PROCEEDINGS

OF THE

LOUISIANA

ENGINEERING SOCIETY

VOL. XIV.—1928

PUBLISHED BI-MONTHLY
BY THE
LOUISIANA ENGINEERING SOCIETY
NEW ORLEANS

PROCEEDINGS OF THE LOUISIANA ENGINEERING SOCIETY

CONTENTS

EDITORIAL NOTES AND COMMENT: PAGE

Action of Sea Water on Reinforced Concrete, The 144
American Engineering Council 74
Asphalt 73
February Meeting Postponed 197
Gulf Coast Seawall, The 143
Inspection Trip Outing 75
Louisiana Engineering Society Prize, The 111
New Members 112, 198
New Orleans and Its Gas 109
New Wood Preservative, A 169
Official Staff for 1928 5
Our Thirtieth Anniversary 6
Point of View, The 9
President Porter 3
Scholarships for Engineering Students 112
Short-Circuiters 170
Smoker, The 5
State Board of Engineering Examiners, The 112
Talking Pictures and Television 195
Telephonic Incident, A 121
Visit of the Western Society of Engineers, The 7
"World's Longest Concrete Sea-Wall, The" 74

IN MEMORIAM:

Resolutions on the Death of Major C. Schoenberger 199
George C. Schoenberger—A Tribute. *By Gervais Lombard* 200

PAPERS AND DISCUSSIONS:

Asphalt in the Paving Industry. *By Leroy M. Law* 77
Basic Principles of Radio Television, The. *By A. A. Schiele* 208
Discussion 218
Industrial Louisiana and the Engineer. Address of the Retiring President. *By E. S. Lanphier* 11
New Orleans and Its Gas. *By A. M. Shaw* 114
Discussion 126
Our Evening with the Telephone Company 220
Discussion 228
Point of View, The. *By A. L. Dunlap* 14
Reinforced Concrete; Its Permanence and Protection with Relation to the Action of Sea Water. *By Lloyd G. Frost* 156
Report of Committee on Withdrawal from American Engineering Council 99
A Telephonic Incident 232

Thirtieth Anniversary of the Founding of the Louisiana Engineering Society.
Address of Col. Sidney F. Lewis 19
Address of Mr. Alfred F. Theard 25
Remarks of Mr. Coleman 27
Remarks of Mr. Gervais Lombard 29
Underlying Principles of Movietone and Vitaphone, The. *By Pendleton Lehde* 202
World's Longest Concrete Seawall, The. *By H. D. Shaw* 146
Discussion 151
Zinc Meta-Arsenite. Its Development and Use in Timber Preservation. *By Kenneth M. Bailey* 174
Discussion 185

MEMBERSHIP LIST FOR 1928 31

MINUTES OF MEETINGS AND BUSINESS OF THE SOCIETY:

Minutes of the Board of Direction:
December 12, 1927 45
January 14, 1928 47
January 14, 1928 (Special Meeting) 49
January 30, 1928 (Special Meeting) 50
February 13, 1928 104
March 3, 1928 (Special Meeting) 105
March 12, 1928 105
April 9, 1928 107
May 1, 1928 (Special Meeting) 141
May 5, 1928 (Special Meeting) 141
May 14, 1928 14
June 11, 1928 167
September 10, 1928 192
October 8, 1928 193
November 12, 1928 235

Minutes of the Society:
December 12, 1927 46
January 14, 1928 49
February 13, 1928 104
March 12, 1928 106
April 9, 1928 107
May 14, 1928 142
June 11, 1928 167
September 10, 1928 192
October 8, 1928 193
November 12, 1928 235

Annual Reports:
Report of the Board of Direction for 1927 52
Report of the Secretary for 1927 54
Report of the Treasurer for 1927 61
Report of Employment Committee for 1927 65
Report of the Auditor 66

VOL. 14
1928

The Proceedings of the Louisiana Engineering Society

Published bi-monthly, February, April, June, August, October, December, under the auspices of the Committee on Publication.

DOUGLAS ANDERSON, Editor.

The Louisiana Engineering Society is not responsible for any statement made or opinion expressed in this publication.

Subscription, $2.00 per annum Single copy, 35 cents

ADVERTISING RATES

	ONE YEAR	HALF YEAR	ONE ISSUE
Full page	$50.00	$28.00	$10.00
Half-page	28.00	15.00	6.00
Quarter-page	15.00	10.00	4 00
One-eighth page	10.00	6.00	2.00

For the back outside cover add 50 per cent to the above rates. For the inside covers add 25 per cent to the above rates.

Address all communications to
Douglas Anderson, Editor, Tulane University,
New Orleans, La.

Entered as second-class matter July 27, 1916, at the Post Office at New Orleans, Louisiana, under the Act of August 24, 1912.

Acceptance for mailing at special rate of postage provided for in section 1105, Act of October 3, 1917, authorized August 1, 1918.

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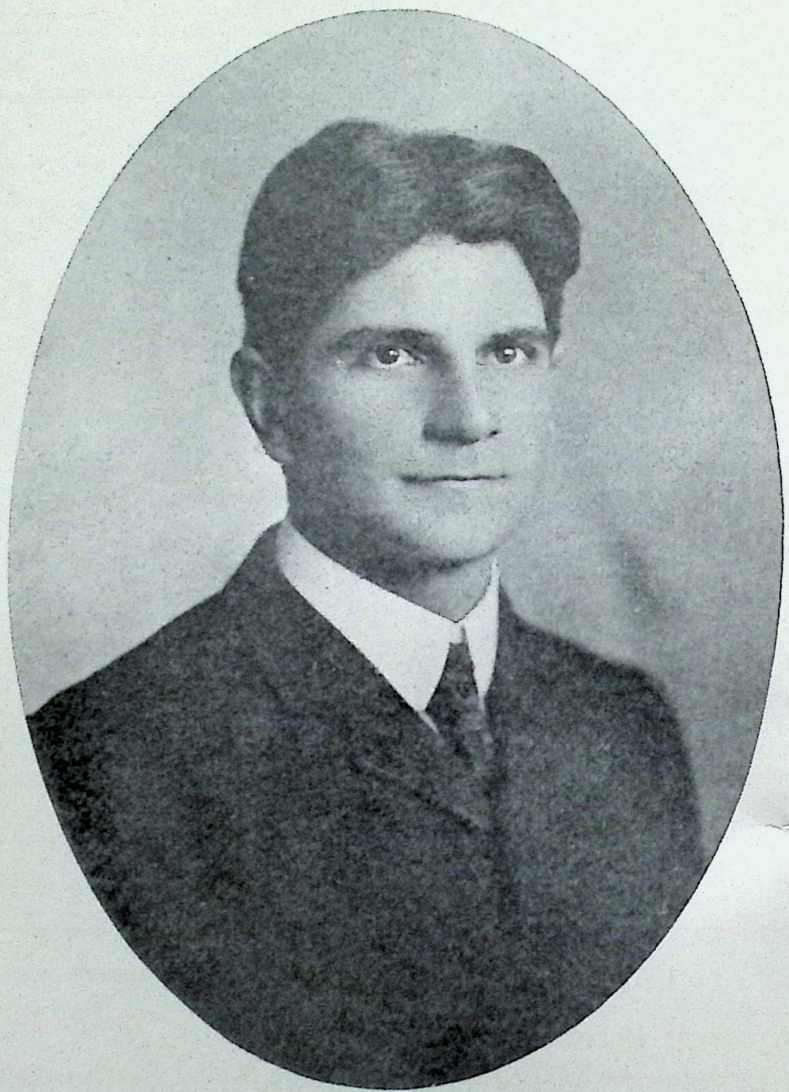
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PRESIDENT JOHN L. PORTER

PROCEEDINGS
OF THE
LOUISIANA ENGINEERING SOCIETY

VOL. XIV. FEBRUARY, 1928 NO. 1

CONTENTS

EDITORIAL NOTES AND COMMENT: PAGE
President Porter ... 3
Official Staff for 1928 ... 5
The Smoker ... 5
Our Thirtieth Anniversary ... 6
The Visit of the Western Society of Engineers ... 7
The Point of View ... 9

PAPERS AND DISCUSSIONS:
Industrial Louisiana and the Engineer. Address of the Retiring President. *By E. S. Lanphier* ... 11
The Point of View. *By A. L. Dunlap* ... 14
Thirtieth Anniversary of the Founding of the Louisiana Engineering Society.
Address of Col. Sidney F. Lewis ... 19
Address of Mr. Alfred F. Theard ... 25
Remarks of Mr. Coleman ... 27
Remarks of Mr. Gervais Lombard ... 29

MEMBERSHIP LIST ... 31
MINUTES OF MEETINGS AND BUSINESS OF THE SOCIETY ... 45
ANNUAL REPORTS ... 52
REPORT OF AUDITOR ... 65

EDITORIAL NOTES AND COMMENT

President Porter. Mr. John Lewis Porter, elected to the presidency of the Louisiana Engineering Society, at the annual meeting in January, was born in North Adams, Massachusetts, March 17, 1878. He received his education in the public schools and Drury Academy of that city, and at the Massachusetts Institute of Technology, where he received his engineering degree in 1900.

He was with the New York-Continental-Jewel Filtration Company for some months, following graduation, engaged in filtration research work.

When the Sewerage and Water Board was organized in 1900, one of its major problems was the investigation of methods of water purification and the determination of the most satisfactory and economical type of plant to furnish water for the City of New Orleans.

Mr. Porter joined the staff of Mr. Robert Spurr Weston, the resident expert chosen by the Sewerage and Water Board to conduct these investigations, in November, 1900, and has been in the employ of the Sewerage and Water Board continuously since that time.

Following these investigations he was engaged in research work on various problems incident to the design and construction work of the Sewerage and Water Board on the sewerage, water and drainage systems and in charge of the testing laboratory which was largely engaged in the inspection and testing of the various construction material.

When the first portion of the sewerage system, including the main pumping station, was ready for operation, he was assigned the task of developing a set of plumbing regulations adapted to local conditions, the licensing of master plumbers, and of organizing a plumbing inspection and house connection department.

After two years in this work he was transferred to the Water Purification Department in September, 1908, as the Carrollton plant was nearing completion.

His major work since that time has been as director of operation of the two purification plants, and during the past six years he has also been in charge of the design and construction of the extensions to the water purification plant at Carrollton—work which is being done exclusively by the forces of the Sewerage and Water Board at a cost of approximately $2,250,000.

During the World War he was at Camp Sheridan, Montgomery, Ala., as the representative of Mr. Geo. G. Earl, Supervising Engineer, in charge of construction for a period of about a year and a half.

He has been associated with Mr. Earl in consulting work on sewerage, water and drainage problems for other municipalities, as well as on various engineering and chemical problems individually.

In 1924 he was chosen by the Gas Committee of the Sewerage and Water Board to make a study and report on the natural gas situation as applied to New Orleans, and he has done considerable work along these lines for the City of New Orleans.

He is a member of a number of technical societies in the engineering, chemical and water works field.

Mr. Porter has contributed valuable service to the Louisiana Engineering Society on committee work, as a member of the Board of Direction and as Vice-President.

Official Staff for 1928. Professor F. H. Fox was elected to the Vice-Presidency succeeding Mr. Porter, who had been elected President. Mr. Frank G. Frost was chosen as a member of the Board of Direction to serve the three-year term. At a special meeting of the Board of Direction Mr. Carl G. Muench was elected a member of the Board to fill out the unexpired term of Professor Fox. Mr. Muth and Mr. Moses were re-elected to their respective offices of Secretary and Treasurer. Mr. Todd remains a member of the Board, his term of office not having expired, and Mr. Lanphier, as retiring President, becomes automatically a member.

The Smoker. A year ago our editorial comment upon this annual event bore the caption "Gentlemen Prefer Blondes." This year—It was a Brunette!

If you were there, you saw it!

If you were not there, why not?

Mr. Carl G. Muench was toastmaster.

The invited guests who honored us with their presence were: President A. B. Dinwiddie of Tulane University, Major W. H. Holcombe, District Engineer of the Fourth Mississippi River District, Commander S. E. Cassidy, Commandant of the New Orleans Naval Station, and Col. H. C. Boyden of the Celite Products Company of Los Angeles, Calif.

Our Thirtieth Anniversary. The year 1928 marks the thirtieth birthday of the Louisiana Engineering Society. The occasion was very appropriately celebrated by devoting the program of the regular meeting of February 13th to "Some Reminiscences by Old Timers."

The first speaker was Mr. J. Frank Coleman, to whom we really owe the first move for the organization of an engineering society in New Orleans. Mr. Coleman said his motive in first suggesting this organization was based upon his desire to form a club or group of engineers, who by pooling their somewhat limited financial resources, might thereby be enabled to subscribe to and have for reference a greater number of engineering journals and publications than it would be possible for one man to secure alone. Mr. Coleman became the first Secretary of the Louisiana Engineering Society, organized December 22, 1897, and incorporated January 1, 1898.

Col. Sidney F. Lewis, the first President of the Society, was next called upon, and he read a paper telling of his personal experiences with the State Board of Engineers and the various levee boards of this and neighboring states. While it was a statement of his own experiences, it was at the same time a brief history of work accomplished and methods used by the above organizations during the many years of Col. Lewis's connection with them.

Mr. Alfred F. Theard, the second President of the newly organized Louisiana Engineering Society, was the third speaker. His reminiscences, given in the form of a short paper, formed a very interesting and instructive review of the development and progress of engineering methods in New Orleans during the past thirty years, particularly with reference to the use of reinforced concrete in the many and varied engineering structures of the Sewerage and Water Board.

The papers of Col. Lewis and Mr. Theard, and the remarks of Mr. Coleman and Mr. Lombard, are printed in this issue of the Proceedings.

The fourth and concluding speaker on the program of the "Old Timers" was Mr. Gervais Lombard, Assistant State Engineer. Mr. Lombard was Secretary of the Society for a num-

ber of years, and he gave a very entertaining account of his experiences as an engineer with the State Board.

The members present at the meeting greatly regretted the fact that Mr. Walter Hoffman and Mr. Alexander Black, our two remaining charter and honorary members, were not able to be present on this occasion.

These early founders of the Louisiana Engineering Society builded well, for from these small beginnings the Society has gone steadily to its present larger membership and to its standing and influence in this community.

The Visit of the Western Society of Engineers. On January 26th and 27th, the Louisiana Engineering Society had the pleasure of serving as host to a group of members of the Western Society of Engineers of Chicago, who, as a feature of their annual program, were making a short tour of this section of the country. There were about forty-five persons in the party, and they spent the day of January 25th in and about Gulfport.

They arrived in New Orleans early Thursday morning and were met at the train by a reception committee of members of the Louisiana Engineering Society. The whole party then proceeded on foot to the Chess Club, where breakfast was served. After breakfast smaller groups of the visitors were shown the more interesting sights of the Vieux Carré, assembling later at the head of Canal Street for a trip around the harbor on the fire-boat Samson. This portion of the trip was concluded with a visit of inspection to the plant of the American Sugar Refining Company at Chalmette.

No special program was arranged for the evening, but the visitors were left free to seek such entertainment as they preferred.

The next day was devoted to an automobile trip about the city, giving the visiting engineers an opportunity especially to visit the water purification plant and the extensive enlargements now in process of construction therewith. They were then taken across the river for an inspection of the plant of the Celotex Company, where a complimentary luncheon was served them by the company. While in New Orleans the visitors lived

aboard their private train, the cars of which were parked in the yard of the Union Station.

Their train left the same evening about 12 o'clock, and Saturday was spent at Vicksburg. Leaving Vicksburg Saturday night, they arrived in Chicago about 9:30 Sunday night.

The personnel of the party was as follows:

Julius L. Hecht, Vice-President, Public Service Co. of N. Illinois.
Mrs. Hecht.
Dr. A. E. Patton, Public Service Co. of N. Illinois.
J. Paul Clayton, Vice-President, Central Illinois Public Service Company.
H. E. Williams, President, Illinois Bridge Company.
Ezra Shoecraft, Consulting Engineer, Grand Rapids, Mich.
J. C. Alderman, Assistant General Manager, Great Lakes Dredge & Dock Company.
Mrs. Alderman.
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Rufus W. Putnam, President, W. S. E., Consulting Engineer, The Harbor Plan of Chicago.
Jerome A. Moss, President, Illinois Section A. S. C. E., General Contractor.
Mrs. Moss.
D. W. Roper, Superintendent Street Department, Commonwealth Edison Company.
Ray Seely, City Engineer, Hammond, Ind.
Mrs. Seely and son.
Alfred Herz, Engineer of Electrical Tests, Public Service Co. of N. Illinois.
C. B. Frankel, Supervisor of Underground Extensions, Commonwealth Edison Company.
G. F. Samuel, Consulting Engineer, Chicago.
D. B. Rush, Department Manager, Robt. W. Hunt Company.
John C. Bley, Bridge Designing Engineer, City of Chicago.
P. V. Brown, Inspector, Robt W. Hunt Company.
Chas. W. Morey, President, Chicago Technical College.
W. H. Haas, Prof. of Geology, Northwestern University.
Duncan M. Campbell, Assistant Engineer, Cook County Highway Department.
Arthur L. Evans, Electrical Contractor, Hammond, Ind.
Richard Evans (son).
C. R. Andrzelczyk, Assistant Engineer, Sanitary District of Chicago.

O. P. Chamberlain, President, Dolese & Shepard.
Elmer E. Perkins, President, Elmer E. Perkins Company, Bradley, Ill.
A. J. Walcott, Professor of Mineralogy, Northwestern University.
A. C. Berry, Architect, Hammond, Ind.
F. M. Poole, Construction Inspector, Public Service Co. of N. Illinois.
W. G. Arn, Assistant Chief Engineer, I. C. R. R., Chicago Terminal Improvements.
W. P. Monroe, Assistant Engineer, I. C. R. R.
D. L. Mac Donald, Assistant Engineer, I. C. R. R.
C. A. Schroyer, Retired Car Superintendent, C. & N. W. Ry.
R. J. Strasser, Engineer, Sargent & Lundy.
Mrs. Strasser.
N. R. Thornton, Assistant Engineer, Pennsylvania R. R.
J. M. Mercer, Assistant Secretary, Western Society of Engineers.

The Point of View. In his paper with this title Mr. Dunlap perhaps does not emphasize as clearly as he might the relation between the illustration he uses of the economic reorganization of the stores department of a public utility company and the "point of view" which he feels the average engineer might take toward such an opportunity for effective and remunerative service.

The example cited by Mr. Dunlap with reference to conditions in the New Orleans Public Service is probably a rather apt illustration of the old adage to the effect that it's "the new broom that sweeps clean." And one familiar with the many factors and conflicting interests and conditions involved in the combination of the separate utility companies of this city into one organization, will realize that it was a situation which would require absolutely a "new broom" to sweep it clean. This applies to departments other than the stores. The broom which swept this stores department clean was a man trained for the profession of business.

Mr. Dunlap wonders whether a man trained for the profession of engineering would have had the "point of view" necessary to enable him to do the job as well.

As brought out more clearly by the subsequent discussion, Mr. Dunlap seems to feel that the young graduate from the engineering college meets with a less sympathetic attitude on the

part of the practicing engineer than does the young graduate from a college of commerce on the part of the business man. This would tend to inspire the young business man with a greater degree of self-confidence and would render it easier for him to secure a good start than would be the case with the young engineer.

To what extent this feeling of the writer of the paper is warranted by the facts is a matter requiring more data and further investigation. This thought might be added. If there really exists such a wide disparity between the problem of getting started in business and getting started in engineering, may this not be due to the wide difference in the inherent difficulties of the two courses, both in college and after?

PAPERS AND DISCUSSIONS

INDUSTRIAL LOUISIANA AND THE ENGINEER

Address of the Retiring President,
E. S. LANPHIER.

Louisiana has entered upon an era of industrial acitvity which some of us may not have envisaged. The tremendous production of petroleum and natural gas and the continued extension of territory within our boundaries, where these basic stimulants to industry are found, bid fair to make this state, within the next few years, one of the most prosperous in the Union. When this is added to our location, soil and climate, there only remains the control of the great river (which will be accomplished) to assure our economic future.

Conditions of life within our state are ideal and should be presented as such. We have a range of climate, conditions of healthfulness and natural resources which will spur us on to accomplishments far greater than the most sanguine expectations of the present generation.

It must be remembered, and it should be continuously broadcasted to the world by every citizen, that Louisiana has the cheapest power in tremendous quantities, natural gas! Indeed, it is so cheap and has so many advantages as a fuel that it is used in Baton Rouge and in the Port Arthur-Beaumont oil refining districts as the fuel for the refineries. Where gas is so cheap that it pays oil refining companies to lay gas pipe lines from the North Louisiana fields to use gas for fuel, notwithstanding the fact that these large oil companies possess what is always thought of as the cheapest fuel, viz.: petroleum fuel oil; it will surely be wise for the people of Louisiana to spread this fact abroad and ever reiterate it until industries of the largest size are attracted to the state. This will be the eventual result, but every effort should be made to hasten the industrial growth of the state. Natural gas can be delivered to any point in the state as economically as it is now delivered to Baton Rouge for refinery purposes (cheaper than it is sold there for commercial purposes), provided there is a demand at any other

point equal to the original demand at Baton Rouge. It must be remembered that the amortization of the cost of the gas pipe lines to the Port Arthur-Beaumont section, and to Baton Rouge, has been taken care of in the cost of the fuel used for refinery use and that the fuel is still low enough in price to justify the investment.

Houston (which is forty to forty-five per cent. smaller in population than New Orleans) secures natural gas for domestic use at 75c per thousand cubic feet, and the industrial rate ranges from 50c per thousand cubic feet down to about 19½c when used in large volume by the lighting and power company, the large oil refineries, and other large consumers. There are two companies competing for the natural gas service and a third building a line into that city. So we may assume that there are no insuperable obstacles to the building of as many natural gas pipe lines to New Orleans as the consumption will warrant.

The industrial development of the State of Louisiana has enlarged the sphere of activity of the engineer to a much greater extent than when the engineer was required in this section for little else than public works.

Louisiana is indeed fortunate in the steady growth and development of engineering education in its many branches. It is of the utmost importance to our state that the products of our engineering schools, the selected youths who have been so well and carefully trained, should be offered to industry.

Under modern methods the distribution of finished products is the most essential of all activities and it would appear that our society has been a worthy instrument in presenting to industry the available material from which to select the trained worker and adviser. The effort of all engineering organizations should be toward a greater appreciation of the services of the engineer in industrial affairs and this is of particular importance in our State of Louisiana.

A careful analysis of the past and present personnel of our society cannot fail to be a source of pride and satisfaction. In its thirty years of existence the society has not failed to leave its impress upon the progress of the state. It has brought to-

gether and co-ordinated the technical engineering skill and made it readily available for guidance and service.

The Louisiana Engineering Society has been the instrument, medium or means, of consolidating and forwarding the best engineering thought in the State of Louisiana. It has brought forth, through its representative membership, the consciousness of the importance of the engineer to the nation, state and city. It constantly has gone forward in traditions of technical skill, ethical procedure and fellowship of the most inspiring nature.

The Society has demonstrated its usefulness. It has brought together a large number of engineers and resulted in the enlargement of our circle of acquaintances in the different branches of the engineering profession. This alone has been of benefit to those who have taken advantage of their membership in the Society.

THE POINT OF VIEW

By A. L. DUNLAP.

Read Before the Society, December 12, 1927.

