.00	
1—New Orleans Securities Gold Note	1,000.00	
1—Farmer & Ochs Gold 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	1,144.52	
Union Homestead	500.00	
Standard Homestead	500.00	
Italian Homestead	500.00	
Security Homestead	500.00	
Columbia Homestead	500.00	
N. O. Bank & Trust Co. (Savings Account)	1,666.06	
Canal Bank & Trust Co. (Savings Account)	596.91	
		9,407.49
		$10,969.19

The following technical exercises were held:

Feb. 9—"The Work of the U. S. Coast and Geodetic Survey," by Lieut.-Commander Ray L. Schoppe.

Mar. 9—"Some Notable European Laboratories," by Prof. W. B. Gregory.

Apr. 13—"A New Story of Ancient Wrought Iron," by Mr. R. Carson Hamlett.

May 11—"Wood—Its Practical Application in Engineering," by Mr. W. H. Seales.

June 8—"Numerically Speaking," by Prof. C. G. Jaeger.

Sept. 15—"An Inquiry Into the Causes of, and the Remedies for Unemployment," by Mr. Carl Schneider.

Oct. 12—"The Old New Orleans Mint Building," by Gen. Allison Owen.

Nov. 9—Inspection of College of Engineering at Tulane University.

Dec. 14—"The American Engineer in Russia," by Mr. A. C. Davis.

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

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

Respectfully submitted,

FRANK A. MUTH, Secretary.

FINANCIAL CONDITION OF THE SOCIETY

January 1, 1932.

Assets:

Cash on hand in bank	$ 1,561.70	
Accounts Receivable (Members)	3,969.75	
Accounts Receivable (Advertisers)	18.70	
Entrance Fees Receivable	255.50	
Smoker Fees Receivable	239.50	
Investments	9,407.49	
		$15,452.64

Liabilities:

Proceedings Reserve Fund	$ 824.99	
Building Fund	151.65	
Library Fund	1,072.50	
Accounts Payable	291.35	
1932 Dues in Advance	31.50	
Balance in General Fund	13,080.65	
		$15,452.64

General Reserve Fund

Balance from 1925 and Previous Years	$ 4,343.72	
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	
Transferred from Proceedings Reserve Fund in 1929	700.00	
Transferred from Library Reserve Fund in 1929	200.00	
Balance from 1929	1,151.22	
Balance from 1930	1,140.29	
Balance from 1931	679.18	
		$13,080.65

Proceedings Reserve Fund

Balance from 1925 and Previous Years	$ 1,311.97	
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	

Less Amount Transferred to General Fund—1929	700.00	
	$ 578.13	
Balance from 1929	169.48	
	$ 747.61	
Balance from 1930	149.04	
	$ 896.65	
Less Deficit 1931	71.66	
		$ 824.99

Cash Account—Year 1931

Receipts:		
1928 Dues Collected	$ 20.00	
1929 Dues Collected	49.00	
1930 Dues Collected	476.00	
1931 Dues Collected	2,462.75	
1932 Dues Collected	24.00	
Smoker Membership Collected	277.50	
Entrance Fees	148.00	
Advertisers in Proceedings	866.67	
Interest	211.92	
Total Receipts		$ 4,535.84
Deduct Exchange		4.60
		$ 4,531.24
Add Balance of January 1, 1931		1,472.96
		$ 6,004.20
Total Vouchers Paid During Year		4,442.50
Balance on Hand, Checking Account, Jan. 1, 1932		$ 1,561.70

Library Fund

Revenues:		
Balance, January 1, 1931	$ 886.14	
Allotted from General Fund	480.00	
		$ 1,366.14
Expenditures:		
Jacob R. Pierre	$ 6.00	
American Society for Testing Materials	10.40	
Subscriptions for Magazines and Periodicals	23.50	
Carrie Freret, Salary	165.00	
Silers, Inc., for Books	9.00	
Steeg Printing Co.	1.50	
W. W. Eckert, Binding	25.00	
Lighthouse for the Blind for Caning Chairs	19.90	
Gaylord Bros., Inc., for Supplies	5.34	
Accounts Payable	28.00	
		293.64
Balance on Hand December 31, 1931		$ 1,072.50

Proceedings Fund

Revenues:		
Advertising Revenues	$ 872.18	
Members Subscriptions	1,018.00	
		$ 1,890.18
Expenses:		
Salary of Editor and Secretary	$ 360.00	
Printing and Mailing	1,326.92	
Stenographer at Meetings	62.25	
Proceedings Miscellaneous Expense	180.00	
Advertisements Cancelled	32.67	
		$ 1,961.84
Deficit		$ 71.66

General Fund—1931

Revenues:		
Membership Dues for 1931	$4,183.00	
Smoker Account	315.00	
Entrance Fees	208.00	
Interest on Investments	322.72	
		$ 5,028.72
Expenses:		
Subscriptions to Proceedings	$1,018.00	
Allotment to Library Fund	480.00	
Secretary Dues	12.00	
Printing and Postage	346.95	
Secretary Salary	540.00	
Refreshments	197.25	
General Expense	221.54	
Exchange	4.60	
Auditor	50.00	
Smoker Expense	630.70	
Scholarships	165.00	
Loss on Cancelled Memberships	683.50	
		$ 4,349.54
Net Revenue for Year 1931		$ 679.18

ANNUAL REPORT OF TREASURER

January 1st, 1932.

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 Jan. 1st, 1931, to Jan. 1st, 1932:

Received from Secretary—	Deposited in New Orleans Bk. & Tr. Co.	Exchange Charged
Feb. 7th, 1931—Memo 1 to 8 incl.	$1,451.28	$ 1.15
Mar. 9th, 1931—Memo 9 to 11 incl.	356.08	.50
Apr. 13th, 1931—Memo 12 to 14 incl.	457.45	.30
May 11th, 1931—Memo 15 to 18 incl.	494.15	.55
June 8th, 1931—Memo 19 to 20 incl.	236.84	.60
July 17th, 1931—Memo 21 to 22 incl.	204.92	.25
Aug. 14th, 1931—Memo 23 to 25 incl.	317.30	.55
Sept. 19th, 1931—Memo 25 to 26 incl.	207.25	.10
Oct. 12th, 1931—Memo 27 to 28 incl.	254.72	.20
Nov. 9th, 1931—Memo 29 to 30 incl.	94.00	.....
Dec. 14th, 1931—Memo 31 to 32 incl.	187.25	.20
Dec. 28th, 1931—Memo 33 to 34 incl.	164.43	.20
	$4,426.47	$ 4.60
Coupons Deposited (Liberty Bonds)	19.37	
Coupons Deposited (N. O. Securities)	30.00	
Coupons Deposited (Farmer & Ochs)	60.00	
		$4,535.84
Less Exchange		4.60
		$4,531.24
Balance on Hand as per Treasurer's Report Jan. 1, 1931		1,472.96
		$6,004.20

Disbursements from January 1st, 1931, to January 1st, 1932.

No.	Name—	Amount
January 19th—		
1	Carrie Freret	$ 15.00
2	Edna Doll	15.00
3	McGraw-Hill Pub. Co.	13.00
4	American Society for Testing Materials	11.20
5	Tulane Press	192.40
6	F. A. Muth	55.75
7	New Orleans Bank & Trust Co.	6.00
8	Gassie and Bell	51.25
9	Jos. Levy and Bros. Co.	8.75
9½	O. H. Ahten Jewelry Co.	2.00
10	W. Tabrum	2.25
11	Jacob Remy Pierre	6.00
12	Addressograph Co.	2.01
13	Leo Loubere	50.00
14	Silers, Inc.	9.00
15	Walter B. Moses	332.45
16	Y. Drouet	35.00
17	Jung Hotel	219.00
February 10th—		
18	Edna Doll	15.00
19	Carrie Freret	15.00
20	F. A. Muth	56.00
21	Boylan's Detective Agency	3.00
22	American Society for Testing Metals	10.40
23	Simmons Boardman Co.	6.00
24	A. Serremon	15.00
March 9th—		
25	Carrie Freret	15.00
26	Edna Doll	15.00
27	Victory Printing Co.	3.50
28	Earle J. Christenberry	7.50
29	F. A. Muth	54.50
30	Tulane Press	102.02
31	Boylan's Detective Agency	3.00
32	A. Serremon	15.75
33	Addressograph Co.	1.72

No.	Name—	Amount
April 13th—		
34	Tulane Press	394.48
35	Ferd. S. Marks Ins. Agency	17.50
36	Carrie Freret	15.00
37	F. A. Muth	54.50
38	Edna Doll	15.00
39	Boylan's Detective Agency	3.00
40	A. Serremon	15.00
41	Walter W. Wekert	10.00
42	Earle J. Christenberry	15.00
43	Douglas Anderson	20.00
44	L. J. Lassalle	20.00
May 12th—		
44A	Tulane Press	$ 50.55
45	E. J. Christenberry	7.50
46	Rowland and McRedmond	20.00
47	Boylan's Detective Agency	3.00
48	Edna Doll	15.00
49	Carrie Freret	15.00
50	F. A. Muth	54.50
51	A. Serremon	15.00
52	Walter B. Moses	48.75
53	Tulane Press	242.45
June 8th—		
54	McGraw-Hill Book Co.	2.50
55	Bobbs Merrill Co.	5.00
56	Edna Doll	15.00
57	Carrie Freret	15.00
58	J. M. Robert	150.00
59	F. A. Muth	54.50
60	Boylan's Detective Agency	3.00
61	E. J. Christenberry	7.50
62	A. Serremon	15.00
63	Blank.	
64	Geo. W. Lawes	3.00
July 20th—		
65	E. J. Christenberry	9.75
66	Carrie Freret	30.00
67	Edna Doll	30.00
68	Tulane Press	202.25
69	Addressograph Co.	1.71
70	F. A. Muth	111.75

No.	Name—	Amount
September 15th—		
71	Tulane Press	250.65
72	Edna Doll	15.00
73	Carrie Freret	15.00
74	Carl Schneider	3.60
75	F. A. Muth	55.50
76	Boylan's Detective Agency	3.00
77	A. Serremon	15.00
78	Tulane University	125.00
79	La. State University	40.00
October 12th—		
80	Tulane Press	8.85
81	W. W. Eckert	15.00
82	Gaylard Bros., Inc.	5.34
83	F. A. Muth	55.50
84	Carrie Freret	15.00
85	Edna Doll	15.00
86	Boylan's Detective Agency	3.00
87	Earle J. Christenberry	7.50
88	A. Serremon	15.00
89	Compressed Air Mag. & Period. Co.	6.00
November 9th—		
90	Tulane Press	9.50
91	Earle J. Christenberry	7.50
92	Douglas Anderson	25.00
93	F. A. Muth	52.50
94	Lighthouse for the Blind	19.90
95	Edna Doll	15.00
96	Carrie Freret	15.00
97	McGraw Hill Book Co.	4.00
December 14th—		
98	James M. Robert	150.00
99	Edna Doll	15.00
100	Carrie Freret	15.00
101	F. A. Muth	55.50
102	Tulane Press	253.29
103	Boylan's Detective Agency	3.00
104	A. Serremon	17.75
105	E. M. S. LeBlanc	40.00
106	Victory Printing Co.	2.50
107	Steeg Printing Co.	1.50
		$4,442.50

RECAPITULATION
January 1st, 1932

Total Receipts	$ 6,004.20	
Total Disbursements	4,442.50	
		$ 1,561.70
Checking Account in N. O. Bank & Trust Co.		$ 1,561.70
1—Union Title Guarantee Gold Note	$1,000.00	
1—New Orleans Securities Gold Note	1,000.00	
1—Farmer & Ochs Gold 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 Lona	250.00	
Greater New Orleans Homestead	1,144.52	
Union Homestead	500.00	
Standard Homestead	500.00	
Italian Homestead	500.00	
Security Homestead	500.00	
Columbia Homestead	500.00	
N. O. Bank & Trust Co. (Savings Account)	1,666.06	
Canal Bank & Trust Co. (Savings Account)	596.91	
		9,407.49
		$10,969.19

Respectfully submitted,

LOUISIANA ENGINEERING SOCIETY,
Walter B. Moses, Treasurer.

REPORT OF THE EMPLOYMENT COMMITTEE

New Orleans, La., January 13th, 1932.

To the President and Members of the Louisiana Engineering Society:

Gentlemen—As Chairman of the Employment Committee of the Louisiana Engineering Society I take great pleasure in handing you herewith my report covering last year's activities of your committee, which is composed of the writer and Mr. R. Bassich.

Mr. Bassich has sent me his figures which I am combining with my own record. I am tabulating below results of your committee's work:

Number of applications received	176
Number of vacancies	35
Number of vacancies filled by applications filed with us	24

It is entirely likely that more vacancies were filled than reported above, because in many instances applicants registered with us have secured positions through out efforts and then overlooked notifying us to the effect that they have secured such positions.

It is also extremely likely that applicants have registered both with Mr. Bassich and myself, but we feel that under the conditions existing last year excellent work has been done.

Mr. Bassich and myself hope that any engineers, draftsmen, etc., out of positions will continue to file their applications with either of us.

I trust that this report is satisfactory to the Society.

Yours very truly,

R. H. Baumbach, Chairman.

The Proceedings of the Louisiana Engineering Society

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LOUISIANA ENGINEERING SOCIETY

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PROCEEDINGS
OF THE
LOUISIANA ENGINEERING SOCIETY

VOL. XVIII. APRIL, 1932 NO. 2

CONTENTS

EDITORIAL NOTES AND COMMENT

My Society—And Yours! !—The Louisiana Engineering Society does not belong to the Editor! It does not belong to the President! Nor does it belong to the Secretary—nor the Treasurer, nor to the Board of Direction!

To whom then does it belong? To *YOU*—the members—to have and to hold, for better or for worse. Never forget this; the officers are only the servants of the Society and have accepted office for the sole purpose of serving the Society, which means serving the members. Just as any person needs the assistance and co-operation of those for whom they are working, so do the officers need *your* help and co-operation in order to serve you better.

This time of stress has put burdens on all of us, nor has the Society itself been exempt from these added burdens. To meet this contingency the Board of Direction has appointed a Budget Committee. This Committee has carefully considered every projected expenditure for the coming year and rendered a report

eliminating every expenditure possible without reducing the efficiency of the Society. The Board has accepted their recommendations.

But certain necessary activities of the Society—*your* Society—must go on. They require money, even if the amount of expenditure has been reduced. The only source of money is dues—*your* dues. Please send them in quickly.

The membership falls into three classes in this time of stress. The first class consists of those, and thank Heaven they are few, who have no job, no early prospect of one, and are hungry. To those we say, "Good Luck," in the early procurement of a job! ! We know you will take care of your dues at your earliest opportunity.

The second class of membership consists of those of us whose incomes have been considerably reduced. We have had to deny ourselves some things, we may be even a little bit hungry, but we are still buying gasoline. To those we say, "Won't you do without a few gallons and send in your dues?" Your Society needs them.

The third class consists of those whose incomes have not yet been materially reduced. Yes, thank Heaven, there are even a few of them, too. They haven't yet sent in their dues because they somehow feel that the Society has enough to operate on, and that it couldn't possibly make very much difference whether they send in their few dollars this months, or two or three months hence.

And to those we say, "It *does* make a difference, a very material difference. Please send them in *now.*"

Your officers are working hard, but they cannot operate *YOUR* Society for *YOUR* benefit, without *YOUR* co-operation. Won't you accord them that co-operation?

Use of Blast Furnace Slag in Bituminous Pavements. We note herewith a paper of the above title. In these days when road construction is the basis of so much discussion, both engineering and political, it is interesting to note a cheap road material which is so admirably adopted to the purpose and which originates in such large quantities in our own Southern locality.

Lee's Ferry Bridge—Grand Canyon of the Colorado. Hurrah for our Student members! The paper with the above title was read by one of our Student members, Mr. Herbert M. Shilstone, Jr. He made a good job of it, too, topping it off with motion pictures.

We can't print the motion pictures, but we are printing Mr. Shilstone's paper which accompanied the pictures. We welcome the efforts of our Student members. Let's have some more! Also, let's have more papers by members of *any* grade.

PAPERS AND DISCUSSIONS

THE USE OF BLAST FURNACE SLAG IN BITUMINOUS PAVEMENTS

W. H. CARUTHERS.*

Abstract of Address Before Louisiana Engineering Society, March 14, 1932.

The use of blast furnace slag in road construction is not a new thing, nor is it confined to this country alone, as we have documentary record of its use in England, Spain, Holland, Austria, Germany, Sweden, France, Czecho-Slavakia, Russia, Belgium, Switzerland, Chili, China, Japan and Australia.