The main function of a corporation is to manufacture and sell its products or service. And all too often the point of view is taken that a maintenance department is just a necessary and expensive evil, while a stores department is an unwelcome step-child whose presence must be borne with great fortitude.

What is your present point of view? How many of you would like to be connected with or even be the head of a stores department of a large corporation? On first thought it probably has little appeal for the engineer, and yet the engineer's training in logical thought, his instinctive hate of disorder and inefficiency, coupled with his knowledge of machinery and materials, can be of great value to such a department.

There is always the question of the proper relationship between stores, purchasing and operating departments, insofar as the specification of materials is concerned. The operating departments feel they should be allowed to specify just what they want to use. The purchasing department feels it should be allowed considerable freedom in specifications, so it may buy on price, while the stores department feels it should be allowed to insist that an operating department use up all of a certain item before it obsoletes it in favor of a newer form. Surely it would be valuable to have the engineer's point of view in each of these departments. When you realize that a utility company operating gas, electric and railway systems in a city the size of New Orleans would carry a continuous inventory of stock and materials of over a million dollars, and that the turn-over of these stocked items alone, excluding fuel, would be a million and a half dollars, don't you think that a man who has control of a business that size should be well paid? Often such men are paid from five to twelve thousand dollars per year.

Actually there is a great amount of interesting work in a stores department. Take for instance, the case of the local Public Service Company. Its history does not differ greatly from the history of stores departments of similar companies

where the management has been chiefly concerned with increasing its power plants, improving its distribution systems, street car and other services. Where there is only so much money to go around it is natural to favor departments that come in contact with the public.

As this company is the consolidation of a number of competing companies naturally the shops and consequently the store rooms are scattered pretty well over the city. Each of the nine store rooms is managed by a district store keeper, who in turn reports to a head store keeper.

A year ago a casual visitor to these storerooms probably would have said that most of them "looked good" but they were crowded. They had increased the stock carried until they were overflowing. Mezzanine floors had been built, and still there was not enough room.

About that time the stores department was turned over to a man with a fresh point of view, one whose vision had not been dulled by the cry: "Cut down your costs but don't spend any money." Study and investigation started. First the cost and inventory systems were overhauled and put on a "punch card" basis, both Holworth and Powers Equipment being used for this. Then attention was turned to the storerooms themselves. It was found that some items were stored at illogical locations, merely because there was more room at these locations. Other materials, on account of lack of space, were not properly protected from the weather. The return value of empty cable reels was decreased by the action of the weather and the gumbo soil on which they were stored. A storekeeper spent a lot of time issuing materials from mezzanine floor and shelves that were too wide, or from bins unsuited to the items to be issued. In some cases even old filing cases were used. Eight foot rolls of canvass were stored vertically at the back end of one of these mezzanine floors. It took two or three men an unreasonable time to make an issue of canvass under such conditions. Reels of small wire from which frequent issues were made, had been stacked against the wall and dragged out each time there was a call for this material. Hours were spent cutting old cable into scrap lengths with hand axes. All material was handled by

hand, even including such heavy items as electric refrigerators. The crated gas ranges were stacked fifteen feet high by hand.

Then the stock itself was studied, lists were made of slow moving items and these lists studied by the stores department together with the department head for whom the material had been originally stocked. Many interesting things turned up. Many items were discovered for which there would be no future use, obsolete glassware from lamps long forgotten, varnishes and dryers bought during the war and of such grade as to be useless today, special track work which will never be used again, and, I am told, even some parts belonging to mule cars. Then there were huge stocks of some items; ten thousand gross of screws in one storeroom, an inexhaustible supply of a certain sized granite block at another storage yard, one item of a dozen jacks from which there had not been an issue in two years, and so on down the line.

Drastic action was taken. A large part of the surplus stock of screws was sold to hardware stores and factories, the surplus granite blocks were sold to a firm in Mississippi. Equipment and materials which could be disposed of as such were sold and the remainder treated as junk. Surplus stock in one storeroom was transferred to other storerooms handling the same item. More careful ordering limits were set, and the ordering of each storeroom for stock, instead of going direct to the purchasing department, now passes through an assistant general storekeeper in charge of all ordering for storerooms. This new system had obvious advantages; one was supplying an emergency order from other storerooms instead of going to the delay inherent with a purchase on the outside. In less than a year the investment tied up in stock had been reduced $205,000.

In each of the storerooms the old wooden bins have been gradually removed and replaced by modern adjustable steel shelving requiring less space and allowing efficient arrangement of items. Each bin is clearly labelled by printed numbers instead of the chalk marking common in wooden shelving. Mezzanine floors have been removed, rolls of canvass and reels of wire have been put on mandrels in racks so that one man can easily make issues from them. Large cable reels are stored on heavy well drained timber, thus preventing rot. A small power

driven alligator shear makes short work of cutting up old cable, and also comes in handy for other purposes. Platforms with lift trucks have been purchased for handling the heavier stocks such as electric refrigerators, gas stoves, etc., making a considerable saving in time and cost of handling these items.

The gas stove affords a rather interesting case. These stoves, crated in knock-down form, used to be stacked fifteen feet high by hand labor. When a stove was to be shipped to a customer it was taken down from the top of the pile by hand, placed on a two-wheel hand truck and wheeled to the assembling room. Here it was dumped off the truck, uncrated, assembled, and then replaced on the same truck and wheeled close to the shipping platform, where it was again removed from the hand truck to await a delivery truck. Today the stoves are still stacked fifteen feet high but by a mechanical stacker. When a stove is taken out of stock it is lowered by this stacker, placed on a platform and carried to the assembly department by a lift truck. It is uncrated without being removed from the platform, assembled directly on this platform and again taken from the assembly room to the shipping room on the lift truck. This results not only in a considerable saving of labor, but it reduces to a minimum the danger of damage to the enamel of the stove.

A year ago the storerooms were crying for more space. Today, due to the elimination of surplus stocks and the installation of modern equipment, there is plenty of room in spite of the fact that some items originally stored in the yards are now stored under roof and in spite of the decreased floor area due to removal of mezzanines.

The $205,000 reduction of stock, figured at 15% (a figure used by many companies to cover interest, taxes, rentals, etc., on such stock) means a permanent annual saving of $30,000. At the same time the re-arrangement of stocks together with a little mechanical handling equipment has effected a saving of $15,000 a year in salaries in spite of the fact that a great many salaries have been increased. The additional investment of $35,000 in shelving and handling equipment will offset this saving to some extent, but a total saving of $40,000 per year

in one department, of whose existence the public hardly has any knowledge, is quite a nice item.

It is true the man that is responsible for most of this is not an engineer, but is there a single engineer in this room who would for one minute admit he could not do the same thing if given the opportunity? Yes, there is good work for an engineer in a stores department if he can acquire and retain the proper point of view.

You may wonder why I talked about storerooms to-night. I thought that the local situation might interest you, and that it might open your eyes to the possibilities of a department which as engineers you might probably be inclined to look down upon. I also want to bring out one more point. As I said, there is probably not one of you who would admit that he could not do what has been outlined above, given the proper opportunity and point of view. I want to emphasize that last item, the point of view.

I wonder how many men in nearly the same position would see the possibilities and have the courage of their convictions to the extent that they would be able to shatter all local precedents and spend rather large sums on a stores department?

When I was in college, it was quite customary for the outside speakers, both technical and practical men, to pound into the students the trite statement that, "This work you are getting at college is all theory; when you get out you will find you don't know a thing and will have to begin and learn all over again." I have not heard much of that expression here in New Orleans, but then I have not heard many expressions either way on the subject. I feel that this breaks down the student engineer's self confidence to the point that he is afraid to go ahead on his own hook, and I believe the engineering profession is largely responsible for giving him an inferiority point of view. The boy's point of view is shaped much more by his friends, relatives and acquaintances than it is by his instructors or professors, and it largely is up to you, the practicing engineers of the country, to instill the proper confidence and vision into the younger members of our profession.

THIRTIETH ANNIVERSARY OF THE FOUNDING OF THE LOUISIANA ENGINEERING SOCIETY

Address of Col. Sidney F. Lewis.

Mr. President and Fellow Members of the
Louisiana Engineering Society:

Over fifty years of my life have been spent in the Department of the Board of State Engineers of Louisiana. The following is the official record:

June 1, 1877, to April 14, 1880, employed as Assistant Secretary, Draughtsman and Instrument Man.

Member State Board of Engineers—

Appointed:

April 15, 1880—Louis Alfred Wiltz.

May 22, 1884—Sam'l Douglas McEnery,

July 9, 1888—Francis T. Nicholls,

July 21, 1892—Murphy J. Foster,

July 10, 1900—Wm. Wright Heard,

June 29, 1904—Newton C. Blanchard,

April 15, 1908-August 16, 1916—Chief Engineer, Orleans Levee Board, under the administration of J. Y. Sanders and Luther M. Hall,

April 15, 1917 to December 16, 1920, Resident Engineer, Southeast Arkansas Levee District, created by Act of Legislature of the State of Arkansas, Session of 1917, and promulgated on April 1, 1917.

Member State Board of Engineers December 16, 1920—John M. Parker.

April 11, 1925—Henry L. Fuqua.

During this long span of time I have witnessed the progress of levee building in the Mississippi Valley, from wheelbarrows to mule scrapers, and to the use of machinery.

I have been continuously engaged in following, during these many years, one line of thought and action in my chosen profession, and that is the vagaries of a sedimentary stream like the Mississippi River, and the prevention of overflow by its confinement by levees. During the high water of 1892, I had

my first experience as engineer in charge of a crevasse, where the whole responsibility for its closure devolved upon my shoulders.

The Tessier Levee, St. James Parish, Pontchartrain Levee District, was breached by a crayfish hole May 16, 1892. The gage at Baton Rouge read 38.5. The gage at Carrollton read 17.5 higher than previous floods in those days. The method of closure was the construction of two independent parallel line of cribs from the more recent built levee, on towards the fragmentary old levee some three hundred and fifty feet riverward, with large and deep barrow pits intervening, which had to be crossed. After the crevasse was bridged and the interlacing and bracing of these cribs accomplished, Captain John Millis, U. S. District Engineer in charge of the Fourth Mississippi River Commission, whose fleet and material assisted us in the closure, reviewed the work that was so far done, and recommended that we ought to begin the sacking of the cribs without any unnecessary waste of time, on account of the probable cutting taking place by the flow of water through these cribs. It had taken a week's time working night and day without intermission to build these cribs; we held, that evening about 5 o'clock, an impromptu meeting of the prominent workers, planters and Captain Milles at the work on the crown of the levee, and in consultation I advised that the cribs be first floored with a layer of sacks, and all barrow pits and depressions leveled up to the natural surface, then to fall back one crib and place two rows of sacks, then take the third crib and place three rows of sacks, and so on to the last crib, the number of cribs in accordance with the depth of water, working towards the head of flow so as to divide the flow equally over the sacks, and prevent concentration of flow, and scour. The Captain agreed with me, but stated to me, as State Engineer, I should take charge of this crevasse, that the government would continue its aid, "I will leave with you my first assistant, who will be under your orders, who will assist you." It was then 5 o'clock in the evening. Captain Millis left shortly afterwards and after chalking the perimeter of the cribs, and posting our planters with poles every fifty feet to see that the sacking was carried out as per instructions, and the sacks placed

by the labor exactly as we wanted them. I took charge of the upper side of the crevasse, and the young assistant the lower side. With this understanding, at a given signal, we began sacking the independent parallel row of cribs at 6 p. m. We had all the lights, equipment and labor required. About 9 p. m. there was a dreadful commotion and a flying of feet at the lower cribs, and that section of the crevasse was abandoned for the night. We continued sacking our line, and by morning we had no water going through our cribs. At daylight I went over to the other side to see what had happened, and I found that the men in charge of the sacking failed to sack the cribs properly. They had pitched the sacks any old way on to the cribs, concentrated the flow of water in spots and in consequence washed out the cribs by 9 p. m., giving up in despair, abandoned the work and gone to bed. We at once reorganized our forces, assembled more material, and I laid out a new set of cribs, and in working four days incessantly with relay carpenters from the Yazoo & Mississippi Valley bridge gangs, built stronger and better cribs, and then sacked them as originally intended, and the crevasse was closed. We then built a coffer dam, or mud box, around the perimeter of the cribs to keep all water from percolating through. Among many distinguished visitors during its closure, Major Starling, at that time Engineer in Charge of the Third Mississippi River Commission District, paid me a visit, complementing me on the successful closure. He subsequently wrote a paper on the closure of the "Tessier Crevasse" and he called it the "Creole Plan." Whether it was because I spoke French to the planters of St. James Parish, I never could understand why he named it so. At that time I never thought that I had accomplished any great feat, the mere building of a levee out of sacks in water, with needle dams to hold the sacks in position, the levelling of the ground by first flooring the cribs, filling the borrow pits to the natural surface, and then to build you a sack levee, breaking steps against the head, thus allowing the head of water to flow over a cushing of sacks, and to continue this operation, going over the work, filling in places where there were sacks missing, until the flow of water is

stopped, and then completing same by a mud box; but the lesson of sacking had served its purpose.

A week or so, in the same year, afterwards, a break occurred in the levee some three miles below Darrowville, on the Hermitage Plantation. I spent four days on this crevasse, and it was sacked and closed by the planters pursuing the same method. In the same year four breaks in the Third Levee District—now known as the Lafourche Basin Levee District—New Hope, Cantrelle and Delogny, in St. James Parish, were closed and sacked by this method. Also Avondale, Jefferson Parish, closed by the Morgan, Louisiana & Texas Railroad Company under Julius Kruttschnitt, then Superintendent, with whom I spent a day at the crucial time. That year there were 34 crevasses on the Mississippi River below Red River, of which 29 were closed.

Since the year 1892 there have been many crevasses closed. In 1897 during the highest river experienced in the lower river —Conrad Point, in the Pontchartrain Levee District, was closed. I was with the Pontchartrain Levee Board on a patrol train during that season of high water for six weeks. In its incipiency we raised 25 miles of levee between Baton Rouge and New Orleans. We had many land sloughs where the land section of the levee kicked out into the public road, notably at Hope, and at the upper end of Bonnet Carre, in St. John Parish. At Bonnet Carre Levee proper, we had the river to the top of the crown, and the land slope so saturated for two thousand feet that you could stick a reed without any effort some ten feet through the slope. These places were all treated by me by blanketing the river slope with fine silt, building a section of levee riverward in place of the lost section on the land side, in eight to ten feet of water. The silt was brought by cane carts from the railroad pit formerly used to build the Yazoo and Mississippi Valley Railroad embankment across Bonnet Carre crevasse in 1882, and the wheeling forces supplied by the Y. & M. V. R. R., and the runs were made by the railroad bridge gangs. This was the first time that blanketing a leaking levee was resorted to in a high water fight. The then existing Carrollton Levee was a wheel-barrow levee, built un-

der Dan Brosnau, City Engineer, before the creation of the Orleans Levee Board, and gave the Orleans Levee Board considerable anxiety in the high water of 1897, the citizens also becoming hysterical. It lacked proper drainage, and in consequence, the land slope became saturated. The then Governor of the State, Murphy J. Foster, the day after a mass meeting had been held at Clay Statue on Canal Street, when the citizenry passed a resolution to cut Bonnet Carre Levee, and relieve New Orleans, had me to go over the levees in Orleans Parish, and report to him orally my findings. Accompanied by Mr. A. C. Bell, Engineer of the Orleans Levee Board, I went over every foot of levee on both banks of the river. At Carrollton I suggested to Bell the blanketing of some twelve or fifteen hundred feet of that levee, the closing of the opening between the two levees and the syphoning of one foot of water of the basin between the levees. This was satisfactorily done, and Bonnet Carre Levee escaped the punishment of Caernarvon. Nearly all the commercial front was sacked during that high water. One Sunday evening with a squall on the river, the water broke through the sacks at the Canal Street Ferry, and flushed Canal Street for a few minutes.

During my connection, 1908-1916, with the Orleans Levee Board, the present Carrollton Bend Levee, from the upper Protection Levee to Joseph Street, the largest section of levee in the State, was built. On the commercial front from Louisiana Avenue to Jackson Avenue, Celeste to Richard Street, Marigny to the lower end of the city on the east bank of the river, were also rebuilt and enlarged, and all levees on the west bank were raised, enlarged and new levees built on caving banks to the Parish Line, under the approval of the Board of State Engineers. The high water of 1916 was the highest experienced at Carrollton at that time, the gage read 20.05, the levee lines had been so far improved, that the expenses incurred by the Orleans Levee Board during this period of high water was less than $40,000, and mostly spent on the commercial front and sacking Canal Street Ferry. The rear levees also were raised and strengthened.

In the month of August, 1915, an equinoctial storm of great intensity struck this city, unroofing many residences, blowing

down chimneys, fences and doing untold damage, the New Basin Canal and the Carondelet Canal overflowed their banks. The power plant transmission poles of the Sewerage and Water Board were levelled to the ground, and in consequence those sections of the city lying adjacent to these canals were flooded for several days. In my report to the Orleans Levee Board I recommended that the Old Carondelet Canal, being no longer a commercial asset, and a standing menace at times of great storms to the city, banks would overflow, that it should be filled in from its basin to Hagan Avenue. I was very much censored by the New Orleans Press for this recommendation. However, I have lived to see that my recommendation made some twelve years ago is now being carried out.

From 1917 to 1920, during the World War, as Resident Engineer of the Southeast Arkansas Levee District, which levees protect the same area of lands in Arkansas and Louisiana, as the Tensas Basin Levee District of Louisiana, and all levee work done with the approval of the Board of State Engineers of Louisiana, and the Mississippi River Commission, I had charge of the construction of 800,000 cubic yards of levee on the Arkansas River, in the counties of Desha and Lincoln, and some 700,000 cubic yards of levee built on the Mississippi River proper from the head of Cypress Creek gap to the Louisiana State Line.

Cypress Creek gap, a five-mile gap between the west bank of the Arkansas River and the west bank of the Mississippi River, was about closed when I severed my connection with this district and returned to membership of the Board of State Engineers of Louisiana in December, 1890, and up to the present time I am still in harness, and I have much to be thankful to the Almighty for in this, particularly that although recently passed the 74th mile stone, I enjoy good health, free from the usual infirmities of my age: "*Mens Sana in Corpore Sano.*"

As your first President, I am happy to be here with those charter members who have survived the original twenty-five members, and to wish you greetings, continuous prosperity, and success in your profession.

"We live in deeds not years, in thoughts not breaths. In feelings, not in figures on the dial. We should count time by heart throbs. He most lives who thinks the most, feels the noblest, acts the best."

Address of Mr. Alfred F. Theard.

Mr. President and Members of the
Louisiana Engineering Society:

I can assure you that I am very much pleased to be with you here to-night and that as a charter member of our Society, and a past President, the officers of 1902 extend their congratulations to the officers of 1928 with best wishes that their administration will be efficient, productive of good fellowship among the membership, and prosperous. It is by this good fellowship that engineers learn to know each other and becoming better acquainted, get more and more interested in each others work.

Some time ago, while reading one of our newspapers, I came across a rather peculiar bit of a dialogue which strikes me as not entirely out of place on this occasion:

"My son," said the father impressively, "suppose I should be taken away suddenly, what would become of you?"

"Why," said the son irreverently, "I'd stay here; the question is: What would become of you?"

To each of the old presiding officers of the Society, such a question presented itself and without in any way increasing or belittling the value of the services of each to the Society, each more or less, in proportion to his own idea of the value of his own services, impressively asked himself: What will become of the Society after my term of office, when I am called away?

I disclose no secrets in admitting that some of us were puzzled to reason out what would become of our Society even before the expiration of our term of office.

But the membership kept on increasing and the good work continued, and after thirty years of a prosperous existence, the Society now irreverently makes this answer:

We are here, enormously prosperous, and one of the finest engineering societies in the country, and we are going to con-

tinue in our prosperous career; but what will become of you, the old charter members?

As one of the few lucky enough to be here, I answer:

We are here, honored by your actions, proud of our Society, and ready and willing to serve it as earnestly as we were 30 years ago.

Gentlemen, thirty years covers a vast span of a man's professional life.

It is useless for me to repeat the history of the Society, that has been already covered by the interesting talk of my friend, Mr. Coleman, but the life of the Engineering Society was co-incident with one of the greatest strides in modern construction and one which interested me most: the practical use of reinforced concrete.

Up to the time of our organization, 1898, we knew of artificial stone, of concrete, of special mortar, but very little was known about reinforced concrete.

It had never been used under the ground in our damp soil, and the exact proportions of its mix were not as thoroughly and definitely fixed as they are to-day.

Mass concrete was first used by the Drainage Commission of New Orleans in the soil of this city in 1897. The mix was 1 : 3 : 6. Instinctively we decided that a dry mix was desirable.

There were no mechanical mixers then, no idea of slump tests, no fixed ratio of water to a cubic foot of cement, etc., and yet we not only accomplished good results, but a few years later we built the first reinforced concrete structure in the ground.

Reinforced concrete and its almost universal use now as compared to its semi-experimental use thirty years ago is to me one of the most marvelous advancements of engineering construction.

Another thing that I have noticed during the past thirty years in the progressive advance is the consideration shown to the engineer as a professional man.

The engineer of years ago was considered as a boss laborer or foreman of construction. To-day he is called in as an adviser for all industrial, commercial or general development and

no public improvement is proposed or decided upon without the advice of the engineer.

The engineer has advanced himself to the same level as the other professional men and finally has come into his own.

During these past years, it has been my good fortune to work for most eminent engineers—L. W. Brown, B. M. Harrod, Henry B. Richardson, Rudolph Hering, A. C. Bell, and W. C. Kirkland. I am mentioning only those who have passed away, but my cordial relations with many others who are still with us make me feel that I have accomplished something during my membership in the Society and within the long years of my professional life. The high consideration to my distinguished confréres and myself in electing us Honorary Members of the Engineering Society is an evidence of your esteem.

Gentlemen, I have here a copy of a small pamphlet which is marked Louisiana Engineering Society, Preamble Constitution and By-Laws. Officers and Members—1900. In it I find a list of the membership; it is very interesting. At that time the record shows 63 Resident Members, 6 Non-Resident Members, 10 Associate Members, and 2 Junior Members, a total of 80—31 are already gone.

Let us on this auspicious occasion, with such a representative body of our profession here to-night, extend our best wishes for the greater glory and achievements of the engineer, past, present and future. May he show the world that with the proper financial backing, he can meet and successfully solve any problem which rightfully should be under his professional calling.

Remarks of Mr. Coleman

Mr. Chairman and Gentlemen:

While the third of February is the anniversary date based on the charter date, the Society really had its birth a little bit earlier than that.

During the fall of 1897 I was principal City Engineer at the munificent salary of $135.00 a month. I did not consider myself able at that price to secure the technical literature in the way of magazines, etc., which I wanted to read and which would be of assistance to me, so I conceived the idea of joining with some other members of the profession in town in the for-

mation of some sort of an organization which could subscribe for periodicals, etc., and could provide for some place in which to read them. In an attempt to recruit the necessary membership for such an organization, I started in the City Engineer's office where Mr. A. C. Bell, Mr. George H. Grandjean, Hunter Stewart and Wright Smith agreed to join. I then went to the old Drainage Board Office (the Sewerage and Water Board was not in existence at that time). Here I found Major Harrod, Miss T. L. Raymond, Alfred Raymond, W. C. Kirkland, A. F. Theard, and W. B. Wright, also Mr. Lambert.

Then I went to the Board of State Engineers, where I found Major Richardson, Col. Lewis, Major Kerr, Messrs. Thompson, Perrilliat, Hoffman and Duval. The office of the New Orleans Levee Board was next, where Mr. Lombard was then Chief Engineer, and we picked up some few others, Mr. A. L. Black, who at that time was connected with the Public Service Corporation here, Mr. T. H. Tutwiler at Memphis, who at that time was located here, Mr. Llewellyn, now with the United States Steel Corporation, and one or two others.

We had our initial meeting as I remember in the City Engineer's private office, some time in the fall of 1897, and agreed to organize. A committee was formed to frame charter and by-laws, which were later submitted for approval and adoption.

At our organization meeting we elected Col. Lewis the first President of the Society, and I was elected Secretary. To the best of my recollection these would constitute the "minutes" up to that period of time.

Now thirty years is not very much in the life of a state or a community, or of a society such as the Louisiana Engineering Society, but thirty years is a long time in the life of an individual.

I remember very well the days of thirty years ago, when this organization was begun, and I did not think at that time that I could ever picture myself in my wildest imagination as an "old timer." I was a very young man and expected I would always stay young. I see on the postcard notices that I am an "old timer," and I guess I am. My main hope at the present time is to keep from wandering through a sea of

words as "old timers" are very apt under ordinary circumstances to do, and with the fear in my mind that I might do that, I am going to bring this little talk to a close and make room for the other "old timers."

Remarks of Mr. Gervais Lombard

Gentlemen of the Society:

I have never been President of the Louisiana Engineering Society. I have served my time in one of the most arduous and most important duties that the Society imposes on some members, and that is Secretary. I was not the first Secretary. Mr. Coleman no doubt thought he might like to be President, but he gave that idea up in favor of a more dignified gentleman, Col. Lewis. He was secretary for some two years, then he was not quite so ambitious, so he turned it over to me. I was willing and held it for a year, but at the end of that time I gave as an alibi that I was a young benedict, and told the Society that as such I found some difficulty at home when I said I was going downtown to meetings at night, and that I was forced to give it up. I have been giving that alibi ever since. I do not attend many meetings of the Society now.

Mr. Coleman has told you of the early days of the Society and what inspired him to organize the Society. I didn't know until to-night what actuated him.

Well, we had a hard time in the beginning to get even a few members. The state laws required that there should be some twenty-five signatures to any corporate organization, and we had some fourteen on December 22nd, 1897. We responded to Mr. Coleman's sincere request to get together, and in a short time we were able to get up, not only the full number required by law, but one extra man. In all there were twenty-six charter members.

Mr. Hoffman is also a charter member and should be here to-night. I don't know why he is not here. I am sorry to say that a good many, over half the list, are not any longer alive, and only five of us are here to-night as members of this Society.

I remember not so many years ago, Mr. Ole K. Olsen, whom you all know, at a smoker said in a toast to Major Kerr—they

were drinking toasts in those days—in commenting on how often the Major had been reappointed to the same Board of Engineers, and by how many different Governors, said: "Governors may come and Governors may go, but Frank Kerr goes on forever." I have been going on almost as long as Major Kerr did, seven successive Governors having appointed me and reappointed me a member of the Board of State Engineers. While I have not served quite as long as Col. Lewis has, it has been quite a long time, and I should feel like an old timer, but I say this much, "I am still making "googoo eyes' at the incoming Governors, and I don't feel so much like an 'old timer' either."

I can hardly say much more of importance, unless I write an obituary or epitaph, but I am not quite ready to do that, so I am going to give way now to any old timer who feels like he is almost as much of an old timer as we are.

I am glad to say I have taken keen interest in the affairs of the Society, was instrumental in working up information relative to a good place at which to regularly hold our meetings. I do not refer to the first meeting of the Society at the City Hall, nor to that held a little later in the Drainage Commission office, nor to the first real meeting held in our own rooms on Union Street, 712, on the second floor of a building that had been rented by the Camera Club, and where they were holding their meetings on the second floor and had all their paraphernalia on the third floor. That was a very nice assembly hall. We paid $20.00 a month for it, fixed it up nicely, had curtains on the windows, started a library, and made the members very comfortable with only a small membership. But we did not stay with only a small membership very long. My recollection is that at the end of the first two or three years, we were some sixty odd members, that is ,active members, and possibly a dozen or more associate and non-resident members. I don't know just what the Society has as its present membership, but it has a whole lot more than that, I am glad to say.

I wish to thank you very much for the opportunity to be ouwith you once more, and I hope I will be able to be with you for many years to come.

MEMBERSHIP LIST.

HONORARY MEMBERS.

A. L. BLACK, (C. M.), with Ford, Bacon and Davis, Inc., 611 Gravier St., New Orleans.

J. F. COLEMAN, (C. M.), of J. F. Coleman Engineering Co., 220 Hibernia Bldg., New Orleans.

WALTER H. HOFFMAN, (C. M.), Civil Engineer, Secretary, Board of State Engineers, New Orleans.

SIDNEY F. LEWIS, (C. M.), Member Board of State Engineers, 213-215 New Orleans Court Bldg., New Orleans.

GERVAIS LOMBARD, (C. M.), Assistant State Engineer, Board of State Engineers, New Orleans.

ALFRED F. THEARD, (C. M.), Drainage Engineer, Sewerage and Water Board Bldg., New Orleans.

RESIDENT MEMBERS.

SAMUEL T. ADAMS, (1927), Superintendent of Fulton Bag and Cotton Mills, 2535 Gen. Pershing St.. New Orleans.

FELIX L. ALCUS, (1922), Vice-President, Carbine-Harange Machinery and Supply Co., 1001 Annunciation St., New Orleans.

ALEXANDER ALLISON, JR., (1926), Office Engineer, Sewerage and Water, Sewerage and Water Board Bldg., 1013 Milan St., New Orleans.

LESTER F. ALEXANDER, (1915), Engineer and Contractor, 834 Audubon Building, New Orleans.

WALTER J. AMOSS, (1924), c/o American Consul, Caracas, Venezuela.

DOUGLAS S. ANDERSON, (1909), Professor of Electrical Engineering and Dean of the College of Engineering, Tulane University, New Orleans.

SAM VERNON APPLEWHITE, (1927), with J. W. Billingsley, 4618 Prytania St., New Orleans.

KENNETH McGRATH BAILEY, (1924), Engineer with Pere Marquette Building Co., 7513 Hampson St., New Orleans.

RALPH C. BAILEY, (1927), with J. W. Billingsley, Consulting Engineer, 8403 Apricot St., New Orleans.

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.

WALTER J. BARNES, (1925), with N. O. Public Service Inc., 1437 Nashville Ave., New Orleans.

WADE BARNETT, (1910), Engineer, 8821 Spruce St., New Orleans.

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

DANIEL M. BEARD, (1926), with A. M. Lockett Company, 1530 Sixth St., New Orleans.

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

BEN H. BELL, (1920), 4215 Freret St., New Orleans.

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

JOHN H. BERNHARD, (1922), President, N. O. Industrial Canal Land and Development Co., 1848 Canal Bank Bldg., New Orleans.

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

JAMES W. BILLINGSLEY, (1914), Consulting Engineer, 702 Interstate Bank Bldg., New Orleans.

A. MERRICK BLAMPHIN, (1908), Construction Engineer, Box 897, 606 Maison Blanche 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.

FRANK P. BROUSSARD, (1925), with Non-Plus Lamella Roof Construction Co., 1839 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.

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

SIDNEY E. CALONGNE, (1927), Civil Engineer, President S. A. Calongne's Sons, Engineers, 907 N. O. Bank Bldg., New Orleans.

C. GLEN 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., 901 Carondelet St., New Orleans.

D. B. H. CHAFFE, JR., (1920), Vice-President, Southern States Equipment Co., Inc., Vice-President, Rogers, Higgins Co., Inc., 801 N. O. Bank Bldg., New Orleans.

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

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

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

RAY MORRISS LAW, (1927), Resident Engineer, Pine Hills, Inc., Box 361, Pass Christian, Miss.

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

R. S. McCORMICK, (1922), District Maintenance Engineer, Louisiana Highway Commission, Napoleonville, La.

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

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

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

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

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

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

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

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

JACK HARDEN PERKINS, (1927), Instrumentman and Assistant Resident Engineer, John F. Coleman Eng. Co., Box 361, Pass Christian, Miss.

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

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

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

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

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

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

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

W. B. ROBERT, Engineer, Baton Rouge, La.

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

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

REGINALD McC. SCHMIDT, (1915), Assistant Engineer, 4th District, Mississippi River Commission, 1023 Leontine St., New Orleans.

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

JOHN A. SILSBEE, (1915), Consulting Petroleum Engineer, Okmulgee, Okla.

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

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

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

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

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

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

FRANK J. TRELEASE, (1928), with Ford, Bacon and Davis, 611 Gravier St., New Orleans.

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

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

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

WM. VON PHUL, (1908), Ford Bacon & Davis, Inc., 115 Broadway, New York, N. Y.

RICHARD CHARLES SANCHEZ WATSON, (1926), Civil Engineer, General Practice, Harvard Bldg., Box 393, Gulfport, Miss.

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

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

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

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

ASSOCIATE MEMBERS.

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

FOWLER BOYNTON BANTON, (1927), Assistant Commercial Engineer, New Orleans Public Service Inc., 317 Baronne 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., 316 Camp St., New Orleans.

JOSEPH A. BRENNAN, (1920), General Contractor, The Brennan Co., 1805-97 Market St., Dallas, Tex., 1703 Hayden St., Amarillo, Tex.

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

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

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

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

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

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

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

JULES GODCHAUX, (1899), New Orleans.

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

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

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

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

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

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

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

FREDERICK M. STROUT, (1928), Sales Manager, Celite Products Co., 519 Whitney Bldg., New Orleans.

RESIDENT JUNIOR MEMBERS.

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

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

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

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

PHILIP HOPE CAMPBELL, (1925), Office Engineer with A. M. Shaw, 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 The South Coast Co., Houma, La.

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

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

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

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

JAMES L. FULMER, (1923), with Cumberland Telephone and Telegraph Co., 2238 General Pershing St., New Orleans.
HORATIO L. GILBERT, (1917), Surveyor, 602 Queen and Crescent Bldg., New Orleans.
GILBERT TESLA GRAY, (1925), with New Orleans Public Service Inc., 1321 Nashville Ave., New Orleans.
FRANK E. HOIGHT, (1926), Draftsman, La. Highway Commission, 311 Church St., Baton Rouge, La.
WALTER HOLLOWAY, (1923), District Engineer, Mississippi Power Co., Gulfport, Miss., 34 Washington Ave., Ocean Springs, Miss.
JOSEPH W. JOACHIM, (1919), President and Manager of Home Ice Co.. 5117 Prytania St., New Orleans.
WILHELM EMIL KOCH, (1913), Civil Engineer, 2627 Coliseum St., New Orleans.
ROBERT JAMES KUHN, (1925), Electrolysis Engineer, New Orleans Public Service Inc., 529 Washington Ave., New Orleans.
FRANCIS A. LANDRIEU, (1926), with Board of Commissioners, 1729 N. Rampart St., New Orleans.
CHARLES RENE MADUELL, (1925), with Truscon Steel Co., 5650 Ada Place, Lakeview, New Orleans.
ROBERT VINCENT MARKEY, (1926), Draftsman, Office City Engineer, 2309 Cleveland Ave., New Orleans.
ALBERT E. MARKS, (1925), Draftsman, Phoenix Utility Company, 3320 Palmyra St., New Orleans.
NATHANIEL LEVIN MARKS, (1925), Assistant City Engineer, 2017 Lowerline St., New Orleans.
ALEX H. McCOMISKEY, JR., (1919), 2837 Carondelet St., New Orleans.
GORDON J. McLEAN, (1924), Power Plant Equipment, New Orleans Public Service Inc., 1544 Henry Clay Ave., New Orleans.
HU. B. MYERS, JR., (1927), Civil Engineer, 7734 Belfast St., New Orleans.
EDWARD M. NABERSCHNIG, JR., (1923), Assistant to Works Superintendent, Southern Cotton Oil Co., Box 360, New Orleans.
CHARLES L. RITTENBERG, (1923), Designer, Dock Board, 2634 Marengo St., New Orleans.
HARRY STEPHEN SALZER, (1927), Assistant Lighthouse Engineer, U. S. Lighthouse Service, 4530 Banks St., New Orleans.
S. A. THEARD, (1920), Maintenance Engineer, Louisiana State Highway Commission, Baton Rouge, La.
ALVIN A. VOSS, (1928), Engineer, 1701 Valmont St., New Orleans.

NON-RESIDENT JUNIOR MEMBERS.

G. O. ALLAIN, JR., (1916), Southern Bell Telephone Co., New Orleans.
G. C. BADGER, (1913), Superintendent of Engineering and Construction, Grinnell Co., of the Pacific, 601 Brannan St., San Francisco, Calif.
JACOB F. MULLER, JR., (1912), Vice-President Muller Furniture Manufacturing Co., Ltd., 3731 Canal St., New Orleans.
WILLIAM L. MYERS, JR., 1927), with Arkansas Highway Department, Camden, Ark.
HERBERT P. NATHAN, (1913), Mechanical Engineer, Southwestern Engineering Corporation, 632 Lafayette Ave., Culver City, Calif.
JAMES KILBOURNE PETRIE, (1924), Student Draftsman, La. Highway Commission, Baton Rouge, La., Box 163, Opelaousas, La.

STUDENT MEMBERS.

MICHAEL CHARLES ABRAHM, 816 Cherokee St., New Orleans.
R. L. ATKINSON, 312 Audubon Blvd., New Orleans.
CHARLES ALBERT BENDER, JR., 1729 Marengo St., New Orleans.
PERCY L. BERNSTEIN, East Beach, Gulfport, Miss.
CHARLES MILTON BROUGH, 1040 Audubon St., New Orleans.
MARTIN CARBONELL, 34 Gayarre Hall, Tulane University, New Orleans.
LESTER B. CLARK, care Bureau of Patents, Washington, D. C.

WILLIAM HENRY CREIGHTON, 1445 Henry Clay Ave., New Orleans.
ALBERT BAKER DAVIS, JR., 7839 S. Claiborne Ave., New Orleans.
ARTHUR A. DE FRAITES, 620 State St., New Orleans.
LUCIEN DEVALL, 3709 Saratoga St., New Orleans.
NEWTON C. EBAUGH, 7018 Jeannette St., New Orleans.
GEORGE FINLEY EUSTIS, 1469 Henry Clay Ave., New Orleans.
CHARLES JULIUS FRITCHIE, Slidell, La.
JOHN MASON GUILLORY, 5201 Magazine St., New Orleans.
VIC. F. HARTEL, 2001 Prytania St., New Orleans.
JOHN DETZEL HAVERKAMP, 1401 Nashville Ave., New Orleans.
E. C. HAWKINS, 7019 Panola St., New Orleans.
W. T. HESS, 7917 Burthe St., New Orleans.
EDMOND FAVRE HUGHES, 4502 S. Miro St., New Orleans.
FRANK EMIL JOHNSON. JR., 4469 Lafaye St., New Orleans.
LEONARD REGINALD KIRST, 2113 Tulane Ave., New Orleans.
F. LAWES KLEINPETER, 2210 Nashville Ave., New Orleans.
CARL VINCENT LAZARONE, Kenner, La.
CHARLES LOB, 3309 St. Charles Ave., New Orleans.
LEO LEVY LOWENTRITT, John Jay Hall, Columbia University, New York City.
ALGERNON ASHE MABSON, 4020 Prytania St., New Orleans.
E. PEUCH MADDEN, 1228 N. Rendon St., New Orleans.
GEORGE ELMER MAY, 1533 Broadway, New Orleans.
WILLIAM O. MASCARO, 34 N. Ferry St., Schenectady, N. Y.
LEAL C. McLEAN, 1544 Henry Clay Ave., New Orleans.
TIM L.McNAMARA, Sellars, La.
HAROLD E. MEADE, 119 Blvd., New Orleans.
PAUL GRENVILLE MERRITT, JR., 1931 Gen. Pershing St., New Orleans.
EUGENE HERBERT MIAZZA, 3424 Prytania St., New Orleans.
HERMAN DAY MYSING, 2115 Palmer Ave., New Orleans.
ARTHUR J. NAQUIN, JR., Engineer, N. O. Public Service Inc., 624 Audubon St., New Orleans.
LAURENCE KITCHENER NELSON, 1926 N. Claiborne St., New Orleans.
J. F. NUNEMACHER, 4915 Baccich St., New Orleans.
WALTER K. OSER, 1108 Pine St., New Orleans.
WILLIAM PETER OSTER, 1430 Frenchmen St., New Orleans.
PASCAL PARETI, JR., 619 Bourbon St., New Orleans.
PHILIP FRANK PHILIPS, 4424 S. Claiborne Ave., New Orleans.
LEON MYERS REINACH, 1805 Robert St., New Orleans.
RENE H. REIXACH, 926 Maqueda Place, New Orleans.
ASHLEY HURT ROBINSON, 1735 Palmer Ave., New Orleans.
HARTWELL JOHN ROSSON, 1322 Elysian Fields St., New Orleans.
RODNEY B. ROUGELOT, 2237 Napoleon Ave., New Orleans.
HENRY B. SARGEANT, 1804 State St., New Orleans.
JOSEPH HENRY SAUCIER, 2616 Ursuline St., New Orleans.
S. B. SCHWARTZ, Superintendent, Maginnis Cotton Mills, New Orleans.
BEN ZION SEGALL, Tester, N. O. Public Service Inc., 530 Magazine St., New Orleans.
GEORGE JACOB SEGEL, 3022 Baronne St., New Orleans.
LEWIS MONROE SHELTON, 4915 Baccich St., New Orleans.
WALTER SUMNER SIMPSON, 19 Audubon Place, New Orleans.
DAVID STAYER, 8314 Jeannette St., New Orleans.
FRANK GURLEY STEWART, 826 Henry Clay Ave., New Orleans.
HERBERT C. SWAN, 6316 Magazine St., New Orleans.
JOSEPH F. THOMPSON, 139 S. Genois St., New Orleans.
BERNARD JAMES TORTOMASI, 2461 Burgundy St., New Orleans.
STEPHEN J. WALLBILLICH, 4027 Delgado Ave., New Orleans.
LUCIEN T. VIVIEN, JR., 1519 N. Broad St., New Orleans.
JOHN MORT WALKER, JR., 6039 Prytania St., New Orleans.
O. P. WALKER, 5918 Chestnut St., New Orleans.

JAMES EVANS WEED, 305 S. Maple St., Mt. Carmel, Pa.
CHARLES CARROLL WIGGIN, JR., 3203 Napoleon Ave., New Orleans.
CHARLES LAFAYETTE WRIGHT, JR., Romeville, La.

SUMMARY.

Honorary Members	6
Resident Members	240
Non-Resident Members	86
Associate Members	21
Non-Resident Associate Members	0
Junior Members	32
Non-Resident Junior Members	6
Student Members	67
Total	458

MINUTES OF THE MEETINGS AND BUSINESS OF THE SOCIETY.

Minutes of the Board of Direction, December 12, 1927.

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

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

Communications were read and the Secretary was instructed relative to replies.

Letter from Colonel Marcel Garsaud relative to the work of the committee appointed in connection with registration of engineers and architects was read and the matter was held in abeyance until further consideration can be given.

Report was read by Mr. John L. Porter, Chairman of the committee appointed to make recommendation relative to reciprocal membership. On motion, duly seconded, it was voted to propose the following amendment to paragraph 3 of Article 7 of the Constitution:

"Any member in good standing of a local engineering or technical society in the United States or Canada which grants a similar privilege may become a member of this Society on his application and election as provided for other applicants for membership, but without payment of entrance fees. The dues of a member so transferred shall be billed from the end of the fiscal year of the society from which he is transferred to the end of the current fiscal year of the Louisiana Engineering Society, but not for a longer period than one year from the date of transfer."

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

For Resident Member.

Henry C. Daubert, Earle B. Morden,
Reuben C. Gotch, Corwin A. Robert,
Edward B. Ludwig, Frederick B. Siems,
B. E. M. Skerrett, Jr.

For Non-Resident Member

Charles D. Batson, Stephen A. Eggleston,
Ira G. Hedrick.

For Associate Member

Frederick M. Strout.

For Junior Member

Wilmot A. Ackerman, Lionel J. Cucullu,
Alvin A. Voss.

For Transfer from Student to Resident Junior Member

William L. Meyers, Jr.

For Student Member

Charles A. Bender, Jr.,
Albert B. Davis, Jr.,
Arthur A. DeFraites,
Newton C. Ebaugh,
George F. Eustis,
John M. Guillory,
Leonard R. Kirst,
Carl V. Lazarone,
Algernon A. Mabson,
Herman D. Mysing,
Rene H. Reizach,
George J. Segel,

Frank G. Stewart.

The President brought up the matter that in February the Louisiana Engineering Society will attain the thirtieth anniversary of its existence and the Board agreed that a meeting should be held in February celebrating this event. On motion duly seconded the President was authorized to appoint a committee of three to make arrangements for that meeting. The following members were appointed: Mr. John L. Porter, Chairman, Prof. Douglas Anderson, Mr. Alfred F. Theard.

The obituary of Mr. J. Devereaux O'Reilly, prepared by Mr. E. S Bres, Chairman of the Special Committee, was read and ordered spread upon the minutes of the Society, with a copy to be sent to Mrs. O'Reilly.

There being no further business the meeting adjourned.

F. A. MUTH, Secretary.

Minutes of the Regular Meeting of the Society, December 12, 1927.

The meeting was called to order with President Lanphier in the chair, F. A. Muth, Secretary, and 46 members and guests present.

The minutes of the previous meeting were read and approved.

The Chairman of the Committee on Entertainments and Outings reported that steps would be taken to have the annual smoker. After some discussion as to the date, it was voted that the smoker be held on Saturday, January 14th, 1928. Due notice of this meeting will be issued later.

The following members were appointed tellers to serve in connection with the nomination of officers for the ensuing year: Messrs. Moses, Olsen and Young. Nominations for officers resulted as follows:

For President

Porter..... 23
Lanphier..... 1
Fox..... 2

For Vice-President

Shaw	1
Olsen	1
Fox	19
O'Neill	1
Koch	3
Dunlap	1
Fey	1

For Secretary

Muth	28

For Treasurer

Moses	30

For Director to Serve Three Years

Frost	26
Muench	4

The following members were therefore declared official nominees and their names were ordered to ballot:

For President.....Mr. John L. Porter
For Vice-President.....Mr. F. H. Fox
For Secretary.....Mr. F. A. Muth
For Treasurer.....Mr. W. B. Moses
For Member of Board to Serve Three years....Mr. F. G. Frost

The technical exercises of the evening consisted of a very interesting address on "The Point of View" by Mr. A. L. Dunlap. This address was followed by an instructive and interesting discussion.

A rising vote of thanks was then tendered the speaker.

The meeting then adjourned to the usual collation.

Minutes of Board of Direction, Annual Meeting, January 14, 1928.

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

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

The resignations of Mr. Oscar Reiss, L. R. Ferguson and J. H. Bateman were accepted with regret.

The following members were transferred to Non-Resident grade: Messrs. W. L. Fey and J. B. Converse. Mr. Jules A. Lorio was transferred to Resident Member.