It is now being used in the manufacture of portland cement and puzzolan cement; moulded into brick and building blocks. Crushed and screened, it is used for the construction of traffic bound road surfaces, water bound macadam, in portland cement concrete, in bituminous concretes, in sheet asphalt, in bituminous macadam, and for surfaces which are mixed in place. Also, it is used as cover for the various types of bituminous surface treatments.

Blast furnace slag is a non-metallic product consisting essentially of silicates and alumina-silicates of lime, which is developed simultaneously with iron in a blast furnace.

Its composition is quite similar to portland cement, having exactly the same component parts and differing only in proportions:

	Blast Furnace Slag %	Portland Cement %
Silica	32 — 48	20 — 25
Lime	17 — 45	57 — 65
Alumina	8 — 20	5 — 29
Magnesia	1 — 12	.065 — 3
Iron	1 — 3	2 — 5
Sulphur Compound	0.5 — 2.5	1.25 — 2.0

* Sales Engineer—Birmingham Slag Co.

From a practical view point blast furnace slag makes an ideal aggregate for use in paving construction. It is clean and free from dust, the individual pieces are cubical in shape with rough pitted surfaces that give better bonding properties with both portland and bituminous cements than is given by other (smooth surfaced) aggregates. In bituminous construction these pits serve as reservoirs for a slight excess of bitumen, which guarantees longer life and pavement service. Slag can be purchased in any gradation of screen sizes from 4" to 200 mesh. It is comparatively light in weight, screened slag passing 1½" screen and retained on ¼" screen will average 2200# per cubic yard, and has a range of voids of from 38% to 46%, with an average apparent specific gravity of 2.30.

The first slag used in America, of which we have a record, was in the construction of a road into the iron furnace at Merramac Springs, Missouri, in 1832—this road is still in use and in good condition.

Probably slag was first used in bituminous paving in England, as records show slag tar macadam was laid in Nottingham in 1861 and again in Sheffield and Bedfordshire in 1875. From that date on its use increased rapidly until in 1926, Tarmac Ltd. was shipping 1,650,000 tons annually from its twenty plants, and the Stanten Coal and Iron Company 825,000 tons annually. The English Tarmac is premixed at a central plant and laid cold in one or more courses. Mr. E. J. Mehren, Editor of *Engineering News-Record;* and other American observers, have found that slag is generally preferred to any other aggregate for this purpose, and have commented upon the unusual smoothness of these road surfaces and the heavy traffic they carry.

In the United States slag was first used in bituminous macadam in New York and Pennsylvania in 1910, and in bitulithic in 1914. Since that time its use has increased rapidly wherever available, until now it is included in the following standard specifications of the American Society for Testng Materials for 1930:

Water Bound Macadam Base,
Water Bound Macadam Wearing Course,
Bituminous Concrete Base,
Bituminous Concrete Fine Graded Type,
Bituminous Concrete Coarse Graded Type,
Bituminous Macadam Wearing Course.

It is described in the above specifications as follows: "The broken slag shall be air cooled blast furnace slag and shall consist of angular fragments reasonably uniform in density and quality, and reasonably free from thin, elongated or glassy pieces, dirt or other objectionable matter."

"The weight per cubic foot of each size specified shall not be less than 70 pounds." Commercial crushed and screened slag is now available in the following sizes:

No. 1	for roads	4" to 2½"
No. 12	for roads	4" to 1½"
No. 2	for roads	2½" to 1½"
No. 23	for roads	2½" to ¾"
No. 3	for concrete	1½" to ¾"
No. 34	for concrete	1½" to ¼"
No. 4-A	for bitulithic	1¼" to ¼"
No. 4	for bituminous paving	¾" to ¼"
No. 46	for bituminous paving	¾" to 10 mesh
No. 6	for bituminous paving	⅝" to 10 mesh
No. 6-A	for roofing	⅝" to ¼"
No. 67	for bituminous paving	⅝" to dust
No. 7	for bituminous paving	¼" to dust
No. 78	for bituminous paving	¼" to 10 mesh

and mineral filler for bituminous pavements.

Due to heavy demands of high speed traffic and limited funds, the use of slag covered surface treatment has become quite general throughout the South. The yardage in use today tells a story of low cost construction and maintenance that has made possible the enviable part slag has played in the development of the Southeastern States:

Alabama	1,494,240 sq. yds.
Arkansas	73,920 sq. yds.
Florida	28,954,570 sq. yds.
Georgia	6,368,630 sq. yds.

Louisiana	530,112 sq. yds.
Mississippi	638,986 sq. yds.
North Carolina	63,360 sq. yds.
South Carolina	2,112,000 sq. yds.
Tennessee	209,933 sq. yds.
Total	40,445,751 sq. yds.

The unusual qualities of blast furnace slag that make it a desirable mineral aggregate for paving construction, coupled with the prompt service given by the producers, has been responsible for running the yardage of all types of paving in which slag has been used in the Southeastern States into very respectable figures:

Amiesite	551,635 sq. yds.
Asphaltic Concrete	2,805,212 sq. yds.
Bituminous Macadam	7,620,103 sq. yds.
Mixed in Place	200,782 sq. yds.
Sheet Asphalt	3,528,602 sq. yds.
Surface Treatment	40,445,751 sq. yds.
Warrenite Bitulithic	2,178,792 sq. yds.
Water Bound Macadam	158,400 sq. yds.
Portland Cement Concrete	6,387,835 sq. yds.
Total	63,877,122

LEE'S FERRY BRIDGE—GRAND CANYON OF THE COLORADO

By Herbert M. Shilstone, Jr.*

Read Before the Society, February 15th, 1932.

I wish to say that I fully appreciate the honor of being before you to-night and I hope that my remarks will justify my presence.

We are greatly indebted to the American Institute of Steel Construction both for the use of the films and for the supplementary data which will be given you.

I wish to give some explanatory data about the Lee's Ferry Bridge over the Colorado River in Arizona, and then show a motion picture of its construction.

From Topock, California, for eight hundred miles up the Colorado River until recently there had not been a single bridge for wheeled vehicles. To travel by road from Flagstaff, Arizona, to Salt Lake City, Utah, had involved a ferry crossing of the Colorado in that portion of the upper part of the Grand Canyon known as Marble Canyon at Lee's Ferry, 145 miles north of Flagstaff. The road into and out of the canyon at this point was extremely dangerous and at times the ferry itself was impassible because of floods. Realizing the need for a safe and dependable river crossing the State of Arizona worked with the Bureau of Public Roads, and in December, 1923, the Federal Government appropriated $100,000 to be used for a bridge to replace the ferry, provided Arizona matched this by an equal sum. Actually the State of Arizona expended $185,000, all of this, or $285,000, was absorbed in the superstructure cost. All excavation and footing costs were taken care of by the Arizona State Highway Department.

The controlling factor in the design and construction of this bridge was that all material used in it had to be transported by truck 145 miles from Flagstaff, the nearest railroad point. After a number of studies it was decided that a three-hinged

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* Student Member, Senior in the School of Civil Engineering, Tulane University.

steel arch would be more economical than a suspension bridge or any other type investigated. The type selected permitted the erection of the two halves of the arch as cantilevers, making final closure on a center pin. During erection, extensions of the upper chord were temporarily made with material later used in the approach structure. These extensions reached back to anchorages and served as tie backs for the cantilevers. Special toggles were used in controlling the individual halves during the act of closure.

About 1200 tons of steel was entirely handled for this work by two six-wheel trucks, one of ten and the other of three and one-half tons capacity. The heaviest single piece weighed twelve tons, while the longest was fifty-three feet.

The estimated excavations for the main arch abutments were 9,000 cubic yards, but because of having discovered a fissure at the north abutment it was necessary to nearly double this. The main span of the arch is 616 feet, made up of twenty-two twenty-eight-foot panels. The roadway is eighteen feet between curbs and is 103 feet above the bottom pins of the arch and 467 feet above the river at low water. The total length of the completed bridge including approaches is 834 feet.

Live, dead, and wind loads were considered in the design. The arch itself is designed for a live load of 60 pounds per square foot of roadway. The floor system is designed for one 15-ton truck or two 12½-ton trucks side by side with 30% impact. Wind loads of 60 pounds per square foot on the exposed area of one truss and of 30 pounds per square foot on that of the handrail and floor system were combined with 150 pounds per lineal foot in the plane of the floor.

The maximum section area of the bottom chord near the pin is 140 square inches. The floor is a 6½" reinforced concrete slab. This was used instead of wood because of the danger of fire.

[Here followed several reels of motion pictures depicting the construction of the bridge and the difficulties thereof.—Ed.]

MINUTES OF THE MEETINGS AND BUSINESS OF THE SOCIETY

Minutes of the Meeting of the Board of Direction, February 15, 1932.

The meeting was called to order by President Billingsley and the following members were present: Messrs. Frost, Dunlap, Bres, Wiggin, Moses and Muth.

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

Communication from the Washington Society of Engineers was read relative to securing approval of the project to commemorate the bicentennial celebration of the birth of Washington by the publication of a book relative to the City of Washington.

On motion, duly seconded, it was voted to be the sense of this meeting that the publication of the book in question meets the approval of the members of the Board and the Secretary was authorized to purchase a copy of same when available, also to furnish a list of members to the Washington Society of Engineers.

Communication was read from Mr. James M. Todd relative to the Green Bill, H. R. 6187, directing the Secretary of the Treasury to contract for outside engineering and architectural services in connection with Government building plans. On motion, duly seconded, it was voted that inasmuch as the Board could not recommend to the Society the indorsement of any bill which had not been studied, the matter was referred to the Legislative Committee with instructions to communicate with the Treasury Department, advising them of the study by the Society and requesting that they be permitted to present their side of the case to the Society if they so desire, relative to this Bill. Upon study of the arguments and of the Bill by the Legislative Committee a report is to be submitted to the Board.

Communication from Mr. H. L. McLean, representing the Foreign Trade Bureau of the Y. M. B. C., was read relative to competition between steamship lines alleged to be favoring the port of New York. On motion, duly seconded, it was voted that the Secretary be instructed to reply to Mr. McLean's letter that this is a controversial subject outside of the scope of action of the Louisiana Engineering Society and that the Society can take no action although it thanks Mr. McLean for giving the Society an opportunity to have its attention drawn to the matter.

Memorandum relative to the Eads Memorial Bill introduced by Congressman Fernandez was brought to the attention of the Board and on motion, duly seconded, the Secretary was requested to communicate with the entire delegation from Louisiana in the House and Senate, advising them of the previous indorsement of the Eads Memorial and requesting that favorable consideration be given toward the passage of the Bill.

The matter of planting of a tree dedicated to George Washington by the Society, with appropriate marking by a bronze tablet at a future date, the total cost not to exceed twenty-five dollars, was authorized by the Board, provided permission could be secured from Tulane University officials to have the tree planted near the Engineering Building on Tulane Campus. If such arrangements could be made the President was authorized to appoint a committee to provide an appropriate ceremony for such an occasion.

There being no further business, the meeting adjourned.

F. A. MUTH, Secretary.

Minutes of the Regular Meeting of the Society, February 15, 1932.

The meeting was called to order about 8:10 p. m., Mr. F. N. Billingsley, President, in the chair, F. A. Muth, Secretary, and 63 members and guests present.

The minutes of the previous meeting were read and approved.

Mr. Carl Schneider brought to the attention of the Society the matter of legislation now in Congress affecting the profession. Attention was drawn to the Green Bill, providing for the Treasury Department to contract for outside architectural and engineering services, also to the Cochran Bill, to provide for public works administration. The President announced that the Legislative Committee had already been authorized by the Board to make a study of the Green Bill. On motion, duly seconded, it was voted that both bills be referred to the Legislative Committee with instructions to secure the views of the various officers involved in the transfer of governmental functions as contemplated in the proposed bills in order that this Society can intelligently take action as to whether its endorsement should be given or not. The Secretary was instructed to communicate with the Legislative Committee to secure the pros and cons on these bills and, if practicable, to secure the views of the American Engineering Council in order that the Society may have the full advantage of all points of views before considering the endorsement of such bills.

The following amendments to the Constitution and By-Laws were placed before the Society for second reading and, on motion, duly seconded, were adopted:

ARTICLE III

Following Sect. 2, insert,

Sect 2a, The President, with the approval of the Board of Direction, shall appoint a Nominating Committee of three (3) members of the Society, not later than the October Meeting. The notices for the November Meeting of the Society shall advise the membership of the personnel of this committee and that the Nominating Committee will consider suggestions for nominations for ten days following the November meeting. This committee shall report its nominations, in writing, at the December Meeting of the Society, which nominations, together with any other additional nominations ordered to be included by vote at the December Meeting, shall be submitted to the membership, for ballot as hereinabove provided.

AMENDMENTS TO BY-LAWS

Section 4, page 15—top line of page,

After the words, "entitled to vote," insert,* * * if additional nominations to those presented by the Nominating Committee are desired* * * "shall by written ballot, etc.,"

Page 15, line 11,

Substitute "all nominees" for the present wording 'the nominees'.

The technical exercises of the evening consisted of a most interesting address on the "Lee's Ferry Bridge," by Mr. Herbert M. Shilstone,

Jr. This address was amplified by motion pictures showing the construction of the bridge.

Professor James M. Robert gave an interesting address on "George Washington," which was enjoyed by all.

The meeting then adjourned to the usual collation.

F. A. MUTH, Secretary.

Minutes of the Board of Direction, March 14, 1932.

The meeting was called to order by President Billingsley and the following members were present: Messrs. Wiggin, Bres, Frost, O'Neill and Muth. Professor Dunlap was excused as he had previously telephoned the Secretary of his inability to be present.

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

Letter from the Chairman of the Finance Committee was read and accepted.

Letter from the Treasurer relative to check from the Interstate Trust & Banking Co. was read and the matter was referred to the Finance Committee for investigation.

The matter of the Golf Tournament to be held this spring was discussed and on motion, duly seconded, it was voted that the President be authorized to appoint an appropriate committee to submit a report of its plans in order to conduct the Golf Tournament so that it will be as near self-supporting as practicable.

Letter from the Louisiana State Board of Engineering Examiners was read and on motion, duly seconded, the President was authorized to submit a list of names to the Governor in connection with the expiration of the appointment of Mr. J. T. Bullen.

Communication from Mr. James M. Todd relative to the establishment of a medal or prize to be presented to an engineer for the greatest public service during the year was read. The matter was held over until next meeting, at which time Mr. Todd will be asked to be present so that the Board can go into the matter with more detail.

Another communication from Mr. Todd was read relative to appointment of a Budget Committee to make a study of expenditures by the Society with a view to effecting economies wherever practicable. On motion, duly seconded, the President authorized a committee of three members to submit report to the Board on this subject.

There being no further business the meeting adjourned.

F. A. MUTH, Secretary.

Minutes of the Regular Meeting of the Society, March 14, 1932.

The meeting was called to order about 8:25 p. m., Mr. F. N. Billingsley, President, in the chair, F. A. Muth, Secretary, and 63 members and guests present.

The reading of the minutes of the previous meeting was dispensed with, owing to the lateness of the hour in opening the meeting.

A most interesting paper on "Slag Road Construction" was read by Mr. W. H. Caruthers, Sales Manager, Birmingham Slag Co. This was followed by some discussion and a rising vote of thanks was then tendered the speaker.

The meeting adjourned to the usual collation.

F. A. MUTH, Secretary.

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PROCEEDINGS
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LOUISIANA ENGINEERING SOCIETY

VOL. XVIII. JUNE, 1932 NO. 3

CONTENTS

EDITORIAL NOTES AND COMMENT

The Economic Status of the Mechanical Engineer. We publish elsewhere a dissertation on the above subject by our member, Mr. Todd.

Now that the economic status of the engineer has been determined, the next question at issue is how to improve that status. "There is nothing permanent but change." The law of the universe seems to say that there is no such thing as status quo. We must either progress or retrogress.

More and more the engineer is being recognized not only as a public figure, but quite a public necessity. It is unthinkable, then, that the status of the engineer will retrogress. His status must of necessity progress, but such improvement will not come spontaneously, nor will it come without a generous modicum of help and insistence from inside the profession.

Our professional destiny lies quite largely within our own hands. The engineer's whole being is dedicated to making life easier and more comfortable for his fellow-man. It is, therefore, not unreasonable for the engineer to desire a small share of the comforts and conveniences which he creates. It should therefore be interesting to watch and assist any fair, honorable and dignified (yet energetic) movement to improve the engineer's economic status.