With reference to the minutes of the previous meeting of the Board, it was voted to accept the resignation of Col. Marcel Garsaud as Chairman of the Committee on Registration of Engineers with the understanding that he would serve as a member of that committee. Prof. Donald Derickson was elected Chairman.

Announcement was made of the forthcoming visit of the Western Society of Engineers and members of the Illinois Section of the A. S. C. E. The President was authorized to appoint the necessary committees to properly entertain our guests.

Announcement was made of the recent meeting of members of the Louisiana Architectural Association, General Contractors Association, and of the Louisiana Engineering Society with reference to the building code of the City of New Orleans. On motion, duly seconded, the following resolution by the Board was recommended to the Society for its endorsement in accordance with the Constitution:

RESOLVED, That it is the sense of the Louisiana Engineering Society that the new building code of New Orleans, as adopted by the Commission Council October 19, 1926, effective January 1, 1927, is hereby approved and the Society recommends that the necessary steps be taken by the proper authorities for the adequate supervision of all work in accordance with the provisions of the code as adopted.

Letter from Mr. Charles E. Kerr was read and together with copy of Bill No. S. 1183 introduced in the U. S. Senate by Senator McNary with reference to provisions for forest research. On motion, duly seconded, it was voted that the following resolution of the Board be passed:

RESOLVED, That it is the sense of the members of the Board present that this bill for forest research be approved as provided in S. 1183 and H. R. 6091.

The annual reports of the Treasurer and Secretary were read and pproved and ordered referred to the Society and later to be printed.

Ballots were canvassed for new members, there being 83 formal ballots and 3 informal ballots, and the following were declared elected:

Resident Member

Henry C. Daubert, Earle B. Morden,
Reuben C. Gotch, Corwin A. Robert,
Edward B. Ludwig, Frederick B. Siems,
B. E. M. Skerrett, Jr.

Non-Resident Member

Charles D. Batson, Stephen A. Eggleston,
Ira G. Hedrick.

Associate Member

Frederick M. Strout.

Junior Member

Wilmot A. Ackerman, Lionel J. Cucullu,
Alvin A. Voss.

Transferred from Student to Non-Resident Junior

William L. Meyers, Jr.

Student Member

Charles A. Bender, Jr.,
Albert B. Davis, Jr.,
Arthur De Fraites,
Newton C. Ebaugh,
George F. Eustis,
John M. Guillory,
Leonard R. Kirst,
Carl V. Lazarone,
Rene H. Reixach,
George J. Segel,
Frank G. Stewart.

One of the members pointed out that the enrollment has now reached 458 members. In view of the increase in members and the work involved in the duties of Secretary since the last salary adjustment four years ago, on motion, duly seconded, it was voted to increase the pay to $50.00 per month.

There being no further business the meeting adjourned.

F. A. MUTH, Secretary.

Special Meeting of Board, January 14, 1928

A special meeting of the Board was held subsequent to the Annual Meeting of the Societly, Mr. John L. Porter, President, presiding, and the following members were present: Messrs. Lanphier, Todd, Fox and Muth.

On motion, duly seconded, Mr. Carl G. Muench was elected member of the Board to fill out the unexpired term of Prof. F. H. Fox, who was elevated to the Vice-Presidency.

There being no further business the meeting adjourned.

F. A. MUTH, Secretary.

Minutes of Annual Meeting of Society, January 14, 1928.

The meeting was called to order by President Lanphier, F. A. Muth, Secretary, and 37 members and guests present.

The minutes of the previous meeting were read and approved.

The following was put before the Society for first reading:

"Any member in good standing of a local engineering or technical society in the United States or Canada which grants a similar privilege may become a member of this Society on his application and election as provided for other applicants for membership, but without payment of entrance fees. The dues of a member so transferred shall be billed from the end of the fiscal year of the Society from which he is transferred to the end of the current fiscal year of the Louisiana Engineering Society, but not for a longer period than one year from the date of transfer."

The annual reports of the Treasurer and Secretary were read and ordered printed in the Proceedings. The annual report of the Board of Direction was approved and ordered printed in the Proceedings.

Ballots were opened for officers, there being 94 formal ballots, of which 93 were straight and one a scratched ballot, and the following officers were declared elected for the ensuing year:

President.....John L. Porter
Vice-President.....F. H. Fox
Secretary.....F. A. Muth
Treasurer.....W. B. Moses
Member of Board to Serve Three Years.....F. G. Frost

The President took this opportunity of thanking all of the officers, committees and members of the Society for carrying out the work of the Society so successfully during the past year.

The new President was then conducted to the chair. Mr. Porter made a few appreciative remarks thanking the members of the Society for the honor conferred upon him.

There being no further business the meeting then adjourned to a most enjoyable smoker, which was held at the Chess, Checkers and Whist Club.

F. A. MUTH, Secretary.

Special Meeting of the Board of Direction, January 30, 1928.

A special meeting of the Board was held in the office of Mr. E. S. Lanphier at 2:00 p. m. January 30th, the meeting having been called by Mr. John L. Porter, President, who presided, and the following members were present: Messrs. Fox, Moses, Muench and Muth. By request Mr. S. M. Young and Mr. W. T. Hogg were present.

Letter from the American Engineering Council dated January 23rd, addressed to Mr. E. S. Lanphier, member of the Assembly, relative to report dated January 19th of the Flood Control Committee, was read and considered.

On motion duly seconded it was voted that the contents of the letter would not be treated as confidential by this Society in view of the importance of the subject matter to this locality, etc.

On motion, duly seconded, the following resolution indicating the position of the Board was adopted:

RESOLVED, That it is the sense of the Board of Direction of the Louisiana Engineering Society in meeting of this date that this Board does not approve and is opposed to the plan of flood relief proposed by the Flood Control Committee of the American Engineering Council. Furthermore, this Board cannot endorse any other plan which will tend to delay Congress in taking definite and immediate steps in flood relief in the Lower Mississippi Valley or that will cause delay in the prosecution of any other plan approved by Congress.

Mr. Lanphier, as member of the Assembly, was requested to reply to the letter of the Council, embodying in it the views of the Board as expressed in the foregoing resolutoin. Also to make known those views to

the members of the Council's Flood Control Committee, also to advise Messrs. Klorer, Schoenberger and Garsaud, members of our Society, who are in Washington. The above communications were authorized by telegram.

On motion, duly seconded, it was also voted to draft a letter to be sent to all member societies of the American Engineering Council indicating the position of the Board as based on the foregoing resolution.

The following committee was appointed to prepare this letter: Messrs. E. S. Lauphier, Sam M. Young and F. A. Muth.

The letter was drafted and issued under date of January 31st.

There being no further business, the meeting adjourned.

F. A. MUTH, Secretary.

ANNUAL REPORTS

ANNUAL REPORT OF THE BOARD OF DIRECTION

Year 1927.

New Orleans, La., January 8, 1928.

To the Members of the Louisiana Engineering Society:

Gentlemen: Your Board of Direction begs to report that during 1927 there were held ten regular and two special meetings or a total of twelve meetings of the Board for the transaction of business of this Society.

Our Technical Papers Committee has given us an excellent program of very high grade papers.

Our Library Committee has done splendid work and a number of books suggested by the members have been added during the year. Additional sections have been added to some of the bookcases and the books have been rearranged for easier reference.

A Special Committee was appointed to prepare specifications for redecorating the library room. Acceptable bids were received and the work of repairing, redecorating and refitting was placed with the lowest bidder, resulting in a very great improvement to the library.

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

Our Committee on Civic and Industrial Affairs prepared a comprehensive and splendid report on Traffic Signals and Signs as used in New Orleans, which report was submitted to the American Engineering Council in connection with the national investigation of traffic ocditions.

The Membership Committee has done good work during this year. The increase in membership has been most gratifying, in that there were 38 members admitted. Of course, as usual, there have been a number of resignations and adjustments, with one death, the net increase resulting in 17 members. It was gratifying that a number of members in lower grades were transferred to higher grades, and it is hoped that this work will be kept up in future years.

The Publication Committee has given us six very excellent issues of the Proceedings during 1927. The Proceedings forms a very powerful factor in the interest and usefulness of our Society, and every member should do what he can to secure advertisements in order to maintain the high character of this publication. Prof. Douglas Anderson, Editor of the Journal, deserves the highest praise for the quality and tone of this magazine.

The Committee on Publication, Davision B, under charge of Mr. John T. Eastwood, has done good work this year, and we are hopeful that greater gains will be made during the next year.

The financial statement shows that the Proceedings Fund has increased $148.11.

The Board ordered the sum of $1000.00 transferred from the Proceedings Fund and Library Fund to the General Reserve Fund.

The committee appointed to prepare legislation affecting engineers and architects, etc., has been unable to accomplish much to the close of the year but it is hoped that constructive work will be prepared for the forthcoming season of the Legislature. An allotment of $50.00 was made to this committee to carry on its clerical work.

Attention is invited to the financial condition of the Society. Our investments are well placed and amount to $5844.85. The General Reserve Fund shows a balance of $7835.17. The Treasurer's report shows a cash balance on January 1, 1928, of $1653.94. The net assets of the Society are $7498.79, having increased $967.71 during the year.

Provision was made for awarding two Junior Memberships in the Society to the most outstanding senior in the engineering college at Louisiana State University and at Tulane University.

Upon recommendation of a special committee appointed for the purpose of studying the advantages of inter-change of membership, the matter of providing in the constitution for reciprocal membership has been announced to the membership for its vote.

Five charter members of the Society who maintained continuous membership and paid dues continuously since 1898 were elected Honorary Members.

During the year the Board appointed a finance committee to make recommendations in regard to investments, etc.

Special effort has also been put forth and the results have been most gratifying in the physical comfort of the members in redecorating the library and making the room more comfortable, adding new sections to the bookcases, purchasing books, etc.

A special committee was appointed to prepare an appropriate ceremony for the celebration of the 30th anniversary of the birth of the Society, this meeting to be held February, 1928.

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

Respectfully submitted,

E. S. LANPHIER, President.
J. L. PORTER, Vice-President.
F. A. MUTH, Secretary.
W. B. MOSES, Treasurer.
FREDERICK H. FOX,
JAMES M. TODD,
Board of Direction.

ANNUAL REPORT OF THE SECRETARY

Year 1927

New Orleans, La., January 9, 1928.

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 1927:

During the past year the Board of Direction has held ten regular meetings and two special meetings, a total of twelve meetings; the Society has held ten regular and one open meeting, making a total of eleven meetings, with an average attendance of 51, maximum 107, minimum 19. Two of the meetings of the Society were joint meetings held with the American Society of Mechanical Engineers.

The membership shows a steady increase from year to year. This year there has been a net increase of 17 members, although there was a total of 38 elected and reinstated.

GRADE	On Roll Jan. 1, 1927	Elected	Reinstated	Transferred to	Transferred from	Dropped	Resigned	Failed to Qualify	Died	On Roll Jan. 1, 1928
Honorary Member..	1	0	0	5	0	0	0	0	0	6
Resident Members..	235	12	3	6	9	6	0	0	1	240
Non-Res. Members..	87	3	1	4	3	2	4	0	0	86
Associate Members	21	1	0	0	0	0	1	0	0	21
Non.-Res. Associate....	1	0	0	0	0	1	0	0	0	0
Junior Members.....	31	3	0	1	0	3	0	0	0	32
Non.-Res. Junior....	5	0	0	1	0	0	0	0	0	6
Student Members..	60	14	1	0	5	2	1	0	0	67
Total.....	441	33	5	17	17	14	6	0	1	458

It is with regret that the death of Mr. James Devereaux O'Reilly is recorded.

The Treasurer's report is submitted separately and shows a cash balance of $1,653.94.

During the year the investment account as submitted in the Treasurer's report stands as follows:

Total Receipts	$7,028.76	
Total Disbursements	5,374.82	
		$1,653.94
Checking account in New Orleans Bank & Trust Co.		$1,653.94
1 Yerxa Steeves Bond	$1,000.00	
2 $100 First Liberty Loan	200.00	
1 $50 First Liberty Loan	50.00	
5 $50 1917 Liberty Loan	250.00	
Greater New Orleans Homestead	914.73	
Italian Homestead	500.00	
Standard Homestead	500.00	
Union Homestead	500.00	
New Orleans Bank & Trust Co. Savings Account	1,407.94	
Canal Bank & Trust Co. Savings Account	522.18	
		5,844.85
Total cash and investments		$7,498.79

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

Two Second Liberty Loan Bonds were cashed and the money was deposited in the checking account.

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

The following technical exercises were held:

February 14.—"The Sub Aqueous Strata of the New Orleans Side of Lake Pontchartrain," by Prof. R. A. Steinmayer.

March 14.—"The Louisiana Portland Cement Plant at New Orleans," by Mr. Lewis R. Ferguson.

April 11.—"Creosoting Plant Design," by Mr. B. S. Nelson. Joint meeting with American Society of Mechanical Engineers.

May 9.—"Pulp and Board from Steam Exploded Wood," by Mr. W. H. Mason.

June 13.—"Stone Bases," by Mr. Rodman Wiley.

September 12.—"Heating and Domestic Oil Burning," by Mr. Chester W. Carr.

October 10.—"Reorganization Plan for the Division of Public Works," by Mr. Carl Schneider. Joint meeting with American Society of Mechanical Engineers.

November 14.—"Pumping Clay Slurry Through a 4-Inch Pipe," by Prof. W. B. Gregory.

December 12.—"The Point of View," by Prof. A. L. Dunlap.

December 5.—"Some Simple Methods of Preventing Termite Damage to Buildings," by Mr. Thomas E. Snyder.

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

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

Respectfully submitted,

F. A. MUTH, Secretary.

FINANCIAL CONDITION OF THE SOCIETY JANUARY 1, 1928.

Assets:

Cash on Hand and in Banks	$1,653.94	
Accounts Receivable (Members)	1,743.75	
Accounts Receivable (Advertisers)	305.40	
Entrance Fees Receivable	204.50	
Smoker Memberships	169.50	
Investments	5,844.85	
		$9,921.94

Liabilities:

Proceedings Reserve Fund	$1,113.65	
Building Fund	151.65	
Library Fund	456.47	
Accounts Payable	336.00	
1928 Dues in Advance	29.00	
		2,086.77
Balance in General Fund		$7,835.17

General Reserve Funds

Balance from 1914	$ 165.00	
Balance from 1915	189.75	
Balance from 1916	377.45	
Balance from 1917	299.49	
Balance from 1918	27.47	
	$1,059.16	
Deficit from 1919	62.93	
	$ 996.23	
Balance from 1920	198.09	
Balance from 1921	90.94	
Balance from 1922	1,186.58	
Balance from 1923	309.84	
Balance from 1924	586.43	
Balance from 1925	975.61	
Balance from 1926	1,128.05	
Balance from 1927	1,363.40	
		$6,835.17
Transferred from Proceedings Reserve Fund	$ 700.00	
Transferred from Library Fund	300.00	
		1,000.00
Balance in General Fund		$7,835.17

Proceedings Reserve Fund

Balance from 1915	$ 112.20	
Balance from 1916	566.13	
Balance from 1917	568.14	
Balance from 1918	567.52	
Balance from 1919	41.08	
	$1,855.07	
Deficit in 1920	221.98	
	$1,633.09	
Balance from 1921	26.25	
	$1,659.34	
Deficit in 1922	301.02	
	$1,358.32	
Deficit in 1923	110.65	
	$1,147.67	
Deficit in 1924	120.26	
	$1,127.41	
Balance from 1925	184.56	
Balance from 1926	353.57	
	$1,665.54	
Balance from 1927	148.11	
	$1,813.65	
Less amount transferred to General Fund	700.00	
		$1,113.65

Proceedings Fund

Revenues:		
Advertisements	$1,105.93	
Members Subscriptions	868.00	
Proceedings Sales	12.35	
		$1,986.28
Expenses:		
Salary of Secretary and Editor	$ 360.00	
Miscellaneous Expenses	180.00	
Stenographer	54.00	
Printing and Mailing	1,230.17	
Advertisements Cancelled	14.00	
	1,838.17	
Gain for 1927		$ 148.11

Annual Statement of the Library Fund, January 1st, 1928

Revenues:

Balance on hand January 1st, 1927	$	814.69
Received from General Fund		480.00
A. S. M. E. Contribution		36.21
Total Revenues		$1,330.90

Expenditures:

January—		
Gus Pilie	$	4.00
McGraw Hill Publishing Company		5.00
February—		
American Society of M. E.		6.00
American Society for Testing Material		12.40
McGraw Hill Publishing Company		1.50
Miss Carrie Freret, Librarian		15.00
March—		
Electric Ry. Journal		4.00
Miss Carrie Freret, Librarian		15.00
April—		
The McMillan Company		4.68
Miss Carrie Freret, Librarian		15.00
May—		
Miss Carrie Freret, Librarian		15.00
The Railway Age		10.00
June—		
Miss Carrie Freret, Librarian		15.00
July—		
Miss Carrie Freret, Librarian		30.00
John Buffato		7.00
George E. Egdorf		196.00
September—		
Miss Carrie Freret, Librarian		15.00
Jacob R. Pierre		6.00
Power Publishing Company		3.00
Gus Pilie		11.00
Owen Gernon Company		41.95
Maison Blanche Company		12.75
October—		
Miss Carrie Freret, Librarian		15.00
F. F. Hansell		39.95

November—		
Miss Carrie Freret, Librarian	15.00	
American Society for Testing Material	2.00	
December—		
Miss Carrie Freret, Librarian	15.00	
Concrete Publishing Company	4.00	
American Society for Testing Material	11.20	
McGraw Hill Publishing Company	5.00	
December 31—		
Accounts Payable	20.00	
		574.43
		$ 756.47
Less Amount Transferred to General Reserve Fund		300.00
Balance on Hand December 31st, 1927		$ 456.47

General Fund, Year 1927

Revenues:		
Membership Dues for 1927	$3,962.50	
Smoker Account	305.00	
Entrance Fees	351.00	
Interest on Investments, Bonds Sold, etc	251.58	
A. S. M. E. Contribution	51.85	
		$4,921.93
Expenses:		
Subscription to Proceedings	$ 868.00	
Appropriation to Library Fund	480.00	
Dues of Secretary	12.00	
Salary to Secretary	420.00	
Printing and Postage	329.26	
Refreshments	145.00	
General Expense	220.93	
Exchange	5.10	
Dues to American Engineering Council	274.20	
Auditor	50.00	
Smoker Expense	528.54	
Loss on Cancelled Ads and Bad Accounts	225.50	
		3,558.53
Net Profit for Year 1927		$1,363.40

Cash Account, Year 1927

Receipts:

1923 Dues Collected	$ 6.00
1924 Dues Collected	18.00
1925 Dues Collected	38.00
1926 Dues Collected	409.00
1927 Dues Collected	2,638.75
1928 Dues Collected	29.00
Smoker Membership	352.00
Entrance Fees	255.50
Advertisers in Proceedings	1,263.39
Proceedings Sales	12.35
Interest	118.10
Contribution for Library Fund	36.21
Liberty Bonds Sold	200.00
A. S. M. E. Contribution to General Fund	51.85
Total Receipts	$5,428.15
Deduct Exchange	5.10
	$5,423.05
Add Balance of January 1, 1927	1,619.71
	$7,042.76
Total Warrants Paid During Year	5,388.82
Balance on Hand, Checking Account	$1,653.94

ANNUAL REPORT OF THE TREASURER

Year 1927.

New Orleans, January 1, 1928.

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 disbursementes for the period of January 1st, 1927, up to January 1st, 1928:

Received from Secretary—	Deposited in New Orleans Bk. & Tr. Co.	Exchange Charged
Feb. 11, Memo. 1 to 8 inclusive	$1.492.34	$ 1.10
Mar. 14, Memo. 9 to 13 inclusive	905.71	.85
Apr. 9, Memo. 14 to 16 inclusive	325.77	.30
May 9, Memo. 17 to 20 inclusive	445.42	.35
June 7, Memo. 21 to 22 inclusive	262.17	.25
July 7, Memo. 23 to 25 inclusive	323.83	.45
Aug. 5, Memo. 26 to 27 inclusive	238.41	.40
Sept. 9, Memo. 28 to 29 inclusive	272.15	.20
Oct. 11, Memo. 30 to 31 inclusive	140.54	.30
Nov. 11, Memo. 32 to 34 inclusive	389.29	.50
Dec. 7, Memo. 35 to 36 inclusive	100.00	.10
Dec. 29, Memo. 37 to 38 inclusive	239.40	.30
	$5,144.03	$ 5.10
Int. Yerza Steeves Bond	65.00	
Coupons Deposited Dec. 19, 1927	19.12	
Liberty Bonds Cashed (2)	200.00	
		$5,428.15
Less Exchange		5.10
		$5,423.05
Less: 5/14, J. L. Pitre (N. S. F.)	$ 3.00	
5/18, Eug. Miazza (N. S. F.)	5.00	
11/25, Theo T. Chenet (N. S. F.)	6.00	
		14.00
		$5,409.05
Balance on hand as per Treasurer's Report Jan. 1, 1927		1,619.71
		$7,028.76

Disbursements from Jan. 1st, 1927, to Jan. 1st, 1928.

No.	Name—	Amount
January 17—		
1	Edna Doll	$ 15.00
2	Carrie Freret	15.00
3	F. A. Muth	43.50
4	Tulane Press	302.54
5	Gus Pilie	4.00
6	Jos. Levy Bros. & Co.	6.75
7	L. Loubere	50.00
8	Aarde Steno Parlor	5.00
9	W. B. Moses	238.94
10	N. O. Chess, Checkers & Whist Club	198.50
11	R. G. Diamond	30.00
12	N. O. Bank and Trust Co.	6.00
13	McGraw Hill Pub. Co.	5.00
Feb. 14th—		
14	American Engr. Council	68.55
15	American Society of Mech'l Engrs.	6.00
16	American Society for Testing Materials	12.40
17	Addressograph Co.	2.47
18	McGraw Hill Pub. Co.	1.50
19	F. A. Muth	46.75
20	Carrie Freret	15.00
21	Edna Doll	15.00
22	Pitre's Restaurant	23.00
23	Tulane Press	48.11
March 14th—		
24	Tulane Press	22.00
25	Addressograph Co.	2.11
26	Electric Railway Journal	4.00
27	Carrie Freret	15.00
28	Edna Doll	15.00
29	F. A. Muth	46.00
30	Boylan's Detective Agency	3.00
31	Col. Marcel Garsaud	50.00
32	Pitre's Restaurant	21.00
33	Aarde Steno. Parlor	5.00

No.	Name—	Amount
April 11th—		
34	Farish Art Store	1.80
35	Am. Engineering Council	68.55
36	Aarde Steno. Parlor	6.00
37	The MacMillan Co	4.68
38	F. A. Muth	44.50
39	Edna Doll	15.00
40	Carrie Freret	15.00
41	Tulane Press	272.36
42	Boylan's Detective Agency	3.00
43	Pitre's Restaurant	16.50
44	Ferd. S. Marks Ins. Agency, Ltd	17.50
May 9th—		
45	Tulane Press	7.75
46	F. A. Muth	46.50
47	Edna Doll	15.00
48	Carrie Freret	15.00
49	Boylan's Detective Agency	3.00
50	Pitre's Restaurant	14.50
51	Aarde Steno. Parlor	8.00
52	Railway Age	10.00
53	Standard Homestead Assn	500.00
54	Union Homestead Assn	500.00
June 13—		
55	Carrie Freret	15.00
56	F. A. Muth	44.50
57	Edna Doll	15.00
58	Douglas Anderson	150.00
59	Tulane Press	414.41
60	T. Fitzwilliam & Co	13.75
61	Boylan's Detective Agency	3.00
62	Pitre's Restaurant	12.50
63	Aarde Steno. Parlor	7.00

No.	Name—	Amount
July 8—		
64	Edna Doll	30.00
65	Carrie Freret	30.00
66	Aarde Steno. Parlor	5.00
67	American Engineering Council	68.55
68	Tulane Press	159.00
69	John Buffato	7.00
70	F. A. Muth	83.50
71	Geo. E. Egdorf	196.00
September 12—		
72	Edna Doll	15.00
73	Carrie Freret	15.00
74	F. A. Muth	42.50
75	Jacob R. Pierre	9.50
76	Power Publishing Co.	3.00
77	G. Gus Pilie	11.00
78	Owen Gernon Co.	41.75
79	Maison Blanche Co.	12.95
80	Boylan's Detective Agency	3.00
81	Roger Boue	15.00
82	Tulane Press	125.00
October—		
83	Aarde Steno. Parlor	5.00
84	American Engineering Council	68.55
85	Tulane Press	60.10
86	Edna Doll	15.00
87	Carrie Freret	15.00
88	F. A. Muth	45.30
89	Roger Boue	15.50
90	Boylan's Detective Agency	3.00
91	F. F. Hansell	39.95
November 14—		
92	Tulane Press	26.45
93	C. L. Franck	24.00
94	F. A. Muth	44.50
95	Aarde Steno. Parlor	5.00
96	Carrie Freret	15.00
97	Edna Doll	15.00
98	Boylan's Detective Agency	3.00
99	Roger Boue	13.50
100	American Society for Testing Materials	2.00
101	J. P. Pierre	5.00

No.	Name—	Amount
December 12—		
102	Douglas Anderson	150.00
103	Carrie Freret	15.00
104	E. M. S. LeBlanc	35.00
105	F. A. Muth	44.50
106	Edna Doll	15.00
107	Concrete Pub. Co.	4.00
108	American Society for Testing Materials	11.20
109	McGraw Hill Pub. Co.	5.00
110	Aarde Steno. Parlor	8.00
111	Tulane Press	175.10
112	Boylan's Detective Agency	3.00
113	Roger Boue	13.50
		$5,374.82

RECAPITULATION

Total Receipts	$7,028.76	
Total Disbursements	5,374.82	
		$1,653.94
Checking account in New Orleans Bank & Trust Co.		1,653.94
1 Yerxa Steeves Bond	1,000.00	
2 $100 First Liberty Loan	200.00	
1 $50 First Liberty Loan	50.00	
5 $50 1917 Liberty Loan	250.00	
Greater New Orleans Homestead	914.73	
Italian Homestead	500.00	
Standard Homestead	500.00	
Union Homestead	500.00	
New Orleans Bank & Trust Co. Savings Account	1,407.94	
Canal Bank & Trust Co. Savings Account	522.18	
		5,844.85
		$7,498.79

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

REPORT OF EMPLOYMENT COMMITTEE

January 12, 1928.

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

Gentlemen: As Chairman of the Employment Committee of the Louisiana Engineering Society I beg to hand in herewith my report covering the year's activities of this committee, which is composed of the writer and Mr. Raymond Bassich.

I have just received a report from Mr. Bassich, and in combining his records with my own I am pleased to report that during the year 1927 I have the following to report:

Number of applicants.....215
Number of vacancies.....119
Number of vacancies filled..... 84

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

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

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

Yours truly,

R. H. BAUMBACH, Chairman.

REPORT OF THE AUDITOR

New Orleans, La., January 9, 1928.

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

Gentlemen:

In accordance with instructions from your Secretary, Mr. Muth, I have audited the books of record of your Society for the calendar year 1927, and as a result of this examination I am pleased to hand you my report with the following detailed exhibits for your attention:

Exhibit "A"—General Balance Sheet December 31, 1927.

Exhibit "B"—Statement showing results of General Fund and changes during the year 1927 as well as profit for year.

Exhibit "C"—Statement showing results of Proceedings Fund and any changes during year as well as balance December 31, 1927.

Exhibit "D"—Statement of Library Fund for the year 1927.

Exhibit "E"—Cash Receipts and Disbursements during the year 1927.

Cash

I have made a careful check of all cash receipts and warrants for payment and wish to report that I have found everything in order and the cash records in balance. Your Secretary and Treasurer are to be commended for the manner in which they co-operate and keep their records in fine order. As shown on Exhibit "E," the balance remaining in your checking account at Dec. 31, 1927, was $1,653.94, a little over the balance in the same account at Dec. 31, 1926.

Accounts Receivable—Membership Dues $1,743.75

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

For 1924 dues	$ 69.50
For 1925 dues	101.00
For 1926 dues	376.00
For 1927 dues	1,197.25
Total	$1,743.75

Your Reserves Are Invested as Follows:

Bank Savings Accounts:		
New Orleans Bank & Trust Co	$1,407.94	
Canal Bank & Trust Co	522.18	
		$1,930.12
Stocks:		
Greater New Orleans Homestead	914.73	
Italian Homestead	500.00	
Standard Homestead	500.00	
Union Homestead	500.00	
		2,414.73
Bonds:		
1 Bond of Yerxa Steeves	$1,000	
2 $100 First Liberty Loan Bonds	200.00	
1 $50 First Liberty Loan Bond	50.00	
5 $50 1927 Liberty Loan Bonds	250.00	
		1,500.00
Total Investments of Your Society at Dec. 31, 1927		$5,844.85

EXHIBIT "A" shows in detail all Assets and Liabilities of the Society at December 31st, 1927, and to the best of my knowledge and belief this balance sheet truly reflects the financial condition of your Society at the date it bears.

Total Assets December 31, 1927	$9,921.94
Total Assets December 31, 1926	8,447.94
1927 Increase Over 1926	$1,474.00

I wish to thank Mr. Muth for his usual courtesies and the manner in which he kept his records, which proves very helpful to the auditor and which is very highly appreciated. Both the Secretary and Treasurer deserve mention for their seeming untiring efforts in putting their best in the work entrusted them.

Respectfully yours,

LEO A. LOUBERE,
Public Accountant.

GENERAL BALANCE SHEET
December 31, 1927
Assets

Cash in Banks:

Checking Account N. O. Bank & Trust Co.	$1,653.94	
Savings Account in N. O. Bank & Trust Co.	1,407.94	
Savings Account Canal Bank & Trust Co.	522.18	
		$3,584.06

Accounts Receivable:

Membership Dues	$1,743.75	
Advertisers Accounts	305.40	
Entrance Fees	204.50	
Smoker Memberships	169.50	
		2,423.15

Stocks and Bonds:

Homestead stock	$2,414.73	
Liberty Bonds	500.00	
Other Bonds	1,000.00	
		3,914.73
Total Assets		$9,921.94

Liabilities and Reserves

Accounts Payable	$ 336.00	
1928 Dues Paid in Advance	29.00	
Total Liabilities		$ 365.00

Reserve Funds:

Proceedings Reserve Fund	$1,113.65	
Building Fund	151.65	
Library Fund	456.47	
		1,721.77
BALANCE GENERAL FUND		7,835.17
		$9,921.94

EXHIBIT "A"

GENERAL RESERVE FUND
At December 31st, 1927

Balance from last report, January 1, 1927	$5,471.77
Add 1927 gain	1,363.40
Add amount transferred from Proceedings Fund	700.00
Add amount transferred from Library Fund	300.00
Balance General Fund December 31, 1927	$7,835.17

ANALYSIS OF GENERAL FUND FOR CALENDAR YEAR 1927

Revenues:

Membership Dues for 1927	$3,962.50	
Smoker Account	305.00	
Entrance Fees	351.00	
Interest Earned	251.58	
Received from A. S. M. E.	51.85	
		4,921.93

Expenses:

Subscription to Proceedings	$ 868.00	
Appropriation to Liberty Fund	480.00	
Dues to Secretary	12.00	
Salary to Secretary	420.00	
Printing and Postage	329.26	
Refreshments	145.00	
General Expense	220.93	
Exchange	5.10	
Dues to American Engineering Council	274.20	
Auditor	50.00	
Smoker Expense	528.54	
Loss on Cancelled and Bad Accounts	225.50	
		3,558.53
Net Gain		$1,363.40

EXHIBIT "B"

PROCEEDINGS RESERVE FUND

December 31, 1927

Balance from last report January 1, 1927	$1,665.54
Add—Net gain for calendar year 1927	148.11
	$1,813.65
Less—Amount appropriated and transferred to General Fund	700.00
Balance December 31, 1927	$1,113.65

ANALYSIS OF PROCEEDINGS FUND FOR THE CALENDAR YEAR 1927

Revenues:

Advertisements	$1,105.93	
Members Subscriptions	868.00	
Proceedings Sales	12.35	
		$1,986.28

Expenses:

Salary of Editor and Secretary	$ 360.00	
Miscellaneous Expense	180.00	
Stenographer	54.00	
Printing and Mailing	1,230.17	
Advertisements Cancelled	14.00	
		1,838.17
NET GAIN		$ 148.11

EXHIBIT "C"

ANNUAL STATEMENT OF THE LIBRARY FUND COVERING PERIOD JANUARY 1 TO DECEMBER 31, 1927

Revenues:

Balance January 1, 1927	$ 814.69	
Received from General Fund	480.00	
Contribution by American Society of Mechanical Engineers	36.21	
		$1,330.90

Expenditures:

January—		
H. G. Pilie	$ 4.00	
McGraw Hill Pub. Co	5.00	
		$ 9.00
February—		
American Society M. E.	6.00	
American Society for Testing Material	12.40	
McGraw Hill Pub. Co	1.50	
Carrie Freret	15.00	
		34.90
March—		
Electric Railway Journal	4.00	
Carrie Freret	15.00	
		19.00
April—		
The McMillan Co	4.68	
Carrie Freret	15.00	
		19.68

May—			
Carrie Freret	15.00		
The Railway Age	10.00		
		25.00	
June—			
Carrie Freret		15.00	
July—			
Carrie Freret	30.00		
John Buffato	7.00		
George E. Egdorf	196.00		
		233.00	
August and September—			
Carrie Freret	15.00		
Jacob R. Pierre	6.00		
Power Pub. Co.	3.00		
Gus Pilie	11.00		
Owen Gernon Co.	41.95		
Maison Blanche Co.	12.75		
		89.70	
October—			
Carrie Freret	15.00		
F. F. Hansell	39.95		
		54.95	
November—			
Carrie Freret	15.00		
American Society for Testing Material	2.00		
		17.00	
December—			
Carrie Freret	15.00		
Concrete Pub. Co.	4.00		
American Society for Testing Material	11.20		
McGraw Hill Pub. Co.	5.00		
		35.20	
December Unpaid Bills—			
Carrie Freret	15.00		
The Electric World	5.00		
Ry. Eng. and Maintenance	2.00		
		22.00	
			574.43
			$ 756.47
Less amount transferred to General Fund			300.00
Balance of Library Fund at December 31, 1927			$ 456.47

EXHIBIT "D"

STATEMENT OF CASH RECEIPTS AND DISBURSEMENTS FOR PERIOD JANUARY 1st TO DECEMBER 31st, 1927

Balance January 1, 1927 ..... $1,619.71

Receipts

Dues Collected:		
1923 Dues	$ 6.00	
1924 Dues	18.00	
1925 Dues	38.00	
1926 Dues	409.00	
1927 Dues	2,638.75	
1928 Dues	29.00	
		$3,138.75
Smoker Memberships Collected:		
1924-25-26	25.00	
1927	327.00	
		352.00
Entrance Fees		255.50
Proceedings and Advertising Receipts		1,263.39
Proceedings Sales		12.35
Interest Collected		118.10
Received from A. S. M. E. for Liberty Fund		36.21
Liberty Bonds Cashed in		200.00
Received from A. S. M. E.		51.85
Total Receipts		$5,428.15
		$7,047.86

Disbursements

General Expense	$ 216.43	
Expenditures for Library Fund	552.43	
1926 Accounts Payable Paid in 1927	344.29	
Dues to American Engineering Council	274.20	
Proceedings Miscellaneous Expense	150.00	
Proceedings Printing and Postage	254.26	
Proceedings Printing and Mailing	1,095.17	
Refreshments	160.00	
Smoker Expense	484.04	
Stenographer Expense	54.00	
Auditor	50.00	
Salary of Secretary and Editor	740.00	
N. E. F. Checks	14.00	
Exchange Charges	5.10	
Investment in Stock of Standard Homestead	500.00	
Investment in stock of Union Homestead	500.00	
		5,393.92
Dec. 31, Balance in Checking Account New Orleans Bk. & T. Co.		$1,653.94

EXHIBIT "E"

The Proceedings of the Louisiana Engineering Society

Published bi-monthly, February, April, June, August, October, December, under the auspices of the Committee on Publication.

DOUGLAS ANDERSON, Editor.

The Louisiana Engineering Society is not responsible for any statement made or opinion expressed in this publication.

Subscription, $2.00 per annum Single copy, 35 cents

ADVERTISING RATES

	ONE YEAR	HALF YEAR	ONE ISSUE
Full page	$50.00	$28.00	$10.00
Half-page	28.00	15.00	6.00
Quarter-page	15.00	10.00	4.00
One-eighth page	10.00	6.00	2.00

For the back outside cover add 50 per cent to the above rates. For the inside covers add 25 per cent to the above rates.

Address all communications to
Douglas Anderson, Editor, Tulane University,
New Orleans, La.

Entered as second-class matter July 27, 1916, at the Post Office at New Orleans, Louisiana, under the Act of August 24, 1912.

Acceptance for mailing at special rate of postage provided for in section 1105, Act of October 3, 1917, authorized August 1, 1918.

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PROCEEDINGS
OF THE
LOUISIANA ENGINEERING SOCIETY

VOL. XIV. APRIL, 1928 NO. 2

CONTENTS

EDITORIAL NOTES AND COMMENT: PAGE
Asphalt 73
"The World's Longest Concrete Sea-Wall" 74
American Engineering Council 74
The Inspection Trip Outing 75

PAPERS AND DISCUSSIONS:
Asphalt in the Paving Industry. *By Leroy M. Law* 77
Report of Committee on Withdrawal from American Engineering Council 99

MINUTES OF MEETINGS AND BUSINESS OF THE SOCIETY 104

EDITORIAL NOTES AND COMMENT

Asphalt. The technical program of the March meeting of the Society was given over to a paper entitled "Asphalt in the Paving Industry," by Mr. Leroy M. Law, Chief Chemist of the New Orleans Refining Company.

Mr. Law opens his paper with a statement of the origin of the term "Bitumen" and quotes the standardized definitions of "bitumens" and "asphalts" as laid down by the American Society for Testing Materials. There then follows a brief history of the use of asphalt from the very earliest times up to the present day.

As to the kinds of asphalt used in the paving industry, there are generally speaking two classes, the "native" asphalts, in their many and diverse forms, and the asphalts of petroleum origin. The paper describes in some detail the two processes by which high grade asphalts are obtained from the crude asphaltic petroleum and closes with this significant statement:

"Free from its early mysteries, and with modern research and machinery eliminating old rule of thumb practices, therefore, asphalt continues its long and creditable relationship to the paving industry;—an industry that is now of world-wide importance as the result of the introduction of the automobile as a modern means of transportation."

"The World's Longest Concrete Sea-wall." At the April meeting Mr. H. D. Shaw, Chief Engineer of the Road Protection Commission of Harrison County, Mississippi, presented a moving picture showing the methods of construction, and explaining the technical details of the sea-wall which now extends for so many miles along the coast line of Mississippi Sound.

The wall is designed to protect this coast from the steady encroachments of the waters of the Gulf of Mexico, which in some places have become so serious as to have completely wiped out the roadways along the front.

These roadways can now be rebuilt and "Over the Lake," in local parlance, will again assume its old-time aspect, and it is hoped, be protected from the ravages of future storms.

The wall, constructed on the step principle, varying in height with the elevation of the land above the level of the beach, appears to be well designed for its purpose, though it has not yet been subjected to the crucial test of one of the severe tropical hurricanes which at intervals strike this coast.

American Engineering Council. At the February meeting it was resolved that the Louisiana Engineering Society withdraw from the American Engineering Council, this to become effective June 30, 1928. Elsewhere in this issue is published the report of the special committee appointed to consider this matter at the present time. The question has come up periodically in the Society, but each time the proposal to withdraw has been defeated, usually by a rather narrow margin.

It seems wise, therefore, as a matter of record and future reference, that the report of the committee and the discussions thereon be published in the official journal.

The only active opposition to the proposition to withdraw from the American Engineering Council was voiced by Mr.

John H. Bernhard. Mr. Bernhard's argument was that when one was a member of an organization, whose policies were contrary to one's own views, it would be better to remain in and fight for a change of policy rather than to simply withdraw.

While this is recognized as a wise principle for one's guidance in many cases, there are occasions when the situation becomes practically hopeless, and withdrawal appears to be about the only recourse.

It is almost the universal opinion in the Louisiana Engineering Society that the American Engineering Council had a hopelessly inadequate conception of the seriousness of the situation confronting this section of the country in the problem of flood control in the Mississippi River and its tributaries.

The Inspection Trip Outing. Mr. Scott Thompson, Vice-president and Manager of the Louisiana Portland Cement Company, extended an invitation to the Society to visit the new plant on the Industrial Canal. The Outing Committee made arrangements to hold this outing on Saturday, April 28th. All participants assembled at noon at the Society's rooms and from there proceeded by automobile to the plant, where they were met by Mr. Thompson and members of his staff.

Mr. Thompson gave a brief outline of what was to be seen and then all parties repaired to the big open air building in which are installed the Rotary Kilns. Here they were served with a very delicious *al fresco* luncheon as a preliminary to the trip through the plant. After luncheon the party was broken up into smaller groups, and each of these groups under the guidance of a member of the technical staff was conducted through the plant from beginning to end, and each step in the process of manufacture was carefully explained.

The plant is now and modern in every respect and it forms a very important addition to the industrial resources of the City of New Orleaens.

It has a capacity of 2300 barrels of cement per day, requiring 900 tons of raw material (rock and clay) and about 190 tons of coal per day for its production.

The daily consumption of electrical power, the plant being electrically driven throughout, is 30,000 Kilowatt-hours.

The Louisiana Engineering Society is greatly indebted to Mr. Thompson and his associates for this opportunity to inspect a very fine plant and for the very gracious entertainment provided in connection with the visit.

Besides Mr. Thompson, the members of his organization who acted as hosts and guides on this very pleasant outing were Mr. Ben F. White, Sales Manager; Mr. G. G. Tomlinson, Traffic and Assistant Sales Manager; Mr. R. G. Sutherland, Superintendent; Mr. F. F. Dearing, Assistant Chemist; Mr. T. P. Honan, General Mill Foreman, and Mr. W. Forster, Mechanical Engineer.

PAPERS AND DISCUSSIONS

ASPHALT IN THE PAVING INDUSTRY

By Leroy M. Law.

Read Before the Society March 12, 1928.

Your speaker has taken as his subject for this evening one of our oldest engineering materials. Having served mankind for upwards of five thousand years in a wide variety of uses, asphalt has well earned this designation and the retention in practice to-day of some of its original applications seems to fully support the slogan of The Asphalt Association that asphalt is a material which has been "proved through the ages."

In no industry has asphalt played a more important part than in paving and this fact, together with the attention now being given to good roads everywhere, has led the speaker to deal with this particular phase of its usefulness. In this paper, therefore, I shall endeavor to show what is asphalt, say something as to its primitive uses and describe briefly its modern applications in the paving industry.

Definition of Asphalt.

The term "asphalt" was originally of Babylonian origin but passed soon into the Greek where, in the adjective form it meant "firm," "stable" or "secure," and thus, as a verb, "to make firm" or stable or secure. This derivation is quite readily understood when we are told that the earliest recorded uses of asphalt were as a cement or adhesive—in fact, these are its essential functions to-day in the paving industry for, after all, an asphalt pavement is a mineral aggregate of some type or other with its various particles held in place by means of what is now called an asphaltic cement.

The term "Bitumen" has often been confused and even held to be synonymous with asphalt. "Bitumen" also originated in the Greek where as "Jitu-Krit" it referred to the pitch producing properties of certain resinous trees. Later, in the Latin as either "Gwitu-men" or "Pixtu-men" it referred to similar pitch exudations. Becoming shortened to

"Bitumen" the term found its way into the French and thence into English.

So much for historical derivations. Engineering practices began to stumble over the confusion of the two terms and a few years ago our American Society for Testing Materials did much to clear up the air from a technical standpoint by standardizing definitions as follows:

> "BITUMENS.—Mixtures of native or pyrogenous hydrocarbons and their non-metallic derivatives, which may be gases, liquids, viscous liquids, or solids, and which are soluble in carbon disulfide."
>
> "ASPHALT.—Solid or semi-solid native bitumens, solid or semi-solid bitumens obtained by refining petroleum, or solid or semi-solid bitumens which are combinations of the bitumens mentioned with petroleum or derivatives thereof, which melt upon the application of heat and which consist of a mixture of hydrocarbons and their derivatives of complex structure, largely cyclic and bridge compounds."

It will be seen that the American practice recognizes "asphalt" as covering not only those asphalts which are obtained directly from nature but the asphalts which are produced from asphaltic petroleums by means of refinery distillations. "Bitumen" is the broader or generic term and covers not only the essential binding constituent of the asphalt but also of the tars which, as you know, are by-products of the gas industry.

There is, unfortunately, some variation from these definitions in foreign practice—particularly in England—but a movement is now on foot toward the standardization of nomenclature internationally and it is hoped that, by the time of the next International Road Congress, which is to be held in the United States in 1929, the American definitions will have become universal.

Chemically speaking, and as indicated by our definition, asphalts are very complex substances. The hydrocarbons which compose their bitumens are not only of intricate structure in themselves but they are of several different types. Furthermore, these frequently have such elements as nitrogen, oxygen and sulphur substituted for their equivalents of hydrogen, thus

forming derivatives which add to the complexity. It may be said of these substitutions that they constitute only minor portions of the bitumen and, as they exist in the form of definite chemical compounds, they are considered as having practically no bearing on the suitability of the asphalt for paving purposes. In spite of this variation in chemical composition among different asphalts, Mother Nature is indeed a wonderful chemist, for it is particularly worthy of note that asphalt from any particular source maintains a remarkable uniformity.

From the foregoing it is readily apparent that chemical analyses are of but little value to us in determining the suitability of asphalts for paving purposes. In fact, outside of the carbon-disulphide solubility test, which indicates the actual bitumen available for paving purposes, chemical tests serve only for identifying the source from which the product originated. In asphalt engineering, therefore, laboratory investigations are usually limited to tests for carbon disulphide solubility (total bitumen), "penetration" or consistency, ductility, flash point and volatilization. Melting points are sometimes determined but, unlike the metals and simple chemical substances, asphalts have no definite melting point so that this test can be made only according to an arbitrary procedure and is consequently of little value.

As asphalts of varying degrees of purity or bitumen content are acceptable in the paving industry ,the carbon disulphide test is, in reality, not an essential specification feature so that good engineering can be based simply on requirements as to penetration, ductility, volatilization loss and perhaps flash points.