Barge Lines in the Mississippi Valley. A paper under the above caption appears elsewhere in this issue. It is interesting in that it notes the progress of an organization which is unique. It is in effect an organization somewhere in between private ownership and management and public ownership and management. While the corporation is owned by the public (or the United States if you will), its organization and management are along the lines of private enterprise. Any benefits accrue to the public only, either in the form of reduced transportation costs, or in the form of profits, if any.

Articles Published by Members of the Society. We note for reference two articles recently published by members of the Society.

An excellent article entitled "Wood Preservation—Economic and Engineering Aspects," by Ralph H. Mann, was published in the April, 1932, issue of Civil Engineering.

In the May, 1932, issue of Civil Engineering appears the comprehensive article "Rainfall at New Orleans and Its Removal," by George G. Earl.

The Golf Tournament. The second annual golf tournament of the Society took place at the Metairie Golf Club on the afternoon of May 20, 1932. When the tournament was first mentioned at a meeting of the Society and entrants called for, only a few hands were raised. When the chair asked, "Have we only these few golf players in the Society?" some extremely uncharitable member called out, "There aren't *any* golf play-

ers in the Society.'' Heavens! He stands repudiated, and how repudiated he stands! Thirty-one entrants *played golf*. The tournament was followed by an extremely enjoyable dinner, participated in by thirty-four persons.

The President's trophy is now in the hands of President F. N. Billingsley, and the other Society trophy is in the hands of Dave Stewart. Both of these trophies will be returned for competition at next year's tournament.

Besides the above trophies the tournament was made considerably more interesting by the donation of a large number of other trophies. These were generously donated by the following firms:

Beckman's Clothing Store, Rubenstein Bros., Eug. Dietzgen Co., New Orleans Blue Print Co., Firestone Company, Wm. Reily Coffee Co., Continental Bank, Dunlap Company, Interstate Electric Company, D. H. Holmes Company, R. D. Pitard Company, General Electric Company, Greybar Electric Company, Southern Pine Ass'n, Electric Supply Co., Lone Star Cement Co., Sears, Roebuck Co.

The Woman's Auxiliary. We, too, have a Woman's Auxiliary. Not only in name, but in fact. A splendid group of ladies gathered at the home of Mrs. W. B. Gregory and founded the above organization.

Mrs. Gregory was elected first president of the organization. They have loyally pledged their aid in all matters in which they can be of assistance. The call has gone forth for a meeting in October at which upwards of a hundred members are expected to be present.

The Woman's Auxiliary will be a valuable addition and aid to the Louisiana Engineering Society.

PAPERS AND DISCUSSIONS

THE ECONOMIC STATUS OF THE MECHANICAL ENGINEER

By James M. Todd.*
Read before the Society, April 11, 1932.

"They shall not be sought in public council," wrote the son of Sirach more than two thousand years ago, and his words have been quoted ever since as a reproach to the Engineer. True, he did add, "without those cannot a city be inhabited," and declared that "they will maintain the state of the world," but compared with the judge, the ruler, the prophet, priest and poet, this creative servant of mankind has been of small importance.

For the past decade the Engineer has been more or less blamed for his own professional and economic status. His individualistic nature, his ego, his technical complex and his supposedly many other alleged shortcomings have all been cited as causes for his present status. To the layman, the faults charged to the Engineer must reflect him, in a measure, as his own worst enemy. But is he after all, as much to blame for the professional and economic status of his profession as many try to make us believe?

Professional status has nothing whatever to do with the success or failure of the individual Engineer. His success depends entirely upon his own ability and personality. If he has not the qualities that make for success under the particular environment in which he might be placed, then no degree of professional status is going to make up that deficiency for him.

No all-inclusive formula for success can be laid down. Ask successful professional men to what they attribute their success, and each will give a different answer. As varied as these answers may be, two factors will always stand forth prominently: namely, a knowledge of the things undertaken, and an ability to adapt oneself to the environment under which one's work has been accomplished. Nor did professional status play any important part in this success. In fact, these men made a success in their practice of engineering in spite of the

*Member.

alleged economic and social status of their profession. On the other hand, many a brilliant engineer has remained in the lower ranks of the profession, because of his inability to adapt himself to his professional surroundings. It is generally this type of engineer who blames his failure to progress on the status of the profession.

In an effort to clear up, at least the economic misunderstanding, the American Society of Mechanical Engineers, in 1931, launched a campaign to gather definite facts from its 20,000 members. After organizing a committee, a questionnaire asking for specific data, and bearing no means of identification, was sent to each and every member. Approximately one-half the membership responded, and some very interesting facts were developed. We believe these figures to be the most reliable that have ever been obtained, up to the present, having to do with engineering earnings.

A complete file of the statistical data collected in this study is kept at headquarters of the American Society of Mechanical Engineers and data may be had upon request.

Engineers who look beyond the statistical information on earnings as exhibited in this report recognize in the investigation which brought out these data the stirrings of a processional consciousness in members of the engineering profession that transcends any interest in their earning characteristics. As important, and definite, and practical as this study was, it is but a starting point for a program of professional development. The greatest significance of the study is the indication it gives that, regardless of his specialty, the mechanical engineer can rarely rise to his full stature in his profession unless he is a "man of full habit." It gives conviction about men and the profession that have always been held by successful professional men. To help engineers as "men of full habit" should be and is the objective of all engineering and professional societies. There already has been formed and recommended to A. S. M. E. Council a definite program of joint action for the development of the individual engineer and the profession he represents—an action in which other engineering societies and groups will participate—bringing the work to its second phase, and which portends significant benefits.

BARGE LINES IN THE MISSISSIPPI VALLEY

By J. S. Brodie.*

Read before the meeting of the Society, May 9, 1932.

The history of steamboating on the Mississippi from the time of the World War until the present is exemplified by the history of the Federal Barge Lines. In the past five or six years, privately owned lines have grown up so that they have really been making history and have become important factors in the transportation facilities of the Mississippi Valley.

Prior to the creation of the Inland Waterways Corporation, the government of the United States was really in the business of barging freight on the Mississippi and Warrior rivers. As a wartime measure, when the railroads of the country were over-burdened with traffic while under the control of the Railroad Administration, a service was inaugurated for the purpose of relieving some of the railroad burden. This service was termed the Inland and Coastwise Waterways Service, and, under the control of the Secretary of War, bought and acquired a quantity of equipment from several sources and operated what was then known as the Mississippi Warrior Service. This designation was derived from the fact that the service was operated over the Mississippi and the Warrior rivers.

At St. Louis, Cairo, Illinois and Memphis, Tennessee, the municipalities built terminals for handling freight onto and out of river barges, and at New Orleans provisions were made by the Dock Board to accomodate the needs of this new barge line.

On the Warrior river there was built a terminal at Birmingport and at several other points for handling coal. At Mobile, a terminal was built for accommodating the barge freight. This contemplated coal movement on the Warrior section, although carried on in considerable volume for several years, never did develop very successfully, but the development drifted into the handling of diversified tonnage, and today is such.

The then acting head of the Inland and Coastwise Waterways Service, Lt. Col. T. Q. Ashburn, seeing the difficulties

*Chief Engineer, Federal Barge Line.

encountered in trying to operate a commercial undertaking under the usual form of governmental procedure, exposed the situation through various available channels, and, with the help of various individuals and organizations, brought about a situation causing the government barge line to be changed in its organization by an act of Congress. This act of Congress, known as H. P. 8209, was enacted by the 68th Congress in June, 1924. This bill created the corporation called the Inland Waterways Corporation and directed that the capital stock should be $5,000,000.00, and that the Treasurer of the United States subscribe for all of the stock. There are too numerous provisions in the act to go into all of them here, but, in general, it provides the Inland Waterways Corporation with an organization which is basically the same as that of a railroad or other shipping corporation, and is administered by the Secretary of War.

From time to time the Secretary of War appoints members for an advisory board, and Major General T. Q. Ashburn has been retained in his capacity as the head of the Inland Waterways Corporation under each of the Secretaries of War who have come into office since the Corporation was created.

In this connection, it should be remembered that Lt. Col. T. Q. Ashburn was put at the helm of this Barge Line in the Barge Line's first inception, and under his able guidance this Barge Line has grown to what it is today. It was not a thing that would just naturally take root and grow like a weed, but it had enemies. These enemies were real enemies and powerful enemies, and although there can be no doubt that certain groups of men did a great deal toward the cultivation of this barge line, it is doubtful if the thing would have lived and grown as it has if this one General Ashburn had not been on the job every year, every month, every day, every hour, to arise quickly to the most important or the most minute detail controlling its existence. It is a real gratification to all who are familiar with the barge line and have its interest at heart to know that General Ashburn is still at the helm and is tense in his readiness to arise and meet any situation, be it of the greatest or of the most insignificant concern.

The Inland Waterways is governed by by-laws and officials very much as is a railway corporation and it can sue and be sued, borrow or lend money, etc., like another corporation, under regulatory conditions.

Since the act creating the corporation was enacted, other measures have been enacted by Congress affecting the corporation, including a material increase in capitalization, but none to change the basic idea of the thing.

One of the outstanding provisions of the act creating the Inland Waterways Corporation is the reference to that part of the Transportation Act of 1920 which declares it to be a policy of Congress to promote, encourage and develop water transportation and to foster and preserve in full vigor both rail and water transportation. This has been the policy guide for the Inland Waterways Corporation since its inception.

Under this policy the Inland Waterways Corporation has developed its traffic not only on the rivers for port-to-port freight movements, but to extend inland away from the rivers until nearly all of the territory drained by the Mississippi river is well served with the lower water freight rates.

The Federal Barge Line belongs to the general public and because the general public want it is the only reason for its existence. Should the Federal Barge Line prove a great money-maker, no one would gain except the general public. In most of our public spirited minds there is a pronounced desire that the assets of the country be made available to the inhabitants, and this Federal Barge Line is the instrumentality through which the assets of our Inland Waterways are being made available to the public.

Rates by water are now generally 20% less than established rail rates and the rates which have been established for joint rail and water movement of freight are lower than the through rail rates, proportioned somewhat in accordance with the portion of the distance traveled by rail and by water.

There has been a great deal of opposition to the development of the Barge Line, mostly by railroad interests. Recently this opposition has had a great deal of publicity. The position of the railroads makes it possible for them to reach the

general public with propaganda in opposition to the Barge Line while the position of the Barge Line limits a counter propaganda.

Many eminent economists have assembled data designed to get the people to oppose the development of the Barge Line but all the arguments thus manufactured have been refuted and the refutation of them is available to those who take sufficient interest in the subject so that the man who really is acquainted with our whole economic situation cannot conceive of any good coming from discouraging the Barge Line operations. Even railroad interests are materially benefitted according to the fairest of our economists.

The present operations of the Federal Barge Lines—which name is given to the operations controlled by the Inland Waterways Corporation—extend north from New Orleans on the main stream of the Mississippi to St. Paul and Minneapolis.

The service branches off on the Illinois River to Peoria, Ill., and from New Orleans thru Lake Pontchartrain and Mississippi Sound to Mobile. From Mobile, up the Alabama River, to the Tombigbee; up the Tombigbee to the Warrior River; and up the Warrior to Birmingport the service is established.

At Birmingport there is an extensive terminal with the tracks of the Warrior River Terminal Company there terminating. The Warrior River Terminal Company is a railroad company owned by the Inland Waterways Corporation and has tracks extending from Birmingport 18 miles over to Ensley, where it joins within the switching limits with the railroads serving Birmingham.

Early extension of the service will soon be made into Chicago from Peoria by the water route which is now nearing completion. Early extension also will be made up the Missouri River to Kansas City, where that city has built a new River Terminal and that part of the Missouri River has been improved to such an extent that with only a relatively small amount of additional work the channel will be navigable for Federal Barge Line equipment.

Various kinds of freight are being handled by the Federal Barge Lines, aggregating in the neighborhood of 1½ million

tons a year. Considerable volume of sugar, coffee, sisal, burlap, aluminum ore and various other imports and commodities produced in the southern states move by barge from New Orleans, north, to be distributed, mostly by rail, on joint thru rates, to points in the Mississippi Valley. From these northern points there move, also mostly by rail to river ports, on joint thru rates, grain, farm implements, machinery and manufactured products of all kinds to be distributed to ocean carrying ships for export and coastwise distribution and to rail lines for distribution into southern territory not reachable by water.

There are municipally owned terminals served and operated by the Federal Barge Lines at—

Minneapolis, Minn.
St. Paul, Minn.
Dubuque, Iowa.
Rock Island, Ill.
Burlington, Ia.
St. Louis, Mo.
Peoria, Ill.
Memphis, Tenn.
Helena, Ark.
Baton Rouge, La.
New Orleans, La.
Mobile, Ala.

and other terminals operated by the Federal Barge Lines at Cairo, Ill., Vicksburg, Miss., Holt, Ala. (near Tuscaloosa), and Birmingport, Ala. All of these terminals are interchange terminals where freight is handled between rail cars and barges.

Altho the Federal Barge Lines own and tow many different sizes of barges, the main part of the tonnage is carried in distinct types of barge.

These barges, classified in order corresponding to the total of the bottom capacity, are:

1st: The 500 and 600 series type: In all there are 111 of these barges in service. They are 230 ft. long by 45 ft. wide by 11 ft. deep, designed to be loaded to 8 ft. draft. These barges will carry 2,000 tons each and are divided into eight

separate cargo hold compartments and have cargo houses on them above the main deck.

2nd: The 200 series type: In all, there are thirty-nine of these barges in service. They are 300 ft. long by 48 ft. wide by 11 ft. deep, designed to be loaded to 8 ft. draft. These barges will carry 3,000 tons each. The cargo holds of these barges are all in one compartment, which have removable covers.

3rd: The Warrior section barges: These barges are 140 ft. long by 25 ft. wide by from 8½ to 11 ft. deep and are designed to be loaded to 7 ft. draft. These barges will carry 500 tons and the cargo holds are all in one compartment with removable covers. There are 52 of these barges.

4th: The 300 series barges. These barges are 126 ft. long by 33 ft. wide by 7½ ft. deep and are designed to be loaded to 6 ft. draft. These barges will carry 500 tons each. There are sixty of these 300 series barges. They were built for carrying freight over routes where the tonnage is not as heavy as it is on the lower Mississippi, where the larger 500 and 600 series barges and the 200 series are used. These barges also have cargo houses on them above the main deck.

The Warrior section barges are so dimensioned that a group of four of them will be accommodated in the locks on the Warrior section. There are 17 locks to be passed between Mobile and Birmingport.

In addition to the above described barge equipment, there are a great number of various kinds of barges used for derricks, oil storage, wharf boats, track barges and various other purposes.

The description above is a general description only of the barge equipment owned and in use by the Line. All of this equipment is of all steel construction and each unit is divided into many separate water-tight compartments, so that it is almost impossible to sink them under ordinary circumstances. As a matter of fact, during the existence of this Barge Line there has never been one of the Line service barges sunk.

About the time of the World War there were several towboats secured from various sources to propel the existing barges. These towboats were of various descriptions and none

of them proved to be efficient enough to satisfy the requirements. Naval architects were then employed and a council of level-headed men were brought together, and they evolved designs of towboats which did prove efficient enough to insure the life of the Barge Line.

Six twin screw, tunnel type, 1800 h. p. towboats were built for the operations of the lower Mississippi and three towboats of a similar but smaller design were built for the operations of the Warrior River section. There were difficulties with these boats: impractical details of design, and difficulty in securing men who could operate them. However, with the persistence exerted by the executives of the Line these difficulties were ironed out to such an extent that operations could be carried on. These nine boats are still in operation and doing the major part of the tonnage transporting of the Barge Lines.

Subsequent to the construction of these tunnel type boats, after the Line was well entrenched and with the favorable incentive given by the co-operation of business men along the river, a number of other towboats were constructed and today the Federal Barge Lines own and operate twenty-four line towboats and three steam harbor tugs. Twelve of these are twin screw tunnel boats, one with Diesel propulsion; twelve are of the stern paddle wheel type; and three are of the ordinary, single screw propeller type. At the present time a contract is being negotiated for two additional new towboats.

These new boats will be of the twin screw tunnel type and will be unique because of their being the heaviest powered screw propeller boats made to navigate on a channel of five foot depth. The propellers of these boats will be driven with reversing, direct connected, Diesel engines, and the boats will draw approximately four feet.

There are four large self propelled barges on the Line. Three of these are used in a fast freight service between New Orleans and St. Louis and one for a similar service between New Orleans and Mobile.

The Federal Barge Lines operate more river equipment and have more extensive terminal facilities than any other one line now existing; but private lines, encouraged by the example

set by the Federal Barge Lines, have sprung up and developed to a great extent.