Early Uses of Asphalt.

Apparently the first recorded uses of asphalt were by the Sumerians who inhabited the Euphrates Valley about the years 3000 to 2500 B. C. These people were skilled in the art of carving and decorating stone, and examples of their work recovered in recent years show that asphalt was used as a cementing medium for attaching the small pieces of stone, shell, etc., to the various objects. In many cases, these ornamental

features have been found intact and firmly bonded by asphalt after over fifty centuries of time and exposure.

Following the Sumerians, asphalt was similarly employed by the Persians (2800 B. C.). They carved figures of birds and animals from alabaster and cemented in eyes of darker stone by means of asphalt. Early Egyptians followed much the same practice in their art and introduced a new use for the material by employing it to preserve the bodies of their dead rulers. These remains were called "Mummies" and so closely was asphalt associated with the embalming process that, for a long time, the terms "asphalt" and "mummies" were synonymous.

Coming down to Biblical times (2500 B. C.) there is abundant evidence in the scriptures concerning the uses of asphalt. For instances some historians claim that Noah used it for water-proofing the ark, although it is possible that the "pitch" referred to may have been a sort of pine tar which was also known at the time. At any rate, the so-called "slime" used as a mortar in the tower of Babel and also for daubing the basket of bulrushes in which Moses was placed, were the early effusions from asphalt deposits later discovered. Quite likely, of course, there must have been some variation in the character and consistency of these "slimes" depending on the extent to which they had evaporated and thickened as the result of exposure to the elements.

The Babylonian era (700-500 B. C.) furnishes us undoubtedly the earliest record of the use of asphalt in connection with paving. Nabopolassar, King of the Babylonians and father of Nebuchadnezzar, is recorded as having built "a road glistening with asphalt and burnt bricks." Not only this, but he paved the court yard of his palace with these bricks laid in or—as we say now—filled with asphalt. Recent discoveries showed this court yard to be in a remarkable state of preservation, in fact, the blocks or bricks were found so firmly bonded that they could not be separated without destroying their identity. Unquestionably this was the fore-runner of the modern brick or stone block pavement with an asphalt filler although the type of construction appears to have become a lost art for a long period of years.

Following Nabopolassar, his son Nebuchadnezzar not only built additional brick and asphalt pavements in the City of Babylon, but he re-built on a grander scale many of the walls and buildings constructed by his father. As in the case of our own Mississippi River, the old Euphrates was subject to seasonal floodings and the simple walls of dried brick had often failed as a protection against the waters. Through the use of asphalt as a mortar, Nebuchadnezzar was not only able to build higher and stronger walls but walls that were water-proofed against the floods. Excepting the basket of Moses, Nebuchadnezzar's work apparently constitutes the earliest record of the use of asphalt as a water-proofing agency—certainly it is the most important from an engineering standpoint.

And so on down through history asphalt seems to have come to be more and more into the literature as various deposits or excidations were discovered. Thus Herodotus (about 450 B. C.) writes of an asphaltic lake in Persia and Xenophon of Greece again describes a wall built after the Nebuchadnezzar practice. Hippocrates, Aristotle, Hannibal, Diodorus Siculus (80 B. C.), Marcus Vitruvis Dioscorides (60 B. C), and Pliny. described these various discoveries and some even went so far as to set up definitions of "real asphalt" and what constituted adulterations. About 1300 A. D. Marco Polo described seepages along the Caspian Sea (Baku); in 1535 the Cuban deposits were discovered and shortly thereafter, the famous Pitch Lake of Trinidad was discovered by Sir Walter Raleigh. Early in the eighteenth century came the discovery of the so-called European rock asphalt deposits such as Val de Travers, Limmer and Seyssel, followed in about a hundred years by the exploitation of the latter material, which is being mined up to the present time.

We may bring our story of early uses and discoveries up to date by mentioning the discovery of the Bermudez Lake, the asphaltic petroleums of California and Texas, then the great production of Mexican crudes, which came on the market in such large quantities about 1910. Finally we see, within the last four or five years, the developments in Venezuela, which now give promise of becoming one of the greatest sources

of asphalt the world has yet known. All of this, however, leads us to another phase of our subject, namely, the various kinds or types of asphalt which have figured in the paving industry, and this will now receive our consideration.

Kinds of Asphalt

Generally speaking, asphalts which have figured in the paving industry have fallen into two classes, namely, so-called "native" or natural asphalts and those of petroleum origin, although technically there is no sound basis for such a distinction. Both classes originated in nature and therefore are "native" products and, while one has to de distilled or refined down to paving consistency, the other has, in most cases, to be "fluxed" or softened before it is suitable for use in the paving industry. Perhaps the term "solid native" or "solid natural" asphalts would be a better name for the first class of materials as it would indicate the condition in which they are obtained from nature and contrast them with the "petroleum asphalts" which originate, of course, in a more or less fluid consistency. At any rate, this method of differentiation will form the basis of this evening's paper.

Solid native asphalts may, for convenience, be divided into two sub-classes, depending on whether their purity or rather content of pure bitumen is below or above, say, ten to twelve per cent. The first sub-class will include the rock asphalts which are mined and used direct as paving mixtures while into the latter sub-class will fall asphalts like Cuban, Trinidad and Bermudez, which are essentially only the cementing agencies and consequently have to be combined with appropriate mineral matter to form an asphalt pavement. This distinction is, of course, only an arbitrary one, but it does harmonize with the evolution of the modern asphalt pavement as will be seen later.

Rock asphalts which, therefore, constitute our first sub-class under solid native asphalts, are either silicious or calcareous rock naturally impregnated with pure bitumen. They are usually mined or quarried, crushed, heated, softened with fluxes in some cases, and spread and rolled to form pavement wearing surfaces over macadam, brick or concrete bases. The

raw materials vary considerably in bitumen content. Specimens of bituminous lime-rock from Oklahoma have shown as low as from three to four per cent, while some bituminous sand-stones from California have run as high as fifteen and seventeen per cent. Kentucky sand-rocks usually test around six to eight per cent, while the continental rock asphalts of Europe show usually a bitumen content of nine to eleven per cent. There is also a considerable variation in the consistency of the bitumen, from the soft "malthas" found in some of the Kentucky materials to relatively hard asphalt of thirty to forty penetration that have been obtained from the rock deposits of Utah and Texas. Aside from these chemical differences there are certain physical variations in the shape and surfaces of the mineral particles. Some rock asphalt pavements have shown surprising stability or resistance to displacement even in spite of soft bitumen, and modern research tends to show that this has been due to the angularity and interlocking nature of these mineral constituents. To these variables the engineer must therefore give careful attention if he is to secure uniform and successful results with asphalt pavements of the rock asphalt type.

Rock asphalts from certain specific deposits have given highly satisfactory results as a paving material, the continental rock asphalts of Europe deserving especial mention. Discovered early in the eighteenth century and exploited nearly a hundred years later under a concession from the French government, the Seyssel rock, for example, was introduced in London for foot pavements in 1836 and in the United States two years later. Val de Travers, another French lime-rock asphalt, discovered about the same time as Seyssel, was laid as the first compressed roadway in Paris as early as 1854 and in London, Newark, New Jersey, and Washington, D. C., about the years 1869-1876. Sicilian, Mons, Neuchatel and others also came into prominence, especially the former which, being rather rich in bitumen, served where water-proofing was desired and for blending with other rock asphalts lower in bitumen.

Rock asphalts, indeed, constitute a unique chapter in the history of asphalt and the paving industry. They brought

about the revival of asphalt paving after the practices of Nebuchadnezzar had, for a long time, been a lost art. Not only this, but the study of their composition and behavior led ultimately to the modern synthetic sheet asphalt pavement of which the first example was laid in Washington in 1879. Recent development of the American deposits of Kentucky, Alabama and Texas would seem to indicate a renewal of their former popularity, especially for relatively small yardages, although high freight rates will probably serve to restrict their use to locations near the points of origin.

This brings us to our second sub-class of the solid native asphalts of which the Trinidad, Bermudez and Cuban products are undoubtedly the most important examples. As indicated before, these are of higher purity or bitumen content than the rock asphalts, varying, in the refined state, from about fifty-six per cent in the caes of Trinidad to sixty or seventy per cent for the Cubans and about ninety per cent for the Bermudez. Both the Trinidad and Bermudez are found in nature in large basins or lakes and these sources early led to their being designated natural or native lake asphalts. The former has been by far the most important, and as it is also characteristic of such deposits, it will be described in further detail.

The famous asphalt lake of Trinidad is on the Island of Trinidad, which lies off the Venezuelan coast of South America and appears to have been formed by the filling up of a large volcano crater with pitch. At any rate, test borings, as far as it has been practical to carry them out, have shown the deposits deepest at the center and generally diminishing as the rim of the lake of crater is approached. The lake is roughly circular and of about one hundred and twenty-seven acres in area; its surface is one hundred feet or more above sea level, and central test borings have been carried down to sea level and perhaps slightly below. Perhaps the most interesting feature of the Trinidad lake is the fact that while thousands of tons of its contents have been removed since its original exploitation, the level of the semi-plastic pitch has not been appreciably lowered.

Trinidad lake asphalt as found in its crude or native state is a very uniform mixture or rather an emulsion of water, gas,

extremely fine sand, clay and bitumen. It has the appearance of moist, spongy earth, smells rather strongly of hydrogen sulphide, and is usually quarried out or mined in lumps by hand and transported in tram cars to refinery or steamships. Most of the water and gas leaves the crude material during handling and transportation and the subsequent refining process is essentially a drying out of the remaining moisture, the melting and agitation of the bitumen with steam and finally a settling-out of the coarser particles of mineral matter. The finer mineral constituents appear to have become intimately associated with the bitumen at the time of origin, remain with it throughout the refining process, and always become a part of pavements in which Trinidad asphalt is employed.

Refined Trinidad asphalt is a hard clay-like material, blue-black in color, and having a somewhat conchoidal fracture. As stated before, it will show a bitumen content of about fifty-six per cent, and it is customary to credit the mineral matter as so much filler, which is, of course, a necessary constituent of al paving mixtures.

Bermudez is also an asphalt which is found in a lake fo mation, the deposit in this case being located in the swamp region of Venezuela near the sea coast and, indeed, not fa from the island of Trinidad. The Bermudez Lake is approximately nine hundred acres in area and has an average depth of about four feet. The asphalt appears to be the exudations from numerous springs throughout its area which have merged themselves intto one large mass. Its consistency varies from soft or fluid near these springs to hard and brittle near the circumference,—the latter doubtless the result of exposure and evaporation.

Crude Bermudez asphalt carries less moisture and gases than Trinidad and, after refinement, shows from ninety to ninety-two per cent of bitumen. It is, therefore, a purer asphalt than the latter and will consequently, weight for weight, lay a greater yardage of asphalt pavement. Bermudez, like Trinidad, has been a very satisfactory paving asphalt.

Several deposits of solid native asphalt have also been operated in Cuba during the past twenty to thirty years, the most important being those known as Mariel, Royal Palm,

Bejucal and Santa Lucia. Unlike Trinidad and Bermudez, however, they do not occur in lake formation but are mined from pits or quarries. They are hard materials in their crude state, black to brown in color, dull to bright vitreous lustre, and carry little or no moisture and gas. Bitumen content in these materials is at best about seventy-five per cent.

Cuban asphalts have appeared on the American market periodically but have had no extended use here for a number of years. In common with the other solid asphalts obtained from nature, they have encountered severe competition from the petroleum asphalts to be described later, and this, together with the high percentage of flux required in their use, has served to render them uneconomical. It is reported in connection with the new Cuban national highway to be built throughout the length of the island, however, that the asphalt sections are to be paved with materials from some of these Cuban deposits—a noteworthy example of home industry and the development of local materials.

Unlike rock asphalts, the solid native asphalts of our second group—that is those relatively high in bitumen—cannot be used directly as surfacing materials. They must be softened or "fluxed," ae we say, to a suitable "penetration" or consistency and at this stage of their manipulation they are simply asphaltic cements which serve to bind together the mineral aggregates which must be prepared independently. For fluxing, residues from petroleum are used and the proportions will vary from, say, twenty per cent in a Bermudez cement to fifty per cent in asphalt cements prepared from some of the Cuban materials. Needless to say, much care should be exercised in the selection of appropriate "fluxes," but with satisfactory cements so obtained, and with proper mineral aggregates available, the engineer can prepare his paving mixture in pre-determined proportions, adapted to his particular traffic and climatic conditions.

We now have to consider our second general group or class of asphalts, which are commonly known as "Petroleum Asphalts." This designation is due to the fact that they are prepared direct from asphaltic petroleum without waiting for the

forces of nature to accomplish a part of the refining process. The word petroleum, however, is in a way superfluous, for most geologists and chemists now agree that all asphalts were primarily of petroleum origin. Perhaps no engineering material has had to overcome greater obstacles in achieving recognition than have these petroleum asphalts, for even at mature stages of their evolution, they were often referred to as "residues." "residuals," "refuse," "by-products," "oil, or manufactured asphalts," etc. While such terminology may have fitted some primitive forms of petroleum asphalts, improved raw materials and processes have long since rendered these designations wholly inappropriate. Let us trace briefly the developments of asphalt from petroleum.

Petroleum doubtless entered the paving industry as a "flux" or softening agency for the solid native asphalt already described. These fluxes were the residues or by-products of oil distillations, for in those early days the major product of all oil refineries was kerosene, and later on gasoline and lubricants. The fluxes were, therefore, what remained in the still after the more valuable constituents had been removed. That they were in a large measure waste or products of lesser importance is evidenced by the fact that often the oils were "cracked" to increase the normal yield of burning oils and with subsequent injury to these still residues. With several more or less well defined oil fields in this country, it is quite conceivable that these fluxes were variable and uncertain in character and perhaps in many cases unsuited for fluxing purposes.

The increasing use of the solid native asphalts early became the stimulus for the development of these petroleum residues so that they might compete with the asphalts to which they had heretofore served only as adjuncts. It was necessary, however, to bring them from their more or less fluid state to solid consistencies suitable for paving purposes, and several important discoveries were made in this direction. For example, Dubbs found that by adding sulphur to the residuum, maintained at elevated temperatures, there resulted a molecular condensation, a liberation of hydrogen sulphide gas and the formation

of solid asphalts. His product was sold under the name of "Pittsburgh Flux." Byerly, working about the same time, found that by blowing air through the hot petroleum residues the oxygen of the air performed the same function as sulphur in the Dubbs process, and in 1893 took out a patent covering the air blowing or oxidation process. This proved an important step in the development of petroleum asphalts and it is still in use to-day for the preparation of paving fillers, etc., although all patent rights expired some time ago. Such materials as the Hydrolenes, Sarco, Ellis Flux, etc., were well early products of the oxidation process and, like the Dubbs material, they were "short" or cheesy in character and little susceptible to temperature changes. They served for water-proofing, as paving fillers and to a large extent as a flux in the preparation of asphaltic cements for asphalt paving blocks.

Another step in the evolution of asphalts from petroleum was accomplished by compounding the distillation residues with relatively small percentages of so-called "asphaltites," such as gilsonite and grahamite. The resulting asphaltic cements were tough, adhesive materials, high in purity and moderately susceptible to temperature, and many pavements laid with them are doubtless still in existence to-day. High costs prevent their successful competition with the modern petroleum asphalts to be described later. This brings us to about the year 1900, previous to which petroleum asphalts were indeed artificial. They were prepared, at best, from oils low in asphalt contents and their solidity or consistency was proportional to the artificial means employed in their preparation.

Asphalts from Texas and California petroleums next deserve attention, and it is interesting to note that they differed rather widely in their physical characteristics. The early Texas asphalts, being largely air blown, were low in susceptibility to temperature but the low ductility retarded rapid adoption, as most paving specifications carried minimum ductility requirements of 15 or 20 centimeters. On the contrary, the early California asphalts were of unlimited ductility for, being made from heavy asphaltic base petroleum, it was possible to reduce them with steam to the desired penetration without re-

sorting to air blowing. Some of the California products were rather highly susceptible to temperature changes but through the selection of appropriate crudes and modern processes, both California and Texas asphalts have long been popular materials in the bituminous paving industry.

About the year 1910, the opening of several large wells in the eastern part of Mexico opened a new epoch in the petroleum asphalt industry. Although Mexican asphalts had previously appeared on the market in small quantities they were but surface effusions from the real deposits that lay from three to five thousand feet below the surface. These new developments gave to the world, however, asphaltic petroleums that were not only eminently suited for the production of asphalts but available in quantity and uniformity. Such important Mexican crudes as Potrero, Panuco, Ebano, Huasteca and Cacalaio are deserving of mention. Heavy, black, viscous materials, showing from fifty to seventy per cent of asphalt, they were readily transported to our coastal refineries and converted into asphalts meeting in every way the requirements of the best engineering practices. Favorable prices, furthermore, enabled them to overcome old prejudices and the result has been that during the last ten or fifteen years Mexican asphalts have been an important factor in the bituminous paving industry.

Recently there has been a notable decline in the Mexican production, due partly to some of the wells showing salt water and also to unfavorable operating conditions under certain interpretations of the Mexican land laws. Recent diplomatic successes in adjusting these conditions have apparently not induced the operating companies to resume their former activities, so that the future of Mexican as a source of asphalt is rather uncertain. Venezuela, however, the mother country of asphalt, is ready to more than make good any shortage. The vast developments around the Maracaibo lake in that country are now producing highly satisfactory petroleums for asphalt manufacture and the potential supply bids fair to outstrip the record of Mexico. High grade paving asphalts from Venezuelan petroleum are, in fact, already on the American market

and are being used extensively in Europe under American specifications and practices. We need, therefore, have little apprehension as to plentiful supplies of petroleum asphalt, at moderate cost, for our future road building programs.

The successful production of asphalt from petroleum has involved radical changes in the equipment and processes of the oil industry. It has already been explained that, in the ordinary oil distillation, the object is to conserve the yield and quality of the light fractions and that the relatively small residues of asphalt may or may not have been damaged in accomplishing this result. With asphaltic petroleum showing from fifty to seventy per cent asphalt and only a few per cent of low grade gasoline and light oils, quite the reverse of the above has been effected. Temperatures of the residues are rigidly controlled, and the light oils, removed as rapidly as possible, are in this case the by-products. This is emphasized for the reason that although petroleum asphalts are made very largely in oil refineries, they constitute, nevertheless, the major product in this phase of the industry.

The production of high grade asphalts from petroleum involves, actually, the distillation or evaporation of the crude materials to proper consistencies even though refinery apparatus often appears rather complicated and mysterious to the layman. The essential features are exclusion of air, an abundance of steam, and, above all, a careful control of the temperature to which the asphalt is subjected. Two processes, in general, are employed and they will be briefly covered as follows:

In the batch or steam still method, the crude is charged into horizontal stills, sometimes as large as 1200 barrels capacity. External heat is applied gradually and, as the temperature rises, the lighter oils begin to boil or distill out and are re-condensed to liquid form in a separate part of the apparatus known as the condenser. When the heavier fractions in the still have reached a temperature of about 375°F., live steam is admitted through a perforated coil in the bottom of the still and rises through the material. Mixed vapors of steam and oil are given off and go to the condensers and the contents of the still are kept in continuous agitation. Local heating from

the fires at the bottom is thus avoided and the effect of the steam is also to lower the boiling points of the oils that are removed. As the still contents approach asphalt consistency, the heat is cautiously raised and the volume of steam increased so that toward the end of the run the ratio of condensed steam to oil is often as high as six or eight to one. When close to the desired consistency, fires are drawn so that from this point on the steam tends to reduce the asphalt temperataures and slow down the refining process. Finally the steam is cut off, top steam is admitted to scour out the remaining vapors, and the asphalt, after final testing, is ready to be pumped either to storage tanks or to tank cars or packages for shipment.

Much asphalt is made to-day by a second method which is practically continuous and involves the use of so-called pipe stills. The pipe still is perhaps best exemplified in the Trumble process named so after its inventor. This process was originally desired for the stripping and removal of moisture from California oils in the manufacture of fuel but about 1913 was taken over by the Royal Dutch-Shell interests and has been subsequently improved and elaborated.

In the Trumble process the crude asphaltic petroleum is pumped continuously through a long coil of pipe enclosed in a furnace, and here, besides being heated, it is kept under a pressure by a check valve at the far end. After leaving the coil, the heated oil is discharged into the top of a tall iron cylinder or tower which is heated externally by the flue gases from the pipe still furnace previously mentioned. The hot oil passes over baffle plates in its passage down the tower, becoming heavier and heavier, until it finally reaches the bottom, where it discharges through a constant level outlet as finished asphalt. Before leaving the bottom of the tower, however, the accumulated asphalt is treated continuously with live steam from a perforated coil as in the steam still and the rising steam vapor, passing over the baffle plates, takes up the lighter fractions from the descending oil. A central stand pipe carries the mixed oil and steam vapors to the condensers. Rate and temperataure of oil feed, and also the volume of steam employed, determine the grade or consistency of the finished

asphalt. Pipe still processes are extremely economical of operation, in that the asphalt, on its way to storage, is usually passed through heat exchangers. Here it gives up a considerable part of its heat to the crude material while the latter is being pumped to the retort or heating coil. Loss of time due to charging and discharging batch stills is avoided and the asphalt is received in storage at convenient temperatures.

From a crude beginning, petroleum asphalts have, through improved raw materials and processes, been developed into products of the highest quality and serviceability. They meet the requirements of modern specifications and are generally acceptable under the most exacting engineering practices. Furthermore, petroleum asphalts are practically one hundred per cent pure bitumen, so that every pound used in the paving mixture means that much bitumen available as the essential binding medium.

Having described the principal types of asphalt which figure in the paving industry it may be well, in closing, to say just a few words as to the principal types of asphalt pavements, for asphalt pavements are essentially sand and stone aggregates bonded and waterproofed by this material. The asphalt filled brick and stone block pavements of Babylonian times are still with us in highly standardized forms, and while rock asphalts are being laid essentially along the lines of their early examples, much care is now taken so that these deposits of nature may be supplied as uniform as possible.

Of the synthetic hot mix pavements, sheet asphalt with its carefully graded aggregate of sand and mineral dust is doubtless the favorite construction of our large cities. Certainly this type has been most intensively studied and only recently some radical changes have been introduced in the design and manipulation of sheet asphalt mixtures. These improvements in sheet asphalt also apply to the fine graded asphaltic cement such as the Topeka pavement, for this type is essentially a stone filled sheet asphalt mixture. Asphaltic concretes, of coarse grading, are also popular pavements. As their name indicates, they are composed of graded, low void mineral aggregates of stone, sand and limestone dust, with an asphaltic cement, and are laid with several forms of surface finish.

Of the lower cost pavements, there is the "penetration" or "grouted" asphalt macadam, as well as several forms of cold mixes, to say nothing of the various methods of salvaging existing roads by means of asphalt in such liquid forms as naphtha cut-backs and emulsions. Indeed, I must not neglect to mention the increasing use of asphalt in the foundation or base course of modern highways, these constructions being commonly referred to as "Black Base" or flexible base. The latter term is perhaps not so startling as it may seem when we consider that all pavements depend for their support upon an adequate sub-grade.

Free from its early mysteries and with modern research and machinery eliminating old rule of thumb practices, therefore, asphalt continues its long and creditable relationship to the paving industry—an industry that is now of world-wide importance as the result of the introduction of the automobile as a modern means of transportation.

Discussion.

MR. PORTER: I think Mr. Law's paper, in addition to giving us a very clear and comprehensive idea of the origin and development of asphalt, and its uses, has cleared our minds perhaps of a great many of the misapprehensions or misunderstandings in regard to the possible difference in the value of so-called natural asphaltic material from the petroleum asphaltic material.

I know there are several men here who are particularly interested in that phase of things, and I know we would be very glad to hear from them. Mr. Schneider, would you care to say something on this subject?

MR. SCHNEIDER: About three years ago I had some experience in maintaining the paved streets of this city. We have quite a number of different kinds of asphalt pavements, and all sorts of problems are encountered in their maintenance.

On a few streets the surface seems to wear away and disintegrate much faster than would be expected in view of the relatively light traffic to which such streets were subjected. I had some specimens taken of the asphalt wearing surface, as we call it, on such streets, and we learned that coal tar had been used for the asphaltic cement.

Another problem of moment was the use of fine gravel as aggregate in bituminous concrete. For several years, on street repairs, the city had been using bituminous concrete having 50% coarse aggregate of gravel, 3/8" to ten mesh in size, the remainder being composed of the so-called "standard sheet asphalt" mixture as to sand grading and bitumen content. The asphaltic cement used was 6¼ per cent. This mixture often gave trouble through disintegration, particularly along cracks in rainy weather. We tried varying the content of asphaltic cement and working temperatures without satisfaction. I attribute the trouble largely to insufficient adhesion between the asphaltic cement and the smooth surfaces of the gravel. Better results were obtained when using broken stone or slag as the coarse aggregate. We finally gave up the use of fine gravel in this type of wearing surface.

There are a great many factors that control the making of a satisfactory asphalt pavement. One of the most important is the foundation. The foundation, whether of concrete or macadam, should be as even and uniform as possible. Unevenness in foundation will require that the asphalt surface be placed in varying thickness to compensate. The rolling of such a surface results in unequal compression and rolling or waving of the surface will inevitably follow.

The wearing surface has to be properly prepared, in proportioning and mixing the ingredients, their temperature control; it should be delivered to the job at a temperature sufficiently high to permit of its being worked with ease. (About 275°F.-300°F.). Raking is a very important factor in securing a first class pavement. It is not proper to dump a load of surfacing material and merely trim it in different directions in order to spread it. It should be placed in small quantities, preferably by hand shovels, raked to uniform texture and even surface. Anything which will cause non-uniformity in texture, thickness, or evenness of surface, will, after rolling, result in a wearing surface of uneven density. The final result is waving of the surface, the "thorn in the flesh" to all asphalt pavements.

It should be said to the credit of the paving industry that it is now appreciated more and more, by both contractors and

engineers, who write the specifications, that each portion of a pavement should stand on its own merits. Slip-shod work in preparation of subgrade and foundation construction cannot be covered satisfactorily by the asphalt top. As a consequence, various schemes of gauging for contour, maintaining evenness of surface on subgrade and foundation, and placing of asphalt wearing surface have come into being.

In regard to the asphaltic cement, it is my opinion that the principal characteristic that will govern its satisfactory use is the penetration. (Note. As referred to below, penetration is the depth in tenths of a m.m. that a No. 2 needle will penetrate a sample of the material at 77°F. when weighed with 50 grams and allowed to penetrate the same for five seconds). In general, low penetration is not conducive to waving but means a brittle pavement. The higher the penetration, the softer the wearing surface, hence the easier it will deform. In northern climates asphalt of about 50 penetration is used; the penetration for new pavement in New Orleans is 40-45. In street repair work we have been using asphalt of from 35-40 penetration. From my experience, I would say that 40 penetration is about the best for this climate.

MR. PORTER: Is there anyone else who has any remarks to make on this paper or any questions they would like to ask Mr. Law?

MR. RHODES: I want to call to Mr. Schneider's attention the way they are building the State roads throughout the country now. They use the straight edge on them. They hold them to standard specifications of one-eighth of an inch per foot from the point of nearest contact, so that asphalt pavements throughout the country now are being built in a very uniform manner.

Now in order to eliminate a great deal of expense, we use the asphalt finishing machine which is very similar to the concrete finishing machine, which prevents wave or any irregularity. This machine not only eliminates one of the expensive items, but it also gives a smooth finish.

MR. PORTER: I would like to ask Mr. Law one question. What is the relation, or distinction, between rock alphalt and oil shales? Is there any except the character of rock material?

MR. LAW: Generally I would say they fall under the same classification. They are both rock impregnated with bitumen and of course there can be differences in the characteristics of the rock and the bitumen.

MR. PORTER: Are there any further questions any one would care to ask?

MR. SCHNEIDER: In many instances it has been noted that asphalt wearing surfaces become brittle after a number of years of service. This loss of resilience, or elasticity, I think, is to be attributed more to the effect of weathering than of traffic. In reality the life of a pavement is prolonged by moderate traffic. One type of Kentucky rock asphalt seems to retain its resilience much better than most other types of asphalt wearing surface. While it is a difficult proposition under some circumstances to obtain initial compression in such asphalt when laying, after once it has become stable, it has given excellent satisfaction. I wonder if there is anything in the bitumen itself that is responsible for this characteristic of that particular asphalt.

MR. LAW: The characteristics are probably due to the soft consistency of the bitumen of this particular asphalt rather than to its composition. In some of the Kentucky rock asphalts the bitumen is as soft as 100 penetration. This means that the bitumen carries a relatively high percentage of lighter oils and consequently the pavements laid in such materials retain their plastic properties longer than where harder bitumens are employed.

As the other extreme, asphalt streets have been laid in New York City with the bitumen as hard as twenty-five or thirty penetration. These pavements were of course low in the lighter or tempering oils and their surfaces frequently cracked during the first year of service.

MR. PORTER: I would like to ask Mr. Law one more question. He mentioned in his paper the distinction between coal tar products and asphalt products. As I understand it, coal tar products are used quite extensively in roofing. I believe anyone who has observed roofing in this climate will agree that after it dries out completely you have absolutely nothing more than a blotting paper roof.

I was wondering if some of the inherent drying out qualities might not be present to some extent in the asphalt material which accounts for the element of the brittleness in the paving material. Can you give me any information along that line?

MR. LAW: I don't know that I clearly got your point. Do I understand you to say that tar and asphalt dry out and become brittle?

MR. PORTER: I believe that the water-proofing in roofing material dries out in a very short time and there is no water-proofing quality left in the paper material.

MR. SCHNEIDER: I think a great deal of that is due to the action by light. It is a very powerful agency in disintegration.

MR. PORTER: I have seen where coal tar products were more resistant below the ground, subject to continual wetting, where asphalt is more resistant above the ground, subject to light and chemical action of the sun rays. Do you know anything about that definitely?

MR. LAW: I cannot answer that question.

MR. SHAW: In regard to greater retention of elasticity, which property is claimed for the Kentucky "Rock Asphalt," might not this difference be due to the fact that there has been a more intimate mixture of the petroleum derivatives and the native sand than heretofore has been secured in the artificial products?

I recall that as a young instrument man, in the employ of the Chesapeake, Ohio and Southwestern R. R., I was sent to make a survey for a spur track leading to this Kentucky deposit. At that time (1897) the rock was being worked in an indifferent manner and was hauled away in wagons for road repairs in the immediate locality. Owing to the coarse, sharp sand which was mixed through the material, the picks used in breaking the rock wore out with surprising rapidity. The appearance and position of the deposit suggests a geological process which follows parallel to the theory propounded by Dr. Dixon concerning the oil and gas deposits of Louisiana and adjoining states. This makes it reasonable to suppose that there has been a flow of liquid or viscous materials through rock crevices or porous earth, the ori-

gin being in the Pennsylvania coal areas. As the flow approached the hills of Kentucky it became sluggish and terminated in the sand stratum where it now is found. It is probable that its primary condition, in the present locality, was as a viscous fluid, which mixed readily and thoroughly with the coarse sand.

MR. LAW: We have to-day on the market a mixer which has been devised to incorporate the bitumen under pressure in order to get a more complete impregnation of the mineral constituents of the paving mixture.

REPORT OF COMMITTEE ON WITHDRAWAL FROM AMERICAN ENGINEERING COUNCIL.

The Louisiana Engineering Society is one of twenty local and state engineering organizations holding membership in the American Engineering Council. Whenever the question has arisen in the past as to the advisability of retaining membership in the Council, the members of the Louisiana Engineering Society have voted to remain, inspired doubtless by the hope that in time the Council would prove its usefulness, not only to the progress of the engineering profession as a whole, but that occasions might arise when the influence of such an organization would be of material assistance and benefit in the solution of critical problems of great importance to a particular community or section of the country.

Such an occasion has now arisen in connection with flood control on the Mississippi River and its tributaries. It is with sincere regret that the Louisiana Engineering Society feels constrained to express its distinct sense of disappointment that American Engineering Council has failed to justify the confidence so far reposed in it by the members of this Society.

The attitude of the Council, as expressed in its resolutions concerning flood control legislation, is one that would seem to indicate an utter lack of comprehension of the seriousness of the situation with which this section of the country is immediately confronted.

Furthermore, the Council, in apparent disregard of the recommendations of the Louisiana Engineering Society, failed to appoint to its Committee on Flood Control a single engineer from this section, in spite of the fact that there are men in this community, members of the Louisiana Engineering Society and of the national societies, who through long experience and study have acquired an expert knowledge of the problem in question.

It would appear that the propriety of naming at least one of these men to the committee in question would have natu-

rally occurred to the Council, even had its attention not been specifically directed thereto.

Respectfully submitted:

For the Committee,
W. B. GREGORY,
DOUGLAS ANDERSON,
F. A. MUTH.

Discussion.

MR. YOUNG: This question has come up for consideration, as we all know, several times before. Last year our Board of Directors gave consideration to it and recommended our withdrawal from the American Engineering Council. It was brought to the attention of the Society, and there was a small vote cast, 7 for and 7 against, I believe. I myself was here but I did not vote.

I was not sufficiently posted to feel that I was qualified to cast a vote one way or the other. I did not feel that I knew whether we were getting sufficient benefits out of membership in the Engineering Council to warrant our continuing that membership. It costs, I believe, about $300.00 annually.

Of course, if we are deriving benefits commensurate with our contribution, the cost would not be of great consequence, but as set forth in the resolutions which have been presented here tonight by your committee, I believe that this Society, and this part of the country, have been ignored in the consideration of one of the most important questions that has ever come up for solution in Louisiana. I refer to this matter of flood control.

Our Board of Directors were called together by our President some months ago to consider resolutions on flood control, prepared by a committee of Engineering Council. These resolutions were to be presented to Congress. As Mr. Lanphier was our authorized representative in Engineering Council at that time, the matter was brought to his attention but he was requested to keep the information confidential. Why the information should have been kept from a member society might be difficult to explain. Mr. Lanphier did not think that it should be kept from our Board and so he brought it to their attention.

Our Board of Directors referred the proposed resolutions to some of our own members who were at that time in Washington appearing before committees of Congress on flood control matters. As I had been working with Colonel Garsaud in preparing data on flood control and as he was in Washingtotn, he requested our Board to have me present when these resolutions prepared by the Committee of Engineering Council would be discussed. I was present and our Board passed resolutions condemning the resolutions prepared by the Committee of Engineering Council and made formal request of Engineering Council not to have the resolutions presented to Congress. It was our belief that favorable action by Congress on these resolutions would result in indefinite delay on any practical flood relief for the lower Mississippi Valley.

Engineering Council, through its committee, presented their resolutions to Congress, in spite of protest from our Board. It would seem that not only did they not help us in a time of great need, but they took action which was, as we believe, contrary to our interests.

It seems to be the general impression that Engineering Council was organized primarily for the purpose of sponsoring legislation for the organization of a Public Works Department in the Federal Cabinet. So far this effort has not succeeded. I recently saw a statement in some prominent journal to the effect that it would seem that this task had failed of accomplishment, and perhaps 'twas just as well.

Under the circumstances, Mr. President, I am in favor of the resolutions presented here to-night by your committee and favorably acted upon by your Board, and I move their adoption. I believe we are not getting our money's worth from our membership in Engineering Council, and if not, we could use to better advantage the two or three hundred dollars which this membership costs us annually.

MR. PORTER: Has anyone else anything to say in regard to this resolution?

MR. BERNHARD: I think I may be a little bit out of order, not having listened to all the arguments in favor of it, but from what I have heard, the American Engineering Council have

made efforts, not according to our views of the flood control, and I think the least we can do is to remain in and fight for our rights. Of course, if you step out, that would seem to be the end of it.

MR. MOSES: You have not been at our meetings lately and therefore do not know what has happened. We joined the Engineering Council about six years ago, hoping to get some benefits. To date we have not received them. There have been several attempts to withdraw on the part of this Society. On each of these occasions certain arguments have kept the Louisiana Engineering Society in the American Engineering Council. This question of flood control is simply the last straw. It is not the first time we have disagreed with them.

MR. BERNHARD: I certainly do not like to monopolize the floor, but I have to answer Mr. Moses. I don't believe in withdrawing from a body like this, if that be the only reason, because they disagreed with us in the past. I beg of you to give careful consideration to this first. If it is because the situation is hopeless, then I say get out, but if it is caused by a misunderstanding, because of the right of opinion to another goal, I say stay in and fight for that goal.

PROF. ANDERSON: On behalf of the committee I should like to state that at least two of its members, and I believe possibly the third, are men who have always opposed the resolution to withdraw from the Engineering Council. The attitude of this Society and, I believe, the attitude of the members of the committee, has been all along one of hope that the Engineering Council was an organization for the constructive good of the engineering profession, and that the Louisiana Engineering Society should remain a member rather than withdraw, even though the majority of the members are unable to see that we were deriving any benefit from such association.

The people of this and neighboring states are face to face with a critical situation in which sound engineering advice and counsel are of the greatest importance. The Louisiana Engineering Society, as one of the constituent members of American Engineering Council, had the right, it would seem, to expect and to receive the highest degree of co-operation from the Council in the solution of this problem of flood control in all its phases.

The members of this Society, as indicated by the expressions of opinion heard here this evening, feel that American Engineering Council has failed them not only through utter lack of cooperation, but that it has almost snubbed them. Has the Council fulfilled our hopes for constructive contributions to the cause of the engineering profession?

MR. BERNHARD: I would like to ask Dean Anderson what constructive contributions we have given to the American Council?

PROF. ANDERSON: Well, I should say that one of the constructive contributions was our financial assistance, which helped to carry on whatever work they had in mind. It is true this financial contribution has not been very large, from their point of view, but it is a considerable item in our own budget. I would say, in addition, that in this immediate contingency, in which a problem arises of greater interest and importance to us than to any other section of the country, we have endeavored to be constructive by giving them suggestions as to the proper kind of legislation, the sort of men to be appointed on the National Committee on the subject of flood control, and similar matters. This would seem to me to be quite constructive. However, our endeavors in this direction have met with no sympathy and we have been utterly ignored.

MINUTES OF MEETINGS AND BUSINESS OF THE SOCIETY

Minutes of Board of Direction, February 13, 1928

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

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

Resignations of Messrs. Dromgool, Manion, Smith and Mascaro were accepted with regret.

Mr. Lionel J. Cucullu was transferred to Non-Resident Junior Member.

The report of the Finance Committee was read and ordered filed.

On motion duly seconded, it was voted to purchase one thousand dollars ($1000) worth of securities recommended by the Finance Committee.

On motion duly seconded, the following Rescolution was adopted:

"RESOLVED, That the Louisiana Engineering Society withdraw from the American Engineering Council, effective June 30, 1928."

There being no further business the meeting adjourned.

F. A. MUTH, Secretary.

Minutes of the Society, February 13, 1928

The meeting was called to order about 8:10 p. m. with John L. Porter, President, in the chair, F. A. Muth, Secretary, and 53 members and guests present.

The minutes of the previous meeting were read and approved.

The following amendment to Paragraph 3 of Article 7 of the Constitution was read for the second time and on motion duly seconded it was adopted:

"Any member in good standing of a local engineering or technical society in the United States or Canada which grants a similar privilege may become a member of this Society on his application and election as provided for other applicants for membership, but without payment of entrance fees. The dues of a member so transferred shall be billed from the end of the fiscal year of the current fiscal year of the Louisiana Engineering Society, but not for a longer period than one year from the date of transfer."

Following resolution previously recommended by the Board was read before the Society for the first reading and on motion duly seconded

it was voted to be acted upon favorably at the next meeting of the Society:

> RESOLVED, That it is the sense of the Louisiana Engineering Society that the New Building Code of the New Orleans as adopted by the Commission Council October 19, 1926, effective February 1, 1927, is hereby approved and the Society recommends that the necessary steps be taken by the proper authorities for the adequate supervision of all work in accordance with the provisions of the Code as adopted.

This meeting being to celebrate the Thirtieth Anniversary of the Society, the exercises consisted of addresses by the charter members, giving their reminiscences of the early days of the Society. Mr. John F. Coleman as the first Secretary of the Society led the series of addresses, and he was followed by Messrs. Lewis, Lombard and Theard. Interesting discussion followed the talks, and a rising vote of thanks was tendered the "old timers," as they were called.

There being no further business, the meeting adjourned to the collation which was served at the Cabildo Restaurant.

F. A. MUTH, Secretary.

Special Meeting of the Board, March 3, 1928

A special meeting of the Board having been called by the President at 11:30 a. m., March 3, 1928, the meeting was held in the office of Mr. E. S. Lanphier, Mr. F. H. Fox, Vice-President, in the chair (Mr. Porter, President, having recused himself), and the following members present: Messrs. Todd, Frost, Lanphier, Porter and Muth. Colonel A. M. Shaw was present upon an invitation.

The following resolution was presented by Colonel A. M. Shaw, and on motion duly seconded was voted referred to the Society for favorable action:

> RESOLVED, That the expansion of the sewer and water facilities, and especially of the drainage facilities of the City of New Orleans are vitally necessary to meet the increasing needs of the city and that the request, made by the Sewer & Water Board for authority to issue additional bonds for the purpose of such expansion is endorsed by the Louisiana Engineering Society.

There being no further business the meeting adjourned.

F. A. MUTH, Secretary.

Minutes of the Board of Direction, March 12, 1928

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

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

Communication from the State Board of Engineering Examiners was read and the Secretary was instructed as to reply to be made.

Prof. Douglas Anderson presented report of the Special Committee appointed to look into the matter of membership in the American Engineering Council. On motion duly seconded it was voted that the report meets the approval of the Board and the Board recommends to the Society the following resolution:

> RESOLVED, That the Louisiana Engineering Society withdraw from the American Engineering Council effective June 30, 1928.

The Secretary was instructed as to the letter to be written to the American Engineering Council in regard to the action of the Society on the foregoing resolution.

There being no further business the meeting adjourned.

F. A. MUTH, Secretary.

Regular Meeting of the Society, March 12, 1928

The meeting was called to order about 8:15 p. m., Mr. John L. Porter, President, in the chair ,F. A. Muth, Secretary, and 49 members and guests present.

The Minutes of the previous meeting were read and approved.

The following resolution was read for the second time and on motion duly seconded was adopted:

> RESOLVED, That i tis the sense of the Louisiana Engineering Society that the New Building Code of New Orleans as adopted by the Commission Council, October 19, 1926, effective January 1, 1927, is hereby approved and the Society recommends that the necessary steps be taken by the proper authorities for the adequate supervision of all work in accordance with the provisions of the Code as adopted.

Prof. Douglas Anderson presented report of Special Committee relative to membership in the American Engineering Council and the advisability of termination of membership in that body.

Announcement was made that at the meeting of the Board on this night, report of the Special Committee was approved and that the Board recommended termination of membership in the American Engineering Council. On motion duly seconded the following resolution was adopted, 23 ballots in favor and 2 against:

> RESOLVED, That the Louisiana Engineering Society withdraw from the American Engineering Council effective June 30, 1928.

The following resolution was given the first reading and on motion duly seconded was favorably voted upon, after discussion by Col. A. M. Shaw:

RESOLVED, That the expansion of the Sewer and Water facilities, and especially of the drainage facilities of the City of New Orleans are vitally necessary to meet the increasing needs of the city and that the request made by the Sewerage and Water Board for authority to issue additional bonds for the purpose of such expension is endorsed by the Louisiana Engineering Society.

The technical exercises of the evening consisted of an interesting address on "Asphalt in the Paving Industry" by Mr. Leroy M. Law. Interesting discussion followed and the speaker was tendered a rising vote of thanks.

The meeting then adjourned to the usual collation.

F. A. MUTH, Secretary.

Minutes of the Board of Direction, April 9, 1928

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

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

Applications of Mr. R. H. Mann and F. M. Ivichievich were approved for transfer to Non-Resident Member. Mr. R. M. Law failed to qualify.

Mr. P. J. Dromgool was reinstated as Member.

There being no further business the meeting adjourned.

F. A. MUTH, Secretary.

Regular Meeting of the Society, April 9, 1928.

The meeting was called to order about 8:15 P. M., Mr. John L. Porter, President, in the chair, F. A. Muth, Secretary, and 54 members and guests present.

The minutes of the previous meeting were read and approved.

The following resolution was read for the second time and on motion, duly seconded, was adopted:

RESOLVED, That the expansion of the Sewer and Water facilities, and especially of the drainage facilities of the City of New Orleans, are vitally necessary to meet the increasing needs of the city and that the request made by the Sewerage and Water Board for authority to issue additional bonds for the purpose of such expansion is endorsed by the Louisiana Engineering Society.

The matter of the outing to be given in the form of a trip to the plant of the Louisiana Portland Cement Company as the guests of Mr. Scott Thompson was brought before the Society and the Secretary was instructed to issue the proper notices for the Committee on Outing and Entertainment. The Outing Committee brought before the meeting a proposition for another outing to be held at some time when desired by the members, which outing will consist of an automobile trip to Gulfport, stopping at certain points of interest en route. On motion, duly seconded, it was voted that this matter be placed before the members of the Society for their suggestions and recommendations, using the usual post card notices.

The technical exercises of the evening consisted of a motion picture of "The World's Longest Concrete Seawall—Showing Methods of Construction," with technical description by Mr. H. D. Shaw.

The address of Mr. Shaw was followed by interesting discussion, and a rising vote of thanks was tendered the speaker.

The meeting then adjourned to the usual collation.

F. A. MUTH, Secretary.

The Proceedings of the Louisiana Engineering Society

Published bi-monthly, February, April, June, August, October, December, under the auspices of the Committee on Publication.

DOUGLAS ANDERSON, Editor.

The Louisiana Engineering Society is not responsible for any statement made or opinion expressed in this publication.

Subscription, $2.00 per annum Single copy, 35 cents

ADVERTISING RATES

	ONE YEAR	HALF YEAR	ONE ISSUE
Full page	$50.00	$28.00	$10.00
Half-page	28.00	15.00	6.00
Quarter-page	15.00	10.00	4.00
One-eighth page	10.00	6.00	2.00

For the back outside cover add 50 per cent to the above rates. For the inside covers add 25 per cent to the above rates.

Address all communications to
Douglas Anderson, Editor, Tulane University,
New Orleans, La.

Entered as second-class matter July 27, 1916, at the Post Office at New Orleans, Louisiana, under the Act of August 24, 1912.

Acceptance for mailing at special rate of postage provided for in section 1105, Act of October 3, 1917, authorized August 1, 1918.