The privately owned lines, as well as the Federal Barge Lines, operate a great variety of equipment: some have small barges and some have large; some are open barges for one kind of cargo; some are closed and housed barges for other kinds of cargoes. The towboats range from small gas or Diesel driven boats of 100 h. p. to large towboats up to 3,000 h. p. with steam propulsion.

It is interesting to observe the tendency for a greater number of screw propeller boats to come into existence each year. In the distant past, every river towboat was driven with a paddle wheel, but today there appears to have been such a growing tendency toward the screw propeller drive that it will not be long until half the towing power on all of the inland rivers will be of the screw propeller type.

This development in propulsion is made possible by the refinements in hull and rudder design being made so that as good maneuverability in the new tunnel boats is just as easy to attain as with the paddle wheel boat. The screw propeller boat develops into a much simpler and more compact and cheaper design than does the paddle wheel type, especially in the higher powered units which must be made with shallow draft.

Not only towboats and barges come into the picture in the study of transportation on our inland rivers; but terminals: terminal sites, terminal construction and terminal equipment are of the most vital consideration.

Privately owned and government owned lines own and operate terminals of many various designs. The design of a terminal is always a study in itself, because the class of traffic, the location, and the various auxiliary facilities in every case are different.

MINUTES OF MEETINGS AND BUSINESS OF THE SOCIETY

Minutes of the Board of Direction, April 11, 1932.

The meeting was called to order by President Billingsley and the following members were present: Messrs. Bres, O'Neill, Wiggin, Frost, Dunlap, Moses and Muth.

Mr. James M. Todd was present upon invitation.

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

The report of the Budget Committee was read and after careful consideration, on motion, duly seconded, it was unanimously voted to receive and adopt the report and that the Budget Committee be thanked for its painstaking effort in analyzing the financial matters of the Society in connection with the preparation of the Budget report, also that the Secretary be instructed to advise the necessary committees from time to time as necessary in carrying out the intent of the Budget and making reports called for to the Board in regard to the economies provided for in the Budget.

The Secretary was also instructed to furnish a copy of the Budget report to the Editor, not for publication, but for his information and co-operation in the Budget for this year.

Mr. Todd presented his ideas as to establishment of a medal or prize to be awarded by the Society to an engineer for public services. On motion, duly seconded, the President was authorized to appoint a committee to investigate this matter and to submit report to the Board.

There being no further business the meeting adjourned.

F. A. MUTH, Secretary.

Minutes of the Regular Meeting of the Society, April 11, 1932.

The meeting was called to order about 8:15 P. M., Mr. F. N. Billingsley, President, in the Chair, F. A. Muth, Secretary, and 72 members and guests present.

The reading of the minutes of the previous meeting was dispensed with.

Several announcements were made and the Chairman of the Golf Committee, also the Chairman of the Technical Papers Committee, reported on the activities of his committee. The Employment Committee also had a more encouraging report for this month.

The meeting was then turned over to Mr. George R. Hammett, Chairman, New Orleans Section of the A. S. M. E., and he introduced the speaker of the evening, Mr. James M. Todd, Consulting Engineer, who delivered a most interesting address on "The Economic Status of the

Mechanical Engineer.'' This address was followed by an interesting discussion and a rising vote of thanks was then tendered the speaker.

The meeting was then turned over to President Billingsley and a short address was made by Mr. Cope on ''A New Insulating Material.''

The meeting was then adjourned to the usual collation.

F. A. MUTH, Secretary.

Minutes of the Meeting of the Board of Direction, May 9, 1932.

The meeting was called to order by President Billingsley and the following members were present: Messrs. O'Neill, Frost, Bres, Dunlap, Wiggin, Moses and Muth.

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

The membership of Mr. E. L. Webre was changed to Non-Resident and the Secretary was instructeod to correspond with him, also with Professor Creighton and Mr. C. A. Williams.

The resignation of Mr. P. J. Dromgoll was accepted with regret.

Suggestion proposed by Colonel Bres regarding amendment to the Constitution and By-Laws relative to the qualifications of various grades of members, including Student Members, etc., was read and carefully considered by the Board. On motion, duly seconded, it was voted that a committee be appointed to make a study of the matter together with members in arrears and to submit report at the proper time. The Secretary submitted a list of members in arrears and it was voted that the matter be referred to the foregoing committee.

There being no further business, the meeting adjourned.

F. A. MUTH, Secretary.

Minutes of the Regular Meeting of the Society, May 9, 1932.

The meeting was called to order about 8:20 P. M., F. N. Billingsley, President, in the chair, F. A. Muth, Secretary, and 74 members and guests present.

The reading of the minutes of the previous meeting was dispensed with, owing to the lateness of the hour in opening the meeting.

Invitation from Mrs. W. B. Gregory for all ladies to attend the meeting of the Ladies' Auxiliary of the Engineering Society at her home and to become charter members was read.

A most interesting paper on ''Barge Lines in the Mississippi Valley'' was read by Mr. J. S. Brodie. This was followed up with some interesting discussion, and a rising vote of thanks was then tendered the speaker.

The meeting adjourned to the usual collation.

F. A. MUTH, Secretary.

The Proceedings of the Louisiana Engineering Society

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LOUISIANA ENGINEERING SOCIETY

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All business communications should be addressed to F. A. Muth, Secretary, 7705 Willow Street, New Orleans, La.

PROCEEDINGS
OF THE
LOUISIANA ENGINEERING SOCIETY

VOL. XVIII. AUGUST, 1932 NO. 4

CONTENTS

EDITORIAL NOTES AND COMMENT

Worthy of Comment. As a builder and producer for the comfort and convenience of man the engineer has always been in the forefront. It is peculiar though how he will overlook some opportunities of development which seem to continually thrust themselves upon him. One opportunity, peculiar to our Southern climate, has particularly escaped development by Southern engineers. We refer to the production of "hot weather comfort" on a widespread and economical basis for offices and homes.

In the northern portion of the country cold weather occupies a large proportion of the year. Early recognition of the necessity of "cold weather comfort" resulted in the development of efficient and comparatively cheap heating systems. In the North today it would be as unthinkable to build a home or office building without a heating system as it would be to

build without a roof. The same remark applies with some modification tn the South where the season of cold weather is much shorter by comparison.

In the South, on the other hand, our period of discomfort is the hot summer season which lasts for such a large portion of the year. The desirability and the economic advantages of hot weather comfort have been known for some time, particularly in the South. It seems strange that Southern engineers have not yet developed for warm weather use the converse counter-part of the heating system.

It is not inconceivable that in the years to come the final product will be a single system which is reversible, a refrigerating plant in summer and a heating plant in the winter. Indeed, such a combination is now being carefully investigated. It has been in mind for some time. When it finally arrives let us hope that Southern engineers will have a "finger in the pie" because it is essentially a Southern pie.

More Papers by Members. At the risk of becoming quite tiresome the attention of the membership is again called to the fact that this is *your* Society. We believe our membership consists of as high-grade men, with as diversified interests, and with activities carrying as much responsibility as any similar group of men in the country. But why have our members such an inordinate sense of modesty?

It is difficult to get them to prepare papers for our meetings, yet we are fully confident that there is a wealth of material for good papers within our membership. Do not hide your light under a bushel. Whatever obstacles you have surmounted; whatever difficulties you have overcome; whatever machines, processes, designs you have developed in the course of your daily work make instructive subject matter for a paper. Give the other members the benefit of your experiences, and in turn let them give you the benefit of theirs. "One hand washes the other and both hands wash the face."

Inspection of Holmes's Air Conditioning Plant. On Monday, June 13, through the co-operation of our fellow-member,

Mr. James M. Todd, opportunity was afforded our membership to inspect the new air-conditioning installation in the D. H. Holmes department store. Quite a few members availed themselves of the opportunity. The visit proved instructive indeed, particularly in view of the fact that later the same evening, at a regular meeting of the Society, a paper on air-conditioning was read. This paper appears elsewhere in this issue.

OBITUARY

LOUIS CHRISTIAN DATZ

Louis Christian Datz was born in New Orleans, April 28th, 1880, and died in St. Louis, May 20th, 1932. He prepared for college in the public schools of New Orleans.

He was graduated from the College of Engineering, Tulane University, Class of 1901, and found employment for a short time with a construction organization and later with New Orleans Railway & Light Company (now New Orleans Public Service Inc.). During a period of seevral years he gained experience in a variety of lines in connection with the operation and maintenance of street railways and electrical properties, and laid the foundation for greater usefulness and larger responsibilities in other cities.

Mr. Datz for several years was Chief Engineer of the southern properties of United Gas & Electric Engineering Corporation, and later Chief Engineer of American Cities Company, and also of the Memphis Light & Power Company. He was Advisory Engineer in the re-organization of United Railways Company of St. Louis, and upon completion of the reorganization was made Chief Engineer of the new company, St. Louis Public Service Company.

Mr. Datz became a member of the Louisiana Engineering Society in January, 1906, and from 1908 to 1911 was Secretary and Librarian. He was a member of the Board of Direction from 1912 to 1914, and was President of the Society in 1915.

Mr. Datz was also a member of the American Society of Civil Engineers, American Electric Railway Association, and American Society of Municipal Improvements. He was President of the American Electric Railway Engineering Association in 1922-23.

For a six-month period of his life, in 1910, he was Secretary of Tulane University. He was always an ardent alumnus.

Mr. Datz was an untiring worker and an engineer of abiilty. He was loyal to friends and a devoted husband and father. He will be missed by his many friends of the Louisiana Engineering Society, and in the business world, as well as by his immediate family.

JOHN T. EASTWOOD,
FRANK S. FROST,
W. B. GREGORY, *Chairman.*

PAPERS AND DISCUSSIONS

AIR CONDITIONING

By O. E. Gammill, Jr.*

Read before the Society, June 13, 1932.

Air conditioning, better known as "Manufactured Weather," is the science of mechanically controlling the (1) temperature, (2) the humiidty, (3) the cleanliness and (4) the movement of the air within buildings and other enclosures, thereby controlling the effects of such air upon the persons and the materials exposed to it.

Aside from its supreme function as a source of oxygen, air is signally important in our lives and in our industries as a conveyor of heat and moisture, and as a regulator of heat and moisture effects.

Manufacturers are discovering that air conditioning for personal efficiency is even more profitable than manufactured for industrial or process efficiency, even though the results in the former case are more difficultly measured in dollars.

Entirely apart from its unnumbered industrial services scientific air conditioning has become an indispensable element in the design of great public meeting places, especially speaking and motion picture theatres, and such mammoth buildings as the Chicago Indoor Stadium (where Republicans meet) in Chicago. Within these immense structures such vast numbers of people are gathered together that despite the colossal proportions of the buildings, copious and continuous air supply must be maintained mechanically. And to insure health and comfort such air must be conditioned before it is admitted to the occupied spaces within the building, and must be distributed so skillfully that drafts are avoided while positive, uniform circulation is established.

The widespread adoption of manufactured weather in public buildings of the types mentioned is a striking evidence of

*Manager New Orleans Office, Carrier Engineering Corporation.

its potentialities from the purely personal viewpoint. Motion picture exhibitors and producers of the speaking stage have proved that clean, draftless theatres, comfortably warmed and humidified in winter, invigoratingly cooled and dehumified in summer, offer an irresistible attraction to the potential patron.

In certain industries, such as the textile mill, wherein manufactured weather is employed primarily for technical reasons, manufacturers have discovered that the improved, more comfortable and more healthful air conditions have attracted the most desirable employees and practically eliminated labor troubles.

Thus, though we shall speak herein chiefly of air conditioning as it affects products and processes, we urge the manufacturer to consider, also, the vital human element. Just as scientific air conditioning renders the manufacturer independent of climate or season, in so far as these affect his product, so does it save him from adverse effects upon his personnel.

The effects of air upon comfort and health are due to the reactions of the human being to variations in air temperature, humidity, cleanliness and motion. The sense or feeling of warmth is dependent upon the moisture content of the air, rather than upon its mere temperature, and for this reason comfortable and healthful heating requires coincident regulation of humidity. The purity of the air breathed by the human being is, of course, primarily important to his physical well-being and personal efficiency is materially depressed by air that is contaminated by foreign matter, particularly in congested centers, manufacturing districts, or in proximity to any source of pollution. Drafts, due to improper distribution of air, are dangerous to health, and subversive to comfort. Air conditioning is a sure and sane means of eliminating the personal inefficiencies resulting from improper air qualities in spaces enclosing human beings. Just as surely as the first invigorating days of spring bring to you a pulsating sense of new energy, so will conditioned air, duplicating those same conditions, perhaps, bring new energy to the workers in shop and factory. Manufactured weather makes "every day a good day," so that the increased productivity of the stimulated

rather than depressed worker yields a day-after-day dividend on the investment in air condiitoning equipment.

Save in those instances where oxidation is a factor (and this frequently obtains in drying), the effects of air upon materials in process of manufacture are physical, rather than chemical. Air acts as the medium which conveys heat and moisture to or from the material, and by regulating the temperature and humidity, as well as the movement, the heating and moistening effects of air can be technically controlled as accurately and reliably as a sensitive governor controls the speed of an engine.

Air as a Carrier. A vivid conception of air's physical functions in modern industrial practice is revealed when the air is regarded as a carrier or conveyor upon which can be placed heat or moisture for conveyance either to or from the material in course of manufacture.

The many materials which are affected by heat or moisture, or both, are, by means of scientific air conditioning, subject to accurate technical control throughout their manufacturing processes. As a broad proposition, it may be said that wherever weather or atmospheric temperature and humidity affect the product in process of manufacture, manufactured weather can be employed to eliminate the disadvantages of the varying natural air conditions and insure the legion advantages of the most desirable air conditions, mechanically established and maintained without variation by means of accurate and dependable automatic controls.

Air. Air is a mechanical mixture, chiefly of the gases oxygen and nitrogen, about in the proportions of one to four. Air nearly always contains certain impurities, such as ammonia, sulphurous acid and carbon dioxide (CO_2). The CO_2 being a product of exhalation from the lungs and of incomplete combustion, is so universally present (about in the same proportions everywhere, except where concentrated by some local condition), that it may be regarded as a normal constituent of the air.

The Properties of Air.

I. Heat. The temperature indicated by an ordinary thermometer is the dry bulb temperature. The scale of an ordinary thermometer, either Fahrenheit or Centigrade, is simply an arbitrary standard by means of which comparisons can be established.

II. Humidity. Air is capable of holding, as a mechanical mixture with itself, varying quantities of water-vapor, depending upon its temperature. When there is mixed with the air all of the water-vapor which it can hold, the air is said to be saturated.

Absolute Humidity. The quantity of water-vapor actually present in a given volume of air, without regard to its temperature, is called its absolute humidity. Thus if air, at any temperature, contains 4 grains of water-vapor per cubic foot, its absolute humidity is expressed as 4 grains per cubic foot.

Relative Humidity. Since air may contain varying quantities of water-vapor at the same temperature, it is necessary to express its degree of saturation as related to its temperature. Thus, there has been established the term "relative humidity." Relative humidity is an expression, in percentage, of the degree of saturation of air at any given temperature. A relative humidity of 50% means that the air, at its given temperature, contains 50% of the water-vapor required to saturate it at that temperature.

Moistening Effect of Air. The moistening effect of the air varies approximately with its relative humidity without regard to the actual weight of water-vapor present.

The drying effect of air varies approximately inversely with its relative humidity, the greater the relative humidity the less the drying effect.

The Wet Bulb Temperature. The wet bulb temperature can be read from an ordinary thermometer by covering the bulb with a moistened wick, and causing the air to pass rapidly over the wick, either by means of a small fan, by aspiration, or by rapidly whirling the thermometer.

This, perhaps, is one of the most important factors in present day air conditioning practice, and it is here that the inexperienced or rule-of-thumb builder is most apt to fail in the construction of a system.

Refrigeration equipment which must be used in conjunction with air conditioning systems, wherever cooling and dehumidification are to be accomplished, has been greatly improved. It was this requirement for a safe, compact, flexible refrigeration unit adaptable to an air conditioning system, which brought about the development of centrifugal refrigeration, now widely in use in conjunction with the modern air conditioning plants in theaters, public and industrial buidings, here and abroad.

Holds Great Hope for Future

When we venture to look forward, we are quite as likely to underestimate the possibilities of the future, as we are to enlarge and place too much importance upon that which is past. We can only say now, that air conditioning has become the useful and often indispensable servant of manufacturers in hundreds of industries.

In the past few years, these developments have been siezed upon to create conditions of healthful comfort in theaters, offices, hotels, stores; and with the present growing interest of the public, it seems evident that merely the surface has been scratched.

We now look forward to the complete air conditioning system in the home, including cooling and dehumidification in the summer, as well as the furnishing of clean, properly humidified and tempered air during the winter.

Now what does tomorrow hold for air conditioning? We have reached the end of the period when the experience of first users in the fields where it is going to be most widely used, has demonstrated both its practicability and its economic values. We are on the threshold of the period when air conditioning will become a standard and accepted service in these fields.

Today, over 300 theaters are equipped. But there are at least 3000 theaters which logically need air conditioning. At a conservative tonnage estimate of only 75 tons per theater, these 3000 theaters constitute a potential demand for 225,000 tons of refrigeration.

There are less than 20 department stores equipped with complete air conditioning today, but there are at least 500 stores whose size and clientele warrant such installations. A potential demand at a modest estimate of 400 tons per installation exceeds 120,000 tons.

Office buildings offer another tremendous field. Today there are less than a dozen completely equipped, that is, providing air conditioning for all rental area. Tomorrow, every new office building will install air conditioning as a matter of course.

Hotels, banks, retail stores, restaurants, barber shops, beauty parlors, the list in the field presents the same story—pioneer installations made and demonstrating the value of the service, and the new era ready to take shape.

Nor should the further expansion of the industrial fields in which air conditioning made its first steps be overlooked. A very small percentage of the total available industrial market for air conditioning has been developed to date.

Will Provide Employment

Another interesting phase of the subject is the part air conditioning will play in providing employment. Always after a depression such as the one we are now suffering, new industries, in their rapid expansion, take up the slack of employment developed during the slump, and in their continued expansion help create new levels of general prosperity. Air conditioning is one of these industries for the era of prosperity we are about to enter.

It must be realized that this development cannot take place at once, but if the acceleration in the application of this art continues for the next 20 years as in the past 20 years, and there is every reason why it should, there will be in this coun-

try an annual business of over $250,000,000 in producing artificial climate.

Such values may be interpreted in terms of demand for power, for materials and machines, for the labor of many men in many trades. This will include air conditioning for industry and for human comfort, not only in the home, but for all enclosures where men assemble—auditoriums and theaters, railway trains, ofces, and stores.

Air conditioning, then, like any other new idea, must inevitably pass through regular and deliberate stages of growth. Today, it has advanced in technique, in experience, in resources and, most important of all, in the appreciation of its values by prospective users to the point where its novelty, its reputation as a luxury, will be replaced by a matter-of-course acceptance. Air conditioning is going to become commonplace, and in so doing, grow with the stored-up energy of its development years.

MINUTES OF THE MEETINGS AND BUSINESS OF THE SOCIETY

Minutes of the Board of Direction, June 13, 1932.

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

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

The President announced the death of Mr. L. C. Datz and on motion, duly seconded, a committee was authorized to draft suitable resolutions or obituary as the committee deems best.

The report of the Golf Committee was received and the Secretary was instructed to write the members of the committee, thanking them on behalf of the Board for the successfud tournament which was conducted as a self-supporting entertainment. The Secretary was also instructed to request the Editor to print in the "Proceedings" a list of the firms who donated prizes for the Golf Tournament.

On motion, duly seconded, the President was authorized to appoint a member of the Society to act with the Louisiana Committee of the National Committee for Trade Recovery. Mr. Carl Schneider was appointed.

The matter of pending legislation affecting the registration of professional engineers was discussed and, on motion, duly seconded, the Secretary was instructed to write to the local sections of the A. S. M. E., A. S. C. E., and A. I. Chem. E., requesting that some names be suggested to the Louisiana Engineering Society for consideration when the Society is called upon to present a list of names to the Governor for membership on the new Board of Examiners.

On motion, duly seconded, the President was authorized to appoint a committee to submit to the Board suggestions for such amendments to the Constitution as the committee deems proper.

There being no further business, the meeting adjourned.

F. A. MUTH, Secretary.

Minutes of the Regu'ar Meeting of the Society, June 13, 1932.

The meeting was called to order about 8:15 P. M., Mr. F. N. Billingsley, President, in the chair, F. A. Muth, Secretary, and 68 members and guests present.

On motion, duly seconded, the reading of the minutes was dispensed with.

Several announcements were made and letter from the President of the Women's Auxiliary of the Louisiana Engineers was brought to the attention of the Society.

On motion, duly seconded, it was voted to recess during the summer months in the usual manner.

In accordance with the Constitution, the A. S. C. E. Unemployment Relief resolution was offered for the first reading and, on motion, duly seconded, was unanimously approved for first reading with recommendation that it be offered for second reading at meeting to be held June 17th, after usual postcard announcements had been mailed.

The technical exercises of the evening consisted of a most interesting paper on "Air Conditioning," by Mr. O. E. Gammill. The paper was followed by considerable discussion. A rising vote of thanks was then tendered the speaker and the meeting adjourned to the usual collation.

F. A. MUTH, Secretary.

Special Meeting of Society, June 17, 1932.

A special meeting of the Society was held, in accordance with meeting notices, at 7:15 P. M., Friday, June 17, F. N. Billingsley, President, in the chair, F. A. Muth, Secretary, and 9 members and guests present.

In accordance with the Constitution, the following Resolution was offered for second reading, and was unanimously carried as at the previous meeting called in accordance with notices:

"WHEREAS, The American Society of Civil Engineers, after careful study of present economic conditions, has drafted a memorandum entitled 'Normal Program for Public Works Construction to Stimulate Trade Recovery and Revive Employment,' which sets forth the principle that through such a program the restoration of normal purchasing power can be made promptly effective; and

"WHEREAS, The Louisiana Engineering Society being particularly familiar with the need and value of a number of proposed public improvements in the State, the construction of which has been deferred principally because of inability to sell bonds, approves the program of the American Society of Civil Engineers; therefore be it

"RESOLVED, That the Louisiana Engineering Society,

1. Approves in principle a normal program of public works construction as the most effective immediate means of increasing purchasing power, stimulating trade recovery and reviving employment; and
2. Urges on the Congress of the United States the enactment of the necessary legislation to extend Federal loan facilities to solvent states, counties, and municipalities, to enable them to carry out their programs of necessary and productive public works; and be it further

"RESOLVED, That the Secretary send a copy of this resotion to each of the Senators and Representatives from the State of Louisiana."

There being no further business the meeting adjourned.

F. A. MUTH, Secretary.

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All business communications should be addressed to F. A. Muth, Secretary, 7705 Willow Street, New Orleans, La.

PROCEEDINGS
OF THE
LOUISIANA ENGINEERING SOCIETY

VOL. XVIII. OCTOBER, 1932 NO. 5

CONTENTS

EDITORIAL NOTES AND COMMENT

You Can't Make 'Em Drink: "You can lead a 'jackass' to water but you cannot make him drink." The engineer in general devotes his life and activities to making this world a better place in which to live. It is a deplorable fact, however, that business so prostitutes the fruits of the engineer's labor that he frequently gets blamed for conditions that are not his. The present situation of unrest is a case in point.

To cite one instance of how unregulated and extremely selfish business can throw a monkey wrench in the gears. Stuart Chase is authority for the statement that the American people as a whole consume about 300,000,000 pairs of shoes per year. Even with most wasteful extravagance the country could hardly wear out 500,000,000 pairs. Yet what do we find? The combined capacity of the shoe factories of the country is 900,000,000 pairs per year! And with these statistics readily available, new shoe factories were being built by "business" men, and banks were lending money for the construction thereof. It should be perfectly plain to those who *desired* to know the truth that either two-thirds of the factories already construct-

ed must necessarily fail, or all of them must run at one-third capacity. And yet you will see repeatedly that statement that the invention and the development of shoe machinery is responsible for the grief in the shoe business! The only possible excuse for the construction of more shoe-making capacity than the country could absorb is business greed. One shoe factory makes money. Immediately other shoe factories are built in feverish haste in order to get in on the "gravy." Before anyone stops for breath it is suddenly discovered that we have more factories than necessary. If the inevitable losses fell on only those whose greed led them into such a crazy predicament, no one would care. But pursue the matter further. These excess factories start up, at least temporarily, with a full crew of labor. This labor has been attracted from other pursuits in which this labor was happy and at least self-supporting. Suddenly, the factory closes down and labor is out of work. The laborers cannot immediately go back to their old pursuits and pending readjustment, which takes time, we have a disturbed condition of labor in the shoe business. Multiply the experiences of the shoe business by all the other businesses whose greed led them to the same excesses and we have a depression. It is a pity, indeed, that the grief can't be borne alone by those who are responsible for it!

Natural Gas Compressing Stations. Elsewhere in this issue is printed a paper under the above caption. This paper was written and delivered before the September meeting by our member, Mr. B. S. Nelson. May others emulate his example!

To those of us who have an inquisitive turn of mind, and are prone to wonder about some of the details of piping natural gas, Mr. Nelson's paper is quite illuminating and very interesting.

A Smoker at the October Meeting. An innovation will be ventured at the October meeting. Instead of a paper to be read, the meeting will be turned into a smoker as a sort of preliminary winter "get-together." We shall probably be able to report on the smoker in our next issue.

PAPERS AND DISCUSSIONS

NATURAL GAS COMPRESSING STATIONS

B. S. Nelson.*

Read before the Society, September 12, 1932.

While the title of this paper indicates that its object is to explain the details of a modern compressor station, a brief exposition of the general problem of marketing natural gas may be of interest.

The stable markets of the nation are those based on supplying mankind's universal wants, such as food, water, fuel and shelter, and our modern industrial civilization requires in addition vast quantities of steam and electric power produced from fuel of some sort.

It is natural that our large financial interests should be attracted to such markets as a means of investment on a major scale. This has been true for many years of our heretofore principal fuels,—coal and oil; but it is a most surprising fact that only within the last six or seven years has the attention of Wall Street been directed to a large scale exploitation of our immense natural reservoirs of natural gas.

Our own Monroe gas field has been known for at least fifteen years, but for nearly ten years, comparatively little gas was piped from it, excepting the large quantities wastefully burned in nearby plants to make carbon black.

The piping of natural gas is, of course, not novel, as the large gas fields of New York, Pennsylvania and West Virginia, for many years, have piped gas to adjacent communities, but such lines were comparatively short ones, of one or two hundred miles length.

To market gas on a large scale requires such a large initial investment that it is probable that big capital was gun-shy until the idea had been tried out and proved by someone else.

Our post-war boom era supplied the necessary surplus capital and gambling spirit, while the industrial activity supplied

*Chief Engineer, A. M. Lockett & Co., New Orleans.

a waiting market for gas; the enormous expansion of the gas pipe line business became a fact and was only halted by the present economic situation. In two years nearly one billion dollars were invested in gas pipe lines, one of which from the Amarillo field to the Chicago District is over a thousand miles long, while the St. Louis and Atlanta lines are about 500 miles each.

It is not unlikely that such expansion was too rapid to be sound as it was in our public utilities and real estate booms; as a prominent pipe line engineer remarked to the writer, some pipe lines were built to sell gas, but many others were built to sell stock.

The fact remains, however, that pumping natural gas through long pipe lines is a permanent and profitable business, and some details of how this is done may be of interest.

The general problem of planning and building such a line is a surprisingly intricate one and highly technical, not only from an engineering stand-point, but also from the economic, financial and operating sides.

Two things are essential to any pipe line: an adequate supply of gas at one end, and an adequate supply of customers at the other. Very careful geological surveys by skilled engineers are necessary to determine approximately the available supply of gas in a given field. A gas field is merely an under-ground reservoir of unknown size, but geologists, by careful study of the pressure drop in a given period and at a known rate of depletion, are able to calculate with some certainty the available supply. Usually the investment in an expensive line is not warranted unless the field has a life of at least fifteen years, during which period the cost of the line is amortised in the price of the gas sold.

The other requisite of a market for the gas requires a careful economic survey, not only of the actual present and future fuel requirements of the district to be served, but also of the possibilities of developing new markets and, incidentally, a careful check of the existing competition with other fuels, such as oil and coal.

Another feature affecting the possible market for gas is the highly seasonal nature of the demand which not only

affects the total annual sales, but has an immense bearing upon the physical details of designing the line and, of course, on the total cost of the proposed line, and its practicability as a sound investment.

Assuming all these details are satisfactorily settled, and sufficient capital interested to finance the project, the actual design of the line gets under way. The four physical essentials in a pipe line system are the right-of-way; the steel pipe line; the compressing stations and the telephone line.

A careful choice of the location of a line is highly essential from the stand-point of first cost, as well as of maintenance and markets. The shortest distance between the terminals of the line is not always the best location as river crossings are very expensive in first cost and up-keep, and right-of-way through a highly developed agricultural or industrial section si expensive; frequently, by careful planning of location, additional communities and markets are brought within reach.

The design of the pipe line itself involves much study and engineering judgment and calculation. For a given quantity of gas, the line may be large in diameter with thin walls and low pressure, or it may be small in diameter with thick walls and high pressure. Its joints may be made by the welding process or by means of rubber packed couplings, or by a combination of both.

No fixed rules govern such design. A number of lines installed during the period under discussion were designed for 400 lbs. per sq. in. working pressure and a majority of them had the joints made with rubber packing couplings. Improvement in welding technique is making the welded line more popular, and improvement in pipe materials seems to point towards higher operating pressures. The Chicago line, for example, was designed for an ultimate pressure of 800 lbs. per sq. in.

Compressor stations are needed because any fluid flowing through a pipe loses pressure due to friction and the purpose of these compressor stations is merely to boost the pressure at proper intervals along the line.

The size and number of compressor stations has an intimate connection for a given pipe line capacity with the size of the

line and the working pressure. For a normal working pressure of 400 lbs. per sq. in. an economic arrangement of stations and pipe line diameter seems to be that which spaces the stations about 100 miles apart along the line, which, at full load on the line, will give a suction pressure of 150 lbs. per sq. in. and a discharge pressure of 400 lbs. per sq. in. This works out as a ratio of compression of about 2½ to 1.

The transmission of gas involves some very different physical laws from those involved in pumping water, oil, or in transmitting electricity, and the intricate calculations involving proper selection of pipe line diameter and working pressure, and the spacing of the compressor stations is too complicated for the purposes of this paper.

The fourth requisite of a pipe line is the telephone line. It is not generally realized that it is necessary to build a complete telephone system with every gas line, and that this phone system is a very busy part of the general system. Gas must be dispatched through the pipe line in exactly the same manner as railroad trains are handled and the station operators are in constant touch with the chief dispatcher for instructions as to varying the pressure and output of gas by varying the speed of the compressor units in order to insure proper pressure delivery at the terminus to meet the varying load demands.

We now come to the topic of this paper, the Compressor Station.

A pipe line system, being a public utility, requires the same care in the design of the line and station as must be exercised for a high class electric power or waterworks system.

In addition to a high standard of physical efficiency and design, considerable thought and money are spent on the aesthetic details both within and without these stations.

It is always surprising to visit one of these plants of the better class, usually located several miles out in the woods from the nearest village, and to come upon a group of substantial and attractive fire-proof buildings set within a fenced area with well-kept lawns and flower beds, and with all exposed metal work, tanks and piping, shining with aluminum paint, while nearby is a group of neat cottages where the operators live with every city convenience, such as running

water, electric power, frigidaires and telephones, and often, a swimming pool.

The same principles apply to the details of mechanical design about the station proper; unfortunately, the most complicated details, such as the piping systems, foundations and electrical work, are for the most part buried underground, or otherwise concealed, and can be appreciated only by a study of the working drawings.

The keynote of design is continuity of service and every possible precaution is taken, and no expense spared, to avoid shut-downs; the individual units are so arranged that an accident to any one unit, or its pipe work and accessories, will not necessitate a complete plant stoppage.

In addition, the station, as a whole, is installed on a by-pass on the main pipe line so that if the station is unavoidably shut down, the gas may be by-passed around it and still permit the line to function at reduced capacity.

The description follows of a large station of 5—1300 H.P. units, which is typical of the class; the main visible structures comprise a main compressor building 68′ x 156′ of steel frame covered with transite; an auxiliary building with auxiliaries and machine shop; a fuel meter house, and an elevated water tank of 100,000 gallons capacity.

The water supply for jacket cooling is a troublesome one on these plants,—each 1300 H.P. engine requires about 250 G.P.M. of water usually got from deep wells.

If the well water supply is favorable in quantity and of non-scale forming quality, motor driven deep well pumps are usually used delivering from large deep wells direct to the elevated tank and engines.

If the well conditions are unfavorable as to quantity or quality, it is customary to use a cooling tower, where only makeup water is needed, and where the water may be softened by chemical treatment.

A typical cross section through one main unit shows the main unit on concrete foundations which, in turn, rest on a monolithic concrete slab or mat 30″ thick running the entire length of the building, and heavily reinforced. An interesting detail is that due to the massive weight of the reciprocating

parts of these large engines, the unbalanced horizontal forces are very great, and excepting in particularly good soil, the horizontal vibration of the engines would be transmitted to the building and other equipment unless precautions were taken. With this in view, the mat supporting the engines is entirely separate from the floors and building walls, and all pipe connections are made elastic so that the whole unit can move slightly without producing disagreeable effects in the floors and building. Underground are the high pressure gas headers consisting of the incoming suction header connected by valves and pipe bends to the compressor cylinder with similar connections back to the distributing header, whence the gas may be lead to any or all of the gas coolers and after cooling, out to the main discharge header.

For large pipe lines, the standard power unit is a double acting gas engine driven recipricating compressor direct connected to a single or tandem double acting four cycle gas engine—usually two such units are connected to a single crank shaft and flywheel, forming a twin unit.

The gas engine compressor drive taking its fuel from the main line seems the obvious, and, so far, the favorite method of compression,—such units are heavy duty, slow speed, long lived machines, thermally and mechanically efficient.

On very long lines, where the value of the fuel gas becomes progressively greater each time it is compressed, there has been some consideration of electric drives both reciprocating and centrifugal for the compressors near the terminus. It is doubtful whether electric drive will make much headway, because the cost of current will be high on account of the high-line expense, and there is always the danger of a complete line shutdown due to failure of the highline.

Because of the large horsepowers involved and the widely varying plant capacities at different hours and seasons, it is customary for flexibility to install multiple identical units; two favorite sizes are the 1000 H.P. and 1300 H.P. units. A visitor to one of these plants is usually impressed by the massive proportions of these units; a 1300 H.P. engine weighs 100 tons, has a 12′ 6″ diameter, 13 ton flywheel, and its two main frame castings weigh 26 tons each. The length of the unit is

54'—and such a unit will pump 25 million cu. ft. of gas per day at 150 lbs. per sq. in. suction pressure, and 400 lbs. per sq. in. discharge pressure when operating at 125 R.P.M. and developing 1280 B.H.P.

In spite of their massive proportions, it is almost as easy to start one of these engines as it is to start an automobile,—all starting operations being done from a central control stand, and by merely tripping the electric switch governing the ignition, the unit may be stopped with equal facility.

The act of compression heats the gas to about 210 degrees, and this temperature would destroy water-proofing paint on the underground pipes and pipe lines, causing them to corrode quickly from ground moisture, so it is necessary to cool the gas as it leaves the compressors. The water for cooling the engine jackets is first passed through the coolers on its way to the engine.

The gas valve yard surrounding the coolers may be recognized from the numerous valve stems protruding from the gravel back-fill. The valve yard is back-filled with gravel to permit quick access to a leaking joint, also to facilitate the escape of any leaking gas.

Great care is necessary in the pipework design to insure safety from gas leaks. No screwed joints are permitted in any gas piping,—all the joints being welded, or of the Van Stone type, and wherever possible fittings are avoided; connections to pipes are made by welding flanged steel necks on to the pipe. The gate valves used are factory tested to 1000 lbs. per sq. in. pressure, and after assembling all high pressure gas piping has a field test of 700 lbs. per sq. in. water pressure.

In addition to the high pressure gas piping already shown, the power end of these engines requires a great deal of accessory piping, such as starting air piping, cooling water and supply and return pipes, lubricating oil supply and return pipes, air intake pipes, and exhaust piping.

Many of these stations are located where the winter climate is severe, and it is necessary to heat the main building. Some plants use an ordinary steam heating system with an auxiliary exhaust gas heat. A less expensive system consists principally of metal jackets around some of the main engine

exhaust pipes with a motor driven air blower passing air over these hot pipes and up through openings in the engine room floor.

These engines have continuous forced feed oiling systems, requiring large quantities of lubricating oil, and much care is taken in planning a safe oiling system. In a typical system, the oil pumps are automatically controlled by the pressure in a main oil supply tank. As the oil pressure falls, the automatic controls progressively start additional pumps until all pumps are operating and if the pressure continues to fall, a red light goes on in the engine room and a siren starts going to warn the operators. The oil, after passing through the engine system, is filtered thoroughly through oil filters in the basement beneath the pump room before returning to the pumps.

In order to accurately check the operating cost of these stations, it is customary to meter the fuel gas just as accurately as if sold to a regular customer, by means of duplicate orifice meters of the recording type, installed in a small meter house.

In addition, the meter house serves as a pressure reducing station for the fuel supply to the main engines. The fuel gas is taken off the suction header at about 150 lbs. per sq. in. pressure and passes through two reducing valves in series, which cuts the pressure down to about eight ounces. It is then led to an underground welded fuel header with branches to each main unit, and at each unit is a final sensitive pressure regulator which cuts the fuel gas pressure to atmospheric and delivers it to a volume chamber at each engine, whence the power cylinders draw their fuel supply. In laying a pipe line through all sorts of country, it is inevitable that a good deal of trash is closed inside the line, such as sticks, gravel, dirt of various kinds, an occasional lunch box, or a pair of overalls. None of these things is good for the compressor cylinders, so it is necessary to install a so-called scrubber where the line enters the station, which is merely a large chamber with baffles within to catch any foreign matter coming through the line. Any water, or gasoline, or other liquid that comes over may be drained out through a suitable blow-out at the bottom of the scrubber.

The auxiliary building houses the accessory equipment. There is a 125 K.W. gas engine driven electric generator which supplies current for lights and motor driven auxiliaries. There are also two air compressors, one engine driven, and the other motor driven, which pump up the starting air for starting the main engines. There is also a complete machine shop. These stations are usually in isolated locations with no readily available shop facilities, and the machine shop is furnished for making practically any repair that might be needed.

There is a surprising amount of electric wiring on one of these jobs comprising three separate systems; one, the lighting system, then the power system for motor driven auxiliaries, and then the low tension ignition system in duplicate which supplies current for the spark plugs on the main units. Part of the equipment is a regular battery charging system with a motor generator set and battery charging control instruments. The spark coil current supply of the ignition system is taken from a series of storage batteries which are floated on the charging circuit exactly like the system used on an automobile, but on a larger scale. An interesting detail of the electric wiring about these stations is the fact that due to the explosion hazard in the event of a possible gas leak, insurance requirements call for strict precaution in the wiring details. All wiring must be in gas tight conduits, and all lights enclosed in gas tight glass safety fixtures.

There is also necessary a rather elaborate gauge board. The various gauges are of the indicating and recording types, and enable the operator to keep a close check on the individual unit performance, and also enable him to vary the station output as indicated by the dispatcher's instructions.

MINUTES OF THE MEETINGS AND BUSINESS OF THE SOCIETY

Minutes of the Board of Direction, September 12, 1932.

The meeting was called to order by President Billingsley and the following members were present: Messrs. Dunlap, Bres, Frost, Moses, Wiggin and Muth. Messrs. James M. Todd and H. L. McLean were present upon invitation.

The minutes of the previous meeting were read and approved and bills on hand were ordered paid, including the scholarships for Tulane and Louisiana State Universities.

Mr. Todd presented an oral report of the work of the Legislative Committee, and, on motion, duly seconded, it was voted to have the President write to the Governor after conference with the Legislative Committee relative to the courteous reception given by the Governor to the Committee when it visited him in Baton Rouge.

Mr. McLean presented plan for Smoker to be held by the Entertainment Committee. On motion, duly seconded, it was voted that the Entertainment Committee arrange for a Stag and Smoker to be held in connection with and immediately following the October meeting at $1.00 per person with an allotment of $50.00 or such amount as will be required to be furnished by the Board in order to complete the arrangements for the Smoker.

The report of the special committee appointed to make recommendation for revision of the Constitution and By-Laws was furnished to each member of the Board for consideration at a later date.

The above committee also submitted a separate report on the matter of delinquent dues.

On motion, duly seconded, this report was adopted, subject to consideration of the matter of publication of the names of any members dropped in accordance with the terms of the report when the Secretary presents the data. The Secretary was instructed to proceed immediately with preparation of letters to members in arrears.

There being no further business, the meeting adjourned.

F. A. MUTH, Secretary.

Minutes of the Regular Meeting of the Society, September 12, 1932.

The meeting was called to order about 8:15 p. m., Mr. F. N. Billingsley, President, in the chair, F. A. Muth, Secretary, and 57 members and guests present.

On motion, duly seconded, the reading of the minutes of the previous meeting was dispensed with.

Mr. McLean made an announcement relative to the Smoker to be held following the October meeting, the date of which will be determined in time for notices of such meeting.

Mr. B. S. Nelson delivered a most interesting paper on "Natural Gas Compressor Stations." The paper was illustrated with lantern slides and an interesting discussion followed. 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. XVIII. DECEMBER, 1932 NO. 6

CONTENTS

EDITORIAL NOTES AND COMMENT

Technocracy. There is always some new "ism" which springs up to befuddle the public in times of stress. The latest of these is Technocracy. With some of the preliminary aims of Technocracy there can be no quarrel, but, unfortunately, like so many things that are good it was quickly surrounded by interests and invested with qualities which seem to make it ridiculous in many respects.

In so far as this country is concerned, there are only two things needed to bring it back to normal and keep it there—*common sense* and *common honesty*.

By far the two largest forces which run this country are politics and business. In politics *common sense* and *common*

honesty have largely been conspicuous by their absence. On the other hand business has yet to show that both attributes have been present within *its* ranks to any overwhelming degree. When politics purchases votes with money, or more insidiously, with threats of economic reprisal; when it substitutes the pork barrel for the serious needs of the nation, then clearly politics has failed this country.

When business is based on stock gambling; on high pressure advertising and salesmanship; on paying small wages to workers and large dividends to non-workers; on small costs of production but exhorbitant prices to consumers with a multiplicity of excessive and unearned profits in between; with wilful, malicious and deliberate attempts to circumvent the natural law of supply and demand with price agreements, etc.; with the line between good business and racketeering not definitely drawn, but with this line farther in the region of business than the business man likes to admit; with banks spreading credit recklessly in times of plenty, but withholding credit at the very time it is needed most; then clearly, too, business has failed.

Now comes Technocracy with the dictum that the logical processes of reasoning which comes from technical training can be applied to the sane operation of the country. With this basic idea there can be no quarrel, *provided*—and *always* provided—it is recognized that the country is made up of human beings. But Technocracy, too, is reckoning without common sense when it attempts to leave human nature out of consideration; either without common honesty or common sense, (we don't know which), when it offers some of the ridiculous conclusions to be drawn from some of its lurid statistics; and without common honesty when it arrogates to itself supposed superlative methods of analysis which are carefully concealed. If these methods of analysis are as good as the ballyhoo says they are, then they could easily stand the light of critical examination by responsible technical organizations.

The United States Waterways Experiment Station and Hydraulic Model Experimentation. Elsewhere in this issue we publish two papers, one dealing with the United States Waterways Experiment Station at Vicksburg, and the other

describing the methods of model experimentation carried on at that station. These papers were written respectively by Herbert D. Vogel and Paul W. Thompson, both of them active and aggressively brilliant young members of the Corps of Engineers. These papers hold good interest for those of us who live in this community and for those of us who have come into contact with the problems of the Mississippi for many years.

Particularly interesting is the outline in Lieut. Thompson's paper giving some of the fundamental facts of the laws of similitude and the application of these laws to model experimentation and the successful solution of some of the problems of the Mississippi. Interesting indeed is the statement that while European experimenters have set the limit of model scale distortion at about 5, distortions of from 15 to 20 are being successfully used at the Vicksburg laboratory with indications that even these distortions are not the limit.

Model experimentation has proved its value as applied to river problems. It has long since proved its value to the aviation industry. Today it would be unthinkable to build a full-sized airplane of new design without a thorough wind-tunnel test on a model of the proposed airplane. Model experimentation is even now being extended to the automobile industry. Some of the recent new body forms have been evolved as a result of wind-tunnel tests in an attempt to cut down wind resistance. Indeed, a wind-tunnel test has recently shown that, if an automobile were properly and quite radically streamlined, at speeds above 40 miles an hour the mileage per gallon of gasoline could be practically doubled.

Members Who Present Papers to Have Dues Remitted. In order to stimulate interest among the membership in writing papers, the Board of Direction has decided to remit the annual dues of any member who presents an acceptable paper before the Society. This action was taken at the December meeting of the Board, the minutes of which will appear in the next issue. It is noted here so that those members who wish to avail themselves of this action can start the preparation of their papers as early as possible.

The Annual Meeting and Dinner Dance. This year at the Annual Meeting an innovation will be tried.

For years there has been quite a bit of agitation on the part of some members to turn the Annual Meeting into a dinner dance instead of having a strictly stag affair. There was just as much agitation on the part of other members to keep the affair strictly a stag smoker. This year the entertainment committee has attempted to please both interests. The October meeting was turned into a stag smoker as a preliminary "get together" for the winter season. This smoker was quite similar in all respects to the annual smoker heretofore held in January.

On the other hand, at the annual meeting to be held this year, a dinner dance will be the order of the day. This dinner dance will be held at the Roosevelt Hotel, 8 p. m., Saturday, January 21, 1933. By all means let us make this an affair to be remembered. The entertainment committee is working hard to make the dinner dance successful. No matter how hard they work, however, it cannot be successful unless a large number of us attend. If you have no wife, bring your sister or sweetheart, but by all means be there.

OBITUARY

GEORGE JAMES GLOVER

Died July 26, 1932.

Born in New Orleans in 1868, he was the son of William Rogerson Glover, a native of Glasgow and Catherine Gilson, a native of Ireland.

Left fatherless at the age of eight, he enlisted himself in the breadwinning ranks to eke out a meager income by selling newspapers before and after school and seeking vacation jobs during the summer months. At fourteen he started as bricklayer's apprentice at fifty cents a day. Later he went to Birmingham, where he became a foreman and landed his first contract, a small masonry job. At twenty-one he was in the masonry contracting business as a partner of Thos. Carey and by 1893 he was in the masonry contracting business for himself. Rising to the top ranks of masonry contractors in 1900 he decided to enter the general contracting business and organized the firm of Glover and Sicard, with Chas. A. Sicard as junior partner. The firm was disolved after two years and Mr. Glover individually carried on a general contracting business under the name of Geo. J. Glover until he organized the firm of Geo. J. Glover Company, Inc., in 1924. For more than thirty years he has occupied a leading position amongst contractors not only in the city of New Orleans but of the South, and the numerous large and beautiful buildings erected by him bear mute testimony to the leading part he bore in changing New Orleans to its present modern skyline.

While Mr. Glover's business success was being made his services were sought in other fields. During the war he was appointed a member of the Fuel Commission. For many years he was an Administrator of the Charity Hospital and a director of the Isaac Delgado Trade School.

His business affiliations included directorships in the Hibernia Bank, Hibernia Securities Co., Lane Cotton Mills, D.

H. Holmes Company, Chas. A. Kaufman Company and the Sixth District Building and Loan Association.

He was also a member of the New Orleans Association of Commerce, American Society for Testing Materials, Louisiana Engineering Society, Pickwick Club, New Orleans Country Club, Southern Yacht Club, Pine Island Club, Round Table Club, Young Men's Gymnastic Club, Louisiana Jockey Club, New Orleans Lodge of Elks, New Orleans Chess, Checkers and Whist Club, and many Carnival organizations.

His career as a master builder not only was notable by reason of materialistic success; it earned for him a reputation for efficiency, dependability, conscientiousness and integrity that is beyond any mere materialistic appraisal. He enjoyed the community confidence in exceptional degree. He set and maintained to the end an example of success wrought by honesty and fair dealing that constitutes a finer monument to his memory than the many large buildings shaped under his direction and responsibility. Men who trusted him found their faith both in his capacity and his character justified and his passing is mourned as a serious community loss.

G. Arthur Seaver,
James M. Todd,
Bernard H. Grehan, *Chairman.*

ALLEN EUGENE WASHBURN

The sudden death of Mr. Allen Eugene Washburn, one of the older members of this Society, on October 10, 1932, was a shock to its members, his family and friends.

He was a mason and a member of the Louisiana Section, American Society of Engineers.

Born at Mer Rouge, in Morehouse Parish, Louisiana, April 15, 1878, on graduating from the public schools of his native parish, he entered Louisiana State University from whence he graduated with the degree of Batchelor of Science in Civil Engineering.

His entrance into the engineering field was with the Southern Railroad during vacation periods. July 7, 1897, he entered the Government service with the 4th District Mississippi River Commission. Later, December 15 of that year, he assumed duty with the U. S. Engineers, First New Orleans District, with whom he served until his death.

During the Spanish-American War he was engaged on fortification work at Fort St. Philip and it was while stationed there that he met Miss Francis Alberta of Sunrise, La., whom he married. One son, Allen Eugene, Jr., was born of their union and his sudden death in early boyhood was a severe blow to them.

He was transferred to South Pass, Mississippi River, as Engineer on Maintenance at Port Eads, La., in June, 1900, and in October, 1907, he was promoted to Engineer in Charge of this work. At the time of his death he was the oldest living engineer in point of service of those who were connected with this important work, and his paper "An Open Mouth for the Mississippi", read before this Society in 1920, is a historical narrative of engineering value in which the ability of the author and his knowledge of river and harbor work is portrayed.

During the World War it was his duty to keep the channel adequate and clear for the passage of shipping to the Port of New Orleans. This duty he discharged ably and well and in service to his country it is comparable with that of our soldiers who fought on Flanders Field.

After serving 21 years at Port Eads, La., he was transferred to the New Orleans office in June, 1921, where he was connected with the early surveys of the Louisiana and Texas Intracoastal Waterways now nearing completion, and with investigations, other surveys, and the regulation of navigable waterways, notable of which was the work preliminary to the approval of the location and plans for the Mississippi River bridge at New Orleans, La.

During the flood of 1927, due to ability and his broad knowledge of the waterways of Louisiana, he assisted in the evacuation of the flooded areas.

Justly termed by his fellow engineers the "Encyclopedia of the Engineer Office", he has taken with him valuable knowledge, but not through selfish hoarding, for he was ever ready to pass it on for the benefit of others.

He liked to hunt, and the haunts of the teal, the canvasback and the mallard were to him well known.

Kind, sympathetic, just, able in his profession, he lived, and the friendships he made which embrace all walks of life were many. Always ready to assist by word or deed, his charities will never be known.

In his passing, the Engineer Department has lost a valued engineer, this Society a fellow member, and all who knew him a friend. But greater than this is the loss sustained by his loved ones, Mrs. Washburn his bereaved wife, and his family, and to them the officers and members of this Society convey their heartfelt sympathy.

To the Louisiana Engineering Society for the minutes and for publication in the Journal, with the request that copies be presented to Mrs. Washburn, his bereaved wife, and to the other members of his family. In writing this we have been guided by this thought: "The truth can never come from the putrid lips of prejudice nor emanate from the inane utterance of the fawning flatterer".

B. H. Dupuy,
W. B. Smith,
Grover C. Rackerby.

PAPERS AND DISCUSSIONS

THE WORK OF THE U. S. WATERWAYS EXPERIMENT STATION

By Herbert D. Vogel *

Read Before the Society, November 14, 1932.

The utilization of models as a means to the determination of full-scale performances was conceived nearly 250 years ago by Sir Isaac Newton, but application of his stated principle was not attempted more than 175 years later, when an English Naval Engineer, Froude, resorted to model tests for the determination of resistance encountered by the hull of a moving ship in still water. These experiments quickly suggested the possibility of investigating, through the employment of small scale replicas, the effects of flowing water on stationary objects, and similarly the effects of engineering structures on the regimen of a river. The first true river models were constructed in 1875 by Fargue in an attempt to determine methods of improving the navigable channel of the Garonne River, and ten years later Osborne Reynolds invoked the principle of similitude and the use of scale models in investigations of an estuary of the Mersey River. About a year after this, Vernon-Harcourt applied the same principles to improvement of the River Seine, but his investigations like those of his predecessors were conducted haphazardly, without suitable equipment and without a thorough understanding of underlying variations in the basic theory of model research.

A renaissance era in the science of river research was initiated by Prof. Hubert Engels of the Dresdener Technische Hochschule in 1898, when he began construction of a permanent and well ordered hydraulic laboratory in a basement room of his University. The methods of Dr. Engels so attracted the attention of other German engineering colleges that in the next few years many new and larger laboratories came into existence. In 1903 there appeared on the horizon a new personality

* First Lieutenant, Corps of Engineers, Director, U. S. Waterways Experiment Station, Vicksburg, Miss.

destined to influence greatly the development of hydraulic laboratory methods and the promulgation of the laboratory idea. This was Dr. G. de Thierry, who in that year received his appointment as Professor of Canal and Harbor Engineering at the Berliner Technische Hochschule. Prof. de Thierry founded an efficient student laboratory at his institution of learning and, assisted by Prof. Ludin of the same University, did much toward promoting the development of the Experiment Institute for Hydraulics and Marine Design in Berlin. This Institute, built in 1902 and 1903 by the Prussian government, carries definitely associated with it the name of Hans Detlef Krey, who until his death in 1928 stood preëminent in the field of practical hydrodynamics. Under the supervision of Prof. de Thierry and sponsorship of the late John R. Freeman the monumental treatise, "Wasserbau Laboratorion Europas", came into being in 1926 as a summary by leading directors of the accomplishments of their respective laboratories. The same book translated into English and published in 1929 under the title "Hydraulic Laboratory Practice" stands today as a leading reference in the subject of hydraulic research. Because of its comprehensive descriptive nature it is deemed unnecessary to elaborate here on the details of the many laboratories now existent in the world as offspring of the parent institution founded by Engels. Suffice it to say tha tthe idea has caught like wild fire and the mathematical doctrine stated in outline by Newton somewhat obscurely in a single paragraph has been expanded and elaborated to cover a wide range of problems, all the way from turbine design to the improvement of harbors.

The scope of hydraulic laboratory practice has been extended in the last decade and a half to studies of bed movement in rivers, and methods of changing or influencing such movement; to investigations aimed at the determination of effects of cut-offs in large alluvial rivers; to experiments dealing with means of preventing damage to railway embankments during overflow by flood waters; and to hundreds of similar studies and investigations. In spite of this rapid expansion of the utility of the hydraulic laboratory, it appears probable that its greatest service to hydraulic science remains yet unper-

formed. The practical field engineer has had a new and most important tool placed at his disposal, but until he has learned to use it most efficiently the work of it will be lacking its full potential value. For this reason it is of utmost importance that field forces maintain constant contact with tests in progress and that they be trained to observe for themselves in the model the phenomena corresponding to those which may be expected in nature. The value of such observations will greatly exceed any valuation that may be placed upon a formal written report of the tests.

Plans for the construction of a hydraulic research center to serve the Lower Mississippi Valley Division and other offices under the administration of the Chief of Engineers, U. S. Army, were begun about the middle of 1929. The original intent was to establish the institution at Memphis, Tenn., but subsequently it appeared desirable to locate the laboratory in the vicinity of Vicksburg, Miss., near the seat of the Mississippi River Commission. The work of acquiring land and planning an operating organization was begun in December, 1929, actual construction was started in April, 1930, and Christmas night of that same year the laboratory supply reservoir overflowed its spillway, thus indicating that facilities for undertaking experiments were ready.

The water supply of most hydraulic laboratories is pumped to overhead tanks, from which it flows to the flumes or models, drains to a receiving tank and is again pumped to the overhead tanks. However, it is expensive to pump large quantities of water, pumping requires the employment of large overflow tanks, and even then be an undependable, unsatisfactory expedient. Accordingly it was decided to select a site for the Vicksburg laboratory where a dam might be constructed to create a large supply reservoir. The location selected is 4½ miles south of Vicksburg, on a small rtibutary of the Mississippi River, where purchase was made of 140 acres of land. Construction of a dam and spillway, so designed that cuts practically balanced fills, was begun in April and completed in October, 1930.

The main laboratory building is rectangular and consists of a single-story experiment hall flanked at each end by a two-

story wing 33 x 51 ft. The width of the central hall is 49 ft., and the over-all length of the building is 209 ft.

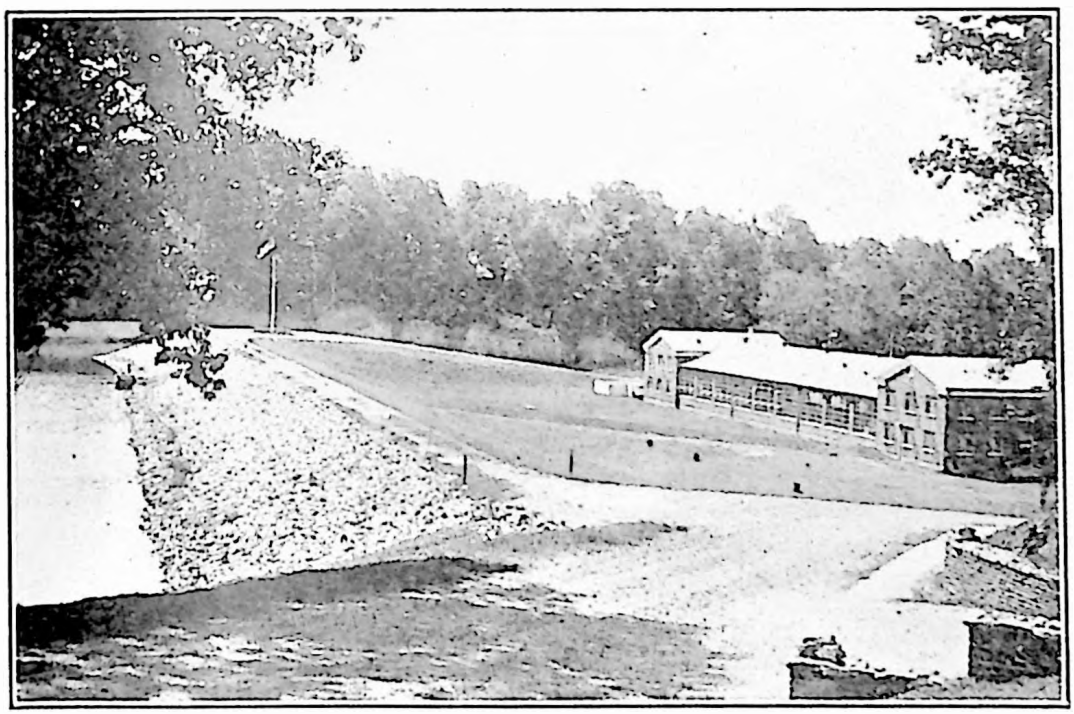
The west wing has three private offices, an administration office and a drafting room on the second floor, while the floor below is divided into space for a plotting room, an instrument room, and two additional offices. The second floor of the east wing contains a sediment and soil laboratory and a photographic dark room.

The east wing is not walled off from the experiment hall except on the second floor and for that portion of the first that constitutes a boiler room. Hence the floor of the experiment hall is continuous to the east end of the building. This is partly to accommodate a 175-ft. hydraulic flume, making it accessible at every point up to where it leaves the building, and partly to provide an open pump room readily controlled from the experiment hall. The pumping system supplements the flow from the storage reservoir and prevents excessive draw-down in possible periods of drought.

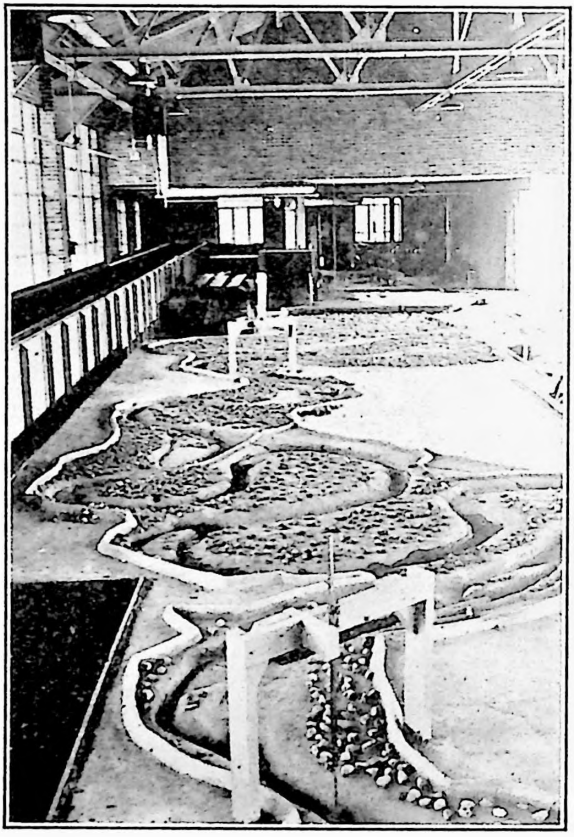
Problems are sent to the experiment station for solution by the President of the Mississippi River Commission, but requests for the performance of research work may originate in engineer districts outside his jurisdiction.

In its first two years of life the laboratory has engaged in many types of river and open channel problems, ranging all the way from investigations for determining the best design of spillways to experiment with movable bed models. Investigations of the future are difficult to predict, but the definite tendency is toward increased work with models of the latter type. Flood control problems decrease in number and importance as the project for the Lower Mississippi River goes into its fifth year well ahead of schedule; and more and more it becomes necessary to consider the problems of nagivation during low water seasons. Considerable work has been done in this field already, but infinitely more remains to be accomplished and it appears probable at the present time that there will never be a lack of hydraulic problems requiring investigation through the use of models.

Close-up of a "Cut-off" in Operation



General View of Laboratory Building Showing Dam and Reservoir which Furnishes the Water Supply



Model of the Famous Greenville Bends
(Model dry)

THE TECHNIQUE OF HYDRAULIC MODEL EXPERIMENTATION

By Paul W. Thompson*

Read Before the Society, November 14, 1932.

The following remarks have been formulated to complete the picture developed by Lt. Vogel in his paper, "The Work of the U. S. Waterways Experiment Station". Lt. Vogel has described the history and development of hydraulic laboratories in general, and of the U. S. Waterways Experiment Station in particular. He has left with us a picture complete in its general outlines. The purpose of the present paper is to add details to that picture; to examine it at close range and to consider carefully the laws of similitude on which the science of hydraulic model experimentation has been based.

It will be helpful to review, briefly, the purpose of a hydraulic model. There arise in hydromechanics many problems which defy solution by pure mathematics or by empirical formulas. It is the purpose of a model to provide the means for economically investigating such problems. The model can be delicately adjusted, manipulated at will, accurately controlled and observed beyond anything possible on its prototype; hence, if results of investigation of the model can be shown to be transferable to the prototype the model has fulfilled its purpose.

In literature dealing with experimentation by models, a great deal is heard of the laws of similitude. These must be defined, and the definition follows from what has been noted as to the purpose of a hydraulic model. The laws of similitude are those principles which insure that results obtained from study of the model will be transferable, quantitatively or qualitatively, to the prototype. Perfect mathematical similitude of model to prototype is not attainable, and, in fact, is not assential as long as this principle of the transferability of results is satisfied. The impression of exact mathematical re-

*Second Lieutenant Corps of Engineers, Assistant to Director, U. S. Waterways Experiment Station, Vicksburg, Miss.

lations which the word "similitude" implies is to be avoided in favor of the conception just enunciated.

There is no royal road to an understanding of similitude as it relates to model experimentation. The road, however, has a logical starting point ni the form of geometric similitude. Geometric similitude is concerned with the relations existing between linear dimensions of model and prototype. The measure of this similitude is in the ratio of any length on a model to the corresponding length on the prototype. Thus, considering the length of a horizontal line on the model, and the length of the corresponding line on the prototype, we can write, as the horizontal (length) scale of the model:

$$l = \frac{L_m}{L_n}$$

(In the notations used above and in all to be used later, upper case letters refer to actual lengths, areas, etc.: subscripts denote whether the length, area, etc., refers to nature or to model.)

And similarly, as the vertical (depth) scale, we can write:

$$d = \frac{D_m}{D_n}$$

And, using the same notation, the mathematical relations of other essential scales follow:

$$\text{Area: } a = \frac{A_m}{A_n} = \frac{L_m \; D_m}{L_m \; D_n} = ld$$

$$\text{Slope: } s = \frac{S_m}{S_n}$$

$$\text{"Roughness": } n = \frac{N_m}{N_n} \text{ [Kutter's or Manning's)}$$

$$\text{Velocity: } V = \frac{V_m}{V_n} = \frac{\frac{1.486}{N_m}}{\frac{1.486}{N_n}} \times \frac{R_m^{2/3}\, S_m^{1/2}}{R_n^{2/3}\, S_n^{1/2}} = \frac{d^{2/3}\, s^{1/2}}{n}$$

(Considering hydraulic radius as equal to mean depth.)

$$\text{discharge: } q = \frac{Q_m}{Q_n} = \frac{A_m\, V_m}{A_n\, V_n} = av$$

The horizontal, or length, scale is the first to be considered in the design of a model. The factors influencing its selection are almost self-evident. In the first place, we have for reproduction a definite section of some hydraulic body, say a river. We have a certain amount of space available at the laboratory. Obviously, the horizontal scale of the model must be such as to make the finished model fit in the space available. However, even if unlimited space be available still there is a limit to the size the model can be built, since a large model costs more to build and to operate than a small one. Also, the larger the model is, the more water it requires for operation, and if the water supply of the laboratory is limited, this consideration may fix the size of the horizontal scale. Finally, as will appear later, it may prove desirable to manipulate the horizontal scale in the interests of obtaining less model "distortion."

The knotty question of model "distortion" is brought up by a consideration of the factors influencing the selection of the vertical, or depth, scale of the model. Where the prototype of a model is a great river like the Mississippi it is apparent that the same depth and length scales would produce a model either absurdly large because of large length scale, or one of almost negligible depths because of small depth scale. As a matter of practical design it is therefore necessary, when building a model of a prototype such as the Mississippi, to employ a larger value for the depth scale than was employed for the length scale. When different scales are so used, the model is said to be distorted, and the measure of the distortion

is taken as the ratio, depth scale to horizontal scale. European experimenters throw up their hands in horror at the mention of distortion ratios greater than about 5. At our own institution we employ successfully distortions as great as 15 or 20. Experience has indicated no limit beyond which distortion *must* not be carried and when such limits have been set, it is invariably found that they are such as to let rivers with which that particular laboratory has to deal under the wire.

Regardless of the ratio selected for the length scale, then, the depth scale must be such as to insure measurable depths in the model. It should also, of course, aim to keep distortion to a minimum. Further consideration of the factors influencing the selection of a value for the depth scale bring us face to face with the matter of dynamic similitude.

Dynamic similitude is rigorously defined as that similitude which requires corresponding particles in models and nature to describe geometrically similar paths, in corresponding time units and as the result of forces acting in a definite ratio, model to prototype. The bark of this definition is much more severe than its bite, and for all practical purposes dynamic similitude is satisfied when

(a) The same character of flow exists in model and in prototype.

(b) When the bed movement of the model is similar to that in nature.

Considering the first named condition of dynamic similitude, it is well known that the flow of water may take place in one of three ways: laminar, or streamline flow, turbulent flow, or shooting flow. It is further known that almost invariably the flow of water in open water courses is in turbulence. Hence, almost invariably the flow of water in the model must be in turbulence. There exist index numbers, developed by experiment, by which water courses may be tested to the end of determining the character of flow to be expected in those courses. Taking the case of a model of a stretch of natural river, where the forces of friction are of relatively high importance, the index or criterion commonly used as a test for character of flow is in the one known as Reynolds Number. This criterion was discovered in 1883 by the great experimenter, Osborne

Reynolds, who found at that time a definite transition point between laminar and turbulent flow. He found that this transition point is indicated by a definite value for the non-dimensional $\frac{V \times R}{K}$, where V indicates velocity, R some linear dimension (usually hydraulic radius) and K the coefficient of kinematic viscosity for the fluid under consideration. Reynold's experiments were on pipes, and his values for his number are not at all applicable to open channels. Experiments at our own institution and elsewhere have indicated that, to insure turbulent flow the value of Reynold's Number for an open water course should exceed about 6000. Evaluating the coefficient of kinematic viscosity, which does not vary a great deal, it is found that turbulent flow in an open channel will occur when the product V x R exceeds .075.

It is possible for flow to pass up through the turbulent stage and into shooting flow. This possibility must be investigated in the design of a model, and, also, since the velocity for shooting flow is the same as that for wave transmission, the necessary condition to insure non-shooting flow is that the velocity in the channel be less than $\sqrt{G\,R}$

To summarize, then, turbulent flow will exist in a model when

$$\frac{.075}{D_m} < V_m < \sqrt{G\,D_m}$$

or, evaluating the model velocity (by means of the velocity scale ratio), when:

$$\frac{.075}{d \times D_n}_{mean} < \frac{d^{\frac{2}{3}}\ s^{\frac{1}{2}}}{n} \times V_{n\ mean} < \sqrt{G \times d \times D_n}_{mean}$$

Now, to apply the above criterion it is necessary to know velocities that can be expected in the model, and this, obviously, requeres knowing the values for length scale, depth scale, slope scale and for n scale. The length scale has beeu set as described. The depth scale is selected so as to insure measureable depths, and the n-scale is assumed from a considera-

tion of the records of past experiments. The slope scale remains to be evaluated, and its evaluation brings us to requirement (b) of dynamic similitude.

Requirement (b) states that the bed movement of the model must be similar to the bed movement of nature. At first glance this requirement seems to indicate that the bed material used in the model (hereinafter described by its German name "geschiebe") must bear the same dimensional relationships to the natural geschiebe as the linear dimensions of the model bear to those of the natural stream. Obviously, a sand so reduced in size would not give a typical bed movement at all, but would be so small as to become colloidal, or go into suspension. Reasoning such as this has given rise to an impression that movable bed studies are not in the province of model experimentation. This impression is false, as a more thorough investigation of geschiebe movement and its causes will show.

A particle of geschiebe lying on the bed of a stream moves as a result of being acted upon by the tractive force of the water flowing over it. A more fundamental statement of the requirement of a movable bed model, then, is that the tractive force of the model must be similar to the tractive force of the natural river. This necessitates a consideration of tractive force and its action.

The laws of mechanics are entirely applicable to water flowing, or sliding down an inclined plane. The resistances of the bed of a stream keep the water from constantly increasing its velocity; which is to say, these resistances just overcome the component of the acceleration of gravity in the direction of the slope. The equation expressing this fact, known as DuBoys Law, ignores possible losses in energy through interior movement in the water, but these losses are small and are entirely unmeasureable. The equation has been checked experimentally, and is generally accepted. Letting S_o= tractive force per unit area, j = unit weight of water, d = depth and s = slope, the equation can be written:

$$S_o = j \times d \times s$$

The method of attack for investigation of the movable bed problem by use of models is now apparent. The factor j is the

same in model and nature. The depth, d, of the natural stream is, say, 100 times the depth in the model. Obviously, if the tractive force of the model is to be the same as the tractive force of nature the slope of the model must be 100 times the slope of nature. This analysis assumes a geschiebe in the model requiring the same tractive force for movement as the geschiebe in nature. Actually, the model geschiebe is generally much finer than that of nature and requires, say, a tractive force one-fifth that required for similar movement of the natural geschiebe. Then, to obtain equality of model and natural tractive forces relative to their respective geschiebes, the slope of the model must be 20 times the slope of nature.

The theory of the movable bed, then, is quite simple; but the technique involved in application of the theory presents some difficulties. First, it is necessary that geschiebe movement in the model begin at stages corresponding to those at which movement begins in nature. But at what stage does bed movement begin in nature? In a great muddy river such as the Mississippi, observation is out of the question.

Resort must be had to the tractive force equation. Suppose a sample of the natural geschiebe be taken and placed in a flume at a slope 100 times steeper than the slope of nature. Water can then be passed over the bed until a depth is reached at which movement is occurring. The tractive force equation can then be solved for the tractive force necessary to move that particular geschiebe, and, with the mean slope of the river known the stage required to produce movement may be calculated. Such a test as the one described is justified because critical tractive force for any particular geschiebe is a constant quantity, not dependent on slope. This property is evident from the manner of the teoretical derivation of the tractive force equation, and it has been verified by many experimenters, one of whom, Lt. Hans Kramer, enunciated the property and called it "The law of the constant critical tractive force."

A flume test similar to the one described must next be run on the sand which it is desired to use in the model. This test will show the tractive force necessary to move the model geschiebe while applying the vertical scale already tentatively selected to the stage at which movement was found to begin in

nature gives the model stage at which movement will begin. The slope necessary in the model follows immediately from another, and final, solution of the tractive force equation.

With the slope of the model fixed, and the slope of nature known, the slope scale is determinable. Reynold's criterion may now be applied to the model, enough sections being tested to insure suitable flow all through the model. If the slope and other elements as selected and determined fail to satisfy the criterion, the scale must be manipulated or another model geschiebe used. Actually, a slope that satisfies requirement (b) of dynamic similitude almost invariably satisfies Reynold's criterion.

With all the scale values known, the quantity of water necessary to operation of the model can be determined from the relationship

$$Q_{m}{}_{max} = q \times Q_{n}{}_{max}$$

and if this result is within the supply available at the laboratory, construction of the model can proceed.

The steps in model design, as just described, insure a successful model provided the construction of the model is accurate and its operation is intelligent and faithful. Construction of a model requires accurate maps and soundings, as well as complete information and data on all regulating works, such as dikes and dams. Often, special maps must be made in the interests of model construction, and while this is expensive it would be folly to go ahead and build a model using insufficient or inaccurate data. A laboratory owes it to itself as well as to the engineers who will use its results, to insist on adequate maps, plans, etc.

A model soundly designed and accurately constructed must still be carefully and intelligently operated if dependable results are to be obtained. The operation of the model, then, is of supreme importance. The model must first be adjusted so as to make certain that it is correctly reproducing phenomena as they occur, or will occur in nature. In the case of movable bed models, it is the practice of the U. S. Waterways Experiment Station to subject each model to what is called a "verification" run. This run consists of starting the model off with

its bed moulded flat and to a mean slope. Hydrographs are run over the model and the bed contour at intervals. Not until the model has shown by means of its verification run that it can of itself reproduce formations as they exist in nature is the model accepted as operating satisfactorily.

These verification runs also serve to indicate a time scale for the model. For instance, it may be known that a certain change in bed formation in nature required a certain time; the time for the corresponding change to occur in the model is noted and a relation as to time values between model and nature is thereby deduced. Such practice is, of course, not absolutely rigid or exact; but it is apt to be more satisfactory than time scales as computed theoretically.

Another phase of the adjustment runs of a model consists of reproducing on the model some known water surface profile of nature. The relative discharges of model and nature for this profile are compared, and a true discharge scale derived. This scale will generally be slightly different from the scale as calculated before, since the latter involved an assumption as to the value of n. However, each completed model adds one more known value to the list of determined n's, and the next model to be designed will have the benefit of that much more experience. As a matter of practice, it is found that the actual and theoretical values of the discharge scales seldom vary more than 5 per cent.

The mechanics of model operation are of importance and of interest. The models are run through hydrographs, compiled from flow duration curves covering as many years as records are available for. Our own station has adopted a 12-hour hydrograph as giving excellent results; the European practice is toward shorter periods, say 8 hours. This means that in 12 hours the model is subjected to all the stages of the natural river, and held at each stage a period of time proportional to the length of time that stage exists in nature as determined from the records of the stream.

At the U. S. Waterways Experiment Station water is measured by means of weirs, mostly of the 90-degree V-notch type. These weirs are carefully calibrated, in place if possible. Water surface elevations are measured in most cases by means of

hook gages with vernier or micrometer attachments. Point gages and manometers are also used for this purpose. Colored sand is used to trace the movement of bed materials, and oat grains, the peculiar hydraulic properties of which were discovered by our institution, are also used. Velocities are measured by means of tiny current meters, pitot tubes, deflectometers, floats; and, in addition, mean velocities are computed. Dyes, yarns, sub-surface floats and oat grains are used to trace current directions. Photographs, both still and movie, are taken whenever they will prove helpful. Operators of all models are required to keep diaries in which they note everything of possible importance or interest. Great care is taken to feed geschiebe onto the model in the same quantities and at the same rate that it goes out. Tail gates, which are, in effect, weirs of adjustable height, are used to obtain calculated slopes. Finally, great emphasis is laid on the desireability of close contact between model and field forces. Engineers from the field are urged to visit the model frequently, and they are kept constantly informed as to its status. On the other hand, operators of the model visit the field and so get first hand information as to the problems they are helping to solve. All in all, no pains are spared to insure that the model will be operated to its greatest advantage.

There are those who regard model studies as the final and unerring cure-all for any hydraulic problem, and there are those who profess to see no good whatever in any form of model investigation. Certainly the true conception lies somewhere between these extremes; and certainly after a fair survey of results actually obtained to date by the use of models, at our own institution and at others, there will be few who will challenge the following statement, from the pen of Osborne Reynolds, who was in the forefront of those who blazed the trail for model experimentation:

> ". . . I have called attention to these results because this method of experimenting (by use of small scale distorted hydraulic models) seems to afford a ready means of investigating and determining beforehand the effects of any proposed harbor works—a means which, after what I have seen, I would consider it madness to neglect before entering upon any costly undertaking".

MINUTES OF MEETINGS AND BUSINESS OF THE SOCIETY

Minutes of the Board of Direction, October 15, 1932.

The Board of Direction met in Room H, Roosevelt Hotel, and the following members were present: Messrs. Billingsley, Bres, Wiggin, O'Neill and Muth. Professor A. L. Dunlap was excused, as he had previously notified the Board he would be unable to be present due to some football activities at Tulane University.

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

Communications from the State Board of Engineering Examiners relative to the expiration of the appointment of Professor Donald Derickson as Member of the Board were read and on motion, duly seconded, the President was authorized to submit to the Governor a list of names of members of the Louisiana Engineering Society from which list the Governor was requested to make appointment.

In accordance with the Amendment to the Constitution, providing for nominating committee, the Board approved the appointment by the President of the following members on that committee:

Mr. John T. Eastwood, Chairman,
Professor Douglas Anderson,
Mr. Frank G. Frost.

There being no further business, the meeting adjourned.

FRANK A. MUTH, Secretary.

Minutes of the Regular Meeting and of Smoker, October 15, 1932.

The meeting was called to order in the Gold Room of the Roosevelt Hotel at about 8:10 p. m., Mr. F. N. Billingsley, President, in the chair, F. A. Muth, Secretary, and 79 members and guests present.

The reading of the minutes of the previous meeting was dispensed with. Announcements were read by the Secretary of the meeting of the American Chemical Society also meeting of the Women's Auxiliary of the Louisiana Engineering Society.

Report of the Employment Committee was also read.

The meeting then adjourned to a most delightful Smoker, held in the same room, which was enjoyed by all.

FRANK A. MUTH, Secretary.

Minutes of the Board of Direction, November 14, 1932.

The meeting was called to order by President Billingsley, and the following members were present: Messrs. Frost, Wiggins, Bres, O'Neill and Moses.

In the absence of the Secretary, Mr. Walter B. Moses acted as Secretary.

The minutes of the previous meeting were read and approved and instructions were issued for the Secretary to submit the bills upon his return for approval of the President and Treasurer.

Copy of letter from President Billingsley to the Governor, thanking him for the courteous reception given the Administrative Committee, regarding the passing of "Engineers' Act", was read, and it was suggested that a copy be sent to Mr. Harry Jacobs, who has given material aid in the passage of this bill.

There being no further business, the meeting adjourned.

FRANK A. MUTH, Secretary.

Minutes of the Regular Meeting of the Society, November 14th, 1932.

The meeting was called to order about 8:10 p. m., F. N. Billingsley, President, in the chair, and Walter B. Moses, Secretary pro tem in the absence of Frank Muth, Secretary, who was excused due to absence from the city.

Eighty-six members and guests were present.

The minutes of the previous meeting were read and approved.

A very stirring talk on the benefits of the Community Chest was given by Rabbi Louis Binstock.

President Billingsley gave a short talk on the Industrial Rehabilitation Committee, which has recently been appointed in Louisiana, with Mr. A. M. Lockett as Chairman. He urged all members to co-operate and to do everything possible to broaden the scope of work being done by this committee.

The President then announced the appointment of the following Nominating Committee:

Mr. John T. Eastwood, Chairman,
Prof. Douglas Anderson,
Mr. Frank G. Frost.

These members will report at the December meeting on the Officers and Board of Direction for the coming year.

The Acting Secretary then submitted for first reading the proposed amendment of the Constitution and By-Laws.

The Acting Secretary read an invitation from the N. A. P. R. E. to attend a lecture in the Jung Hotel, Wednesday, Nov. 23rd.

A technical paper, consisting of a very elaborate discussion on "The Technique of Hydraulic Model Experimentation", was read by 2nd Lieut. Paul W. Thompson, of Vicksburg, Miss.

The other paper, which was to have been given by 1st Lieut. Herbert D. Vogel, of Vicksburg, Miss., on "The Work of the U. S. Waterways Experiment Station", was read by 2nd Lieut. Paul W. Thompson, in the absence of 1st Lieut. Herbert D. Vogel.

Second Lieut. Thompson was tendered a rising vote of thanks, and the meeting adjourned to the usual collation.

FRANK A. MUTH, Secretary.