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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. XIV. JUNE, 1928 NO. 3

CONTENTS

EDITORIAL NOTES AND COMMENT: PAGE

New Orleans and Its Gas 109
The Louisiana Engineering Society Prize 111
Scholarships for Engineering Students 112
The State Board of Engineering Examiners 112
New Members 112

PAPERS AND DISCUSSIONS:

New Orleans and Its Gas. *By A. M. Shaw* 114
Discussion 126

MINUTES OF MEETINGS AND BUSINESS OF THE SOCIETY 141

EDITORIAL NOTES AND COMMENT

New Orleans and Its Gas. Under this title Colonel A. M. Shaw contributed to the program of the May meeting of the Society a paper which throws much light upon this very vexed question and does it in a way which is clear, concise and readily understood.

The central idea in Col. Shaw's presentation is that in our present system of charging consumers, practically a uniform meter rate of so much per thousand cubic feet, only about one-third of them really pay the cost of the gas they use. Furthermore, this same one-third really pays the cost of serving the other two-thirds.

This other two-thirds is made up of the small and more or less casual consumer whose consumption of gas is so small as to make it highly unprofitable to serve him unless other consumers, with a more normal demand, really pay their service costs, and of the consumer who uses a large amount of gas, principally for space heating, and whose demand always coincides with the peak load, both daily and seasonal.

The normal consumer, and the one who really pays the fixed charges of equipment and operation, is pretty well represented by the householder who uses gas for cooking, for heating water, for family laundry during warm weather, and for short period heating of small rooms, such as bath rooms, etc.

The use of gas for space heating in New Orleeans gives rise to a particularly troublesome problem on account of the seasonal peak demand being so high and of such short duration. Complaints from consumers about sudden and excessive increases in their monthly gas bills may in many cases be traced back to just this condition of coincidence between short and sudden cold spells and extra demand for space heating.

It appears, therefore, that the consistent, all year-round user of gas is the one to whom the greatest consideration must be given in the question of reducing the cost of gas, whether it be the natural or the artificial product. And there will not be much opportunity of decreasing the cost of gas in New Orleans, either natural or artificial, until a new system of rate making is allowed and adopted.

The one, apparently best adapted to local conditions, is what is called the "Three Part Rate." The essential idea in this is that the domestic rate shall be made up of three parts:

1. A demand charge or a service charge.
2. A fixed rate per 1000 cubic feet for all consumption up to the average number of cubic feet used for ordinary household purposes.
3. A much higher rate per 1000 cubic feet for excess consumption over 2, this excess being gas used for space heating.

Item 1 would have the effect of making the small or casual consumer bear his proper share of the cost of supplying the gas. At the same time it would not impose a heavier burden on the normal user, because it would have the effect of lowering the fixed rate.

Item 3 would make the user of gas for space heating bear a far more equitable share of the burden than obtains under present conditions.

There is another important point about the gas situation in New Orleans which was discussed only briefly and that near the end of the evening. A great factor in other cities, which are cited as users of natural gas at low rates, is the large consumption of gas by the industries. As Col. Shaw says in his discussion:

"Without large industrial users to form a market, it would obviously be impracticable to bring natural gas to New Orleans and retail it at anything like the prices which have been proposed. If an industrial market on a reasonable scale exists, or can be created, I believe that our chances of getting natural gas for New Orleans are good, but without such a market, the outlook does not appear to be very promising."

At the same time we must guard ourselves against the common fallacy of assuming that gas should be furnished to domestic consumers at the same price as to industrial users, or even that the industries should be made to bear the greater part of the cost of supplying natural gas to the City of New Orleans.

The whole problem of natural gas for New Orleans involves engineering, business and politics, and the greatest of these is politics. It is only fair to Col. Shaw to say that this last *editorial* remark was not brought forth by anything in the paper. Perhaps the Editor was influenced by the coincidence that as he writes this, Governor Long is holding a conference in the city, the purpose of which is to give New Orleans the natural gas which it so ardently desires.

The Louisiana Engineering Society Prize. For the first time there was awarded at the commencement exercises of Tulane University this year the prize offered to the outstanding student in the Senior Class of the College of Engineering. The prize consists of a Junior Membership in the Society with dues paid in full for the first year, and is given to the outstanding student in scholarship as well as other qualities. It was awarded to Mr. William P. Oster, student in the Mechanical-Electrical Engineering Course. The corresponding prize at

Louisiana State University was awarded to Mr. Henry W. Page of Monroe, La.

Similar prizes are offered by the local chapters of A. S. M. E. and A. S. C. E. The A. S. M. E. prize was won by Mr. Bernard J. Tortomasi, and the A. S. C. E. prize by Mr. Arthur A. DeFraites.

Scholarships for Engineering Students. Since the Society has withdrawn from the American Engineering Council, it has been suggested that the amount appropriated for annual dues to the Council be now used to establish scholarships for engineering students, one at College of Engineering of Tulane University and one at the Louisiana State University.

This suggestion should be carefully considered by the Board of Direction, as the establishment of such an aid to worthy boys desiring to secure engineering training would be of the greatest value.

The State Board of Engineering Examiners. A bill has been introduced into the Legislature having for its object a radical change in the composition of the Board of Engineering Examiners for Civil Engineers and Surveyors. The Society has already taken cognizance of this and has appointed a committee to keep in touch with the situation.

It is to be hoped that our legislators will give the whole question their very earnest consideration and not take any action which might weaken the present provision of the registration laws. The Board of Examiners as now constituted has rendered loyal and effective service for the cause of safeguarding the practice of the profession of Civil Engineering, and there would appear to be no good reason for a change.

What is really needed now is to put more teeth into the registration law so that incompetent men who are now practicing as civil engineers without proper registration may be reached and prosecuted, and by which such practices may be prevented in the future.

New Members. Since our last issue the following members have been added to the rolls of the Society:

Resident Members

George H. Burt, Chief Engineer, The Celotex Company.

Samuel C. Collins, Mechanical Engineer, Pan-American Petroleum and Transport Co.

Callender F. Hadden, Standard Supply and Hardware Co.

Arthur F. Shuey, Manager, Equipment Finance Department, Mortgage and Securities Co.

Resident Associate Member

Scott Thompson, Manager, Louisiana Portland Cement Company.

Transfer From Student to Junior Member

William P. Oster, (Winner of Louisiana Engineering Society Prize at Tulane University).

Non-Resident Junior Member

Henry W. Page, Monroe, La. (Winner of Louisiana Engineering Society Prize at Louisiana State University).

PAPERS AND DISCUSSIONS

NEW ORLEANS AND ITS GAS

By A. M. Shaw.

Read before the Society, May 14, 1928.

In the more formal technical organizations, it has become the established custom to introduce discussions with a summary of the subject matter which the paper is purported to contain but, in this case, I shall begin by stating some of the things which this paper does *not* contain.

First, it does not suggest a method for composing the present three-cornered controversy between the municipal authorities, Public Service Inc., and the residential users of gas.

Second, it does not attempt to defend any one, not even the public.

Third, it does not propose to be bothered with, nor to be bound by such stubborn and inconvenient things as facts and figures, excepting as these may be used occasionally to illustrate a point or assist in presenting a theory.

So much for what the paper does not contain.

In order that a common ground for discussion may be established, the following assumptions are given in the belief that they will be accepted generally by all but fanatics, the grossly misinformed and those whose selfish interest will be permitted to warp their judgment.

1. The gas business, as presently operated in New Orleans, is unsatisfactory to a large number of people.
2. The price at which gas is sold to the domestic user is unsatisfactory to most (possibly including the vendor).
3. Assuming an equitable plant valuation as a basis, followed by an intelligently supervised system of administration and accounting, the allowed rate of return of 7½% on the investment is not unreasonable.
4. To merit serious consideration by the public, any new plan for furnishing gas to domestic users should provide:
   a. A reasonable price.

b. A continuing and dependable service.
c. Minimum of inconvenience to customers during any transition period.
d. Minimum of interference with traffic from laying or repairing gas mains.
e. Reasonable assurance of a fair rate of return on capital invested, together with provision for amortization. (This last may be questioned by some but, without it, the public will suffer in the end).

In considering the foregoing proposed assumptions, the first two, which refer to present dissatisfaction, may be dismissed as being universally accepted. The third, dealing with valuation and rate of return, is discussed frequently (and often noisily) by the "man on the street" and this man is quite positive in his statement that the "Gas Company put one over on the city" when the plant value was established for rate making purposes. If this man is right, and fraud or material error entered into the original valuation figures, then there should be a review of these figures, including perhaps, capital charges which have been made subsequently. Before undertaking such an investigation, however, consideration should be given to the fact that the public pays the bill, whether it be by direct fees to the investigators or by its effect on net returns if the cost is born by the gas company. If undertaken, it should be by the best talent available and should be conducted in a judicial manner, with no opportunity for expert juggling of figures to obtain either an unfairly low or high valuation. Unless this course is followed, the results secured will be open to attack at frequent intervals. We should not return to the methods which were employed in the early days of the Interstate Commerce Commission. When this regulatory board was initiated, it seemed to throw the accounting departments of many of the railroads into a mad frenzy. The auditors sensed rather dimly the trouble which was in store for them but they seemed quite generally to feel that if they could enter the fray with a well bolstered account of "Capital Investment," they might be able to postpone the evil day of receivership. Devious and grotesque were some of the methods adopted to swell the Capital account. I can well remember the scenes of hectic

rush in a certain division headquarters office when the first pay rolls were prepared which were to pass before the eyes of the newly created commission. There always had been a rush, beginning with the arrival of the first monthly time books, and ending only after the rolls had been made up for the entire division, duly copied by the use of many large, wet and evil smelling rags and dispatched to headquarters, but past "pay roll time" confusion was nothing to what obtained with the advent of the Commission. Supposedly clear and concise instructions had been issued during the previous month to the section foremen and this had the effect of spurring them all to unwonted literary effort but the result was absolutely unintelligible. Lars Larson, foreman on the Minnesota branch, described the work of his one man gang by the phrase "kat cod lane." He meant to say that they had been cutting the grass (sod) line along the ends of the ties. (There was no ballast). Such unintelligible entries did not delay the monthly report however, as the Chief Clerk was a resourceful individual, compelling the entire force to remain on duty all night to re-write the whole set of time books. Each book was rendered authentic, however, as an "all station" message had gone out to the various foremen, directing them to meet the morning train and be ready to sign on the dotted line.

Such tactics long since have fallen into disrepute and there is no chance that any similar course was followed in establishing the valuation of the present gas plant, though if there is reasonable evidence that an error was made, a close scrutiny of the old records would disclose the condition and point to the remedy.

The question of cost of production, quality of service rendered, rate of return and subjects of a similar nature have been covered by recent reports by others and for this reason no effort will be made to discuss them in this paper. We shall assume for the present purpose (though not necessarily concede) that the affairs of the gas company have been administered in the past without undue regard for the interests of the stockholders, as against those of the consumer, and from this assumption, proceed to a consideration of the questions in-

volved from a somewhat different angle from that taken by recent investigators.

To get the view desired, it might be well first to sketch a few of the more important points in the early development of the gas industry. Gas service is the oldest of the public utilities, if we do not include the furnishing of water, which goes back into early Greek history, and probably further. Even so, the use of gas on a commercial scale is only slightly more than a century old. Late in the 17th century, Dr. John Clayton distilled gas from coal, collected it in bladders and amazed his friends by lighting the gas as it was permitted to escape through pin holes. In 1785, Prof. Minklin lighted his class room experimentally in the University of Louvain, while in 1802, Wm. Murdoch installed a successful plant for lighting the engine works of Boulton, Watts & Co., of Soho, England. This was followed in 1807 by the first street lighting.

In the early days of the industry, individual plants were constructed for the specific demand and, so far as it has been practicable to ascertain, were owned and operated by the interests benefitted, though it was not long before it was realized that a central plant would serve a number of users more economically. With the growth of this idea came the necessity for some sort of a just (or, at least, workable) method of distributing the cost—rate fixing became necessary. The natural first step was to base the charges on assumed consumption with the number of burners serving as an index of consumption. Even before the various heating and cooking appliances came into general use in the homes, meters were found to be a necessity and with the present varied uses of gas, a measurement of the commodity furnished is absolutely essential to any rate fixing system. Un-metered gas service now is practically unknown excepting in small communities close to gas wells, where the cost of delivery is negligible.

Up to this point, the method of measuring service and of fixing rates was followed closely by the newer utility, electricity, but the youngster has far outstripped its older companion in the application of more scientific methods of establishing equitable rates among its various patrons.

A few of us still remember the first practical use of electricity for lighting; the spluttering, glaring arc light which was described by its wondering admirers as being "stronger than the sun." Then came the Edison carbon lamps, which could be used for home lighting. With the extensive use of the carbon lamp came the need of a rate fixing plan. This took the form of a flat rate for each outlet, and was covered by a contract which prohibited the use of lamps of larger than 16 candle power, excepting by special agreement and at a special price. There was considerable "boot legging" of high power lamps from other towns but this was difficult as it was not easy for individuals to buy lamps and if they were bought from any but authorized sources, it might be found that they would not fit the sockets in the home town. Each light company strove to select a special socket for which lights could not be secured through other sources.

As late as 1891, a town in which I was living had a newly installed electric lighting system which furnished current for both street and house lighting on a flat rate. In the interest of economy, the street lights were not turned on for moonlight nights, and the calendar was the sole arbiter as to whether there was, or was not, light from the moon. The plant was shut down completely at 10:30 each night. For the benefit of those who might have need of light after that hour, the lights were switched off for a second or two at 10:15 and again at 10:25. That gave one time to hunt up the old oil lamps which were always kept in readiness. On very rare occasions, such as when the banker or the editor of the paper was giving a party, the plant was run until midnight. At such times, the host gave his personal attention to the loading of a tray with liberal portions of all the refreshments and having it sent around to the two employees at the plant.

That same mid-western town now has an efficiently operated plant, furnishing current to small residences, stores and industries with a rate schedule so carefully adjusted that each user pays his just proportion of the cost of the service rendered. This may result in a variation of "commodity rate" charged to various users of as much as 1 : 8, the small user who comes into

the line at peak load periods and only for a few hours paying the highest rate and the large user, with an even load which is kept off of the line during peak hours being given the benefit of the lowest rate. With the perfection of recording meters, showing the use of energy throughout the day, it now is possible to base charges on the actual peak demand or on maximum demand during peak demand hours for the plant. This principle has been applied, to a limited extent, to the measuring and charging for gas service to large industries, and it would appear that, under conditions obtaining here in New Orleans, an adaptation of the idea should be applied to residential service if some practicable method for doing so can be devised.

Under our plan of operation, domestic users pay a uniform rate per M. c. f., regardless of the amount of gas used, the rate of use or the time during the day or year that the greatest demand occurs. (This is not quite true as about 2% of the users get a slightly lower rate on a part of the gas consumed, this being due to their being in what might be termed the "wholesale" class.) With a variation of 500% between a minimum summer day production and a maximum winter day production, it is easy to realize the economies which would follow any equalization of these high and low points in the demand curve. The savings so secured should be passed on to the consumer. To illustrate the advantages which can be derived by an equalization of demand, let us make a rough analysis of the costs of operation of a typical plant such as now is in use in New Orleans. The total charge which is made to the customer may be divided into the following three classifications:

Demand cost at	$0.60 per M.c.f.
Customer cost at	.25 " "
Other operating cost	.45 " "
Total	$1.30

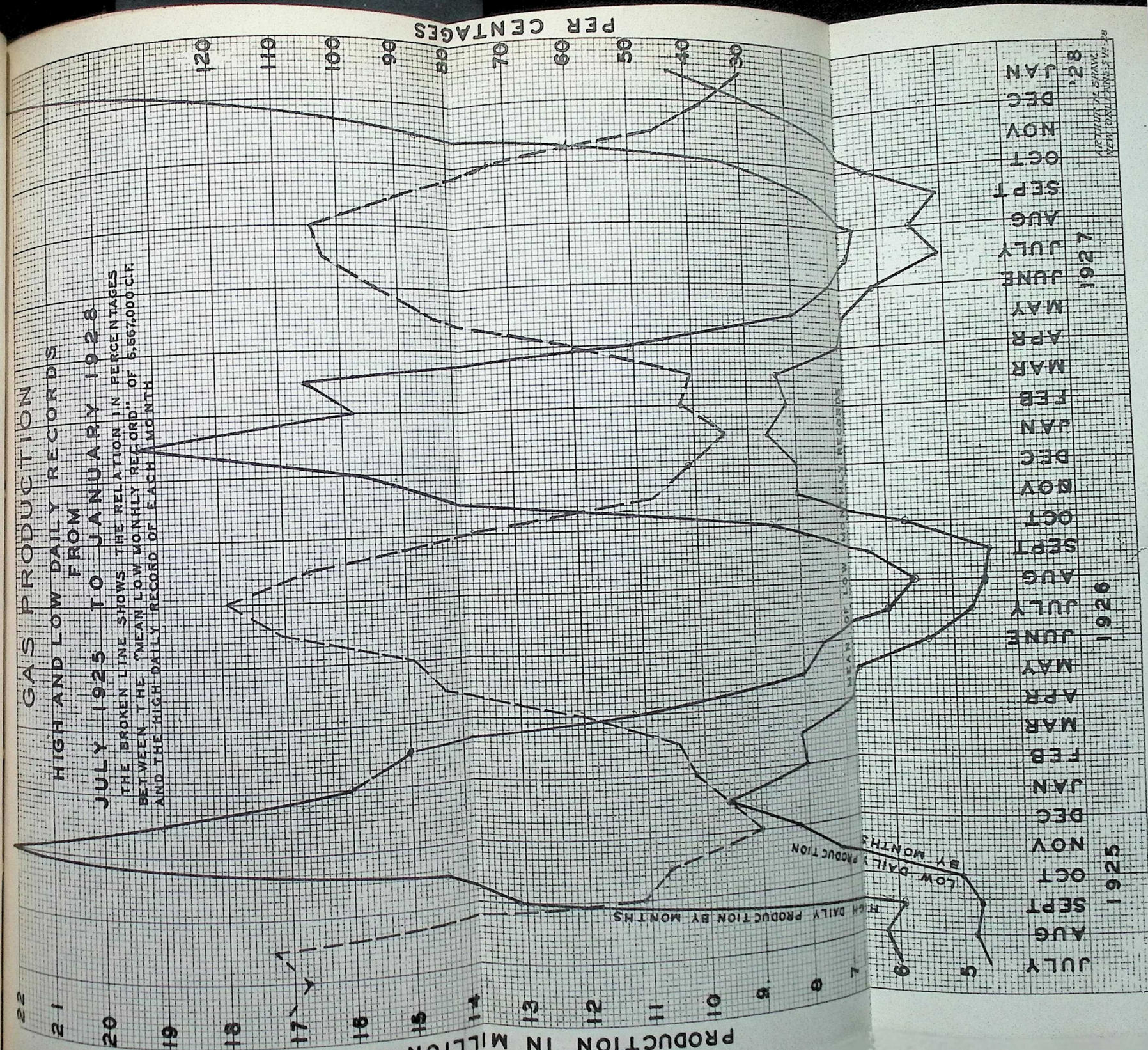
These sub-divisions have been made arbitrarily, without any attempt to conform to standard accounting classification but it is intended that the "Demand cost" shall include those items

of expense ordinarily included under "fixed charges" such as interest, taxes, reserve, allowed return on investment, etc. Under "Customer cost" has been placed only those items of expense which may be considered as directly attributable to the service rendered to the individual customer, such as meter reading and maintenance, customer bookkeeping, collections, etc. Not only is it difficult to come to a common agreement as to just what items should be included under "Customer cost" but it is not logical to state this in terms of cost per thousand feet of gas as it varies with the number of customers served rather than with the amount of commodity marketed, therefore it should serve as the basis for fixed service charge when such a charge is imposed. It is not intended to include any "readiness to serve" charge. The last item includes all remaining expenses.

Whether the rate to customers be $1.30 or 30c, provision must be made for each of these items of expense. This being the case, it is obvious that a flat rate, based on meter readings only, cannot be equitable to all users. For some unexplainable reason the public objects vociferously if anyone mentions a service charge, though I have never heard a sound argument presented against the principle. Considering the fact that some of the "Demand cost" might be considered as a part of the customer cost, a service charge of as much as one dollar per customer per month might be defended, though a fifty cent service charge would be more in line with other localities and will be assumed in the following.

On the basis of 1927 business, the gas company would have received, from a fifty cent service charge, a return of about $308,400.00. Deducting this from total sales would permit a commodity rate of $1.11 and would work out about as follows:

	Casual user	Average user	Large user
Assumed use per month (c.f.)	350	3,500	35,000
Service charge	$0.50	$0.50	$0.50
Commodity charge at $1.11	.39	3.89	38.85
Total monthly bill	$0.89	$4.39	$39.35
Under present system	$0.46	$4.55	$45.50



The line of cleavage between those who would be benefitted and those penalized by this two part rate would be in the 2½ M.c.f. per month zone, the net bill being $3.25.

A small error is contained in the foregoing as it disregards that small number (already mentioned) whose monthly consumption is great enough to secure for them a slight reduction in rate. Nearly fifty per cent of the 1927 bills were for less than two M.c.f., but this does not mean that the two part rate would work a hardship on the family of moderate means, for the reason that in a family where the most of the meals are prepared at home and the wife does the family washing, the necessary consumption of gas is great enough to enter the favored zone. The really small monthly bills are caused by the bunsen burner in the dentist's and doctor's office, the cigar lighter, and the flat dwelling citizen who prepares only an occasional meal at home and whose most important culinary implement is the can opener.

While the two part rate is a move in the right direction, a more nearly equitable distribution of cost can be secured by an adjusted commodity rate which will tend to stabilize the rate of consumption and thus reduce the excessive plant investment now necessary to meet occasional peak demands. This will result in the three part rate, which would reduce the cost of gas to the normal user and place the extra burden where it belongs, on the erratic users who are responsible for a considerable portion of the total cost of gas. An examination of the accompanying charts will show that there is a great variation in the daily and the seasonable demands. Whether the New Orleans of the future is to be furnished with its gas by the company now operating or by a new interest, bringing in natural gas, provision must be made by any adult company to meet peak load conditions. The farther this peak leaves the normal curve, the greater will be plant investment and the "Demand Cost." I have used the term "adult company" for the reason that it is common, and usually justified, for a newly created project to provide considerable plant capacity for future growth and during the time that it requires to build the business up to the provided capacity, extra efforts are made

to increase consumption, with only moderate attention given to peak loads. As demand approaches plant capacity, however, the high peaks begin to cause worry and sleepless nights for those who are responsible to the public for service and to stockholders for dividends. Well in advance of reaching this point, consideration should be given (both by the company and the consumer) to an adjustment of rates which will place the "flat demand curve" customer in a favored position as compared with the casual and erratic user.

The excessive use of gas during cold weather, as indicated by the charts, points unmistakably to the fact that we are using gas on a large scale for space heating. This means that the people of New Orleaens have permitted themselves to drift into a practice which is unsafe, wasteful and unfair to the normal user.

Paying our respects to each of these indictments in the order given, we have only to mention the evil effects on health resulting from a continued stay in a room heated by an open flame gas burner which is not adjusted to insure full combustion. An additional hazard will be introduced with the use of natural gas.

As regards the uneconomical use of gas, I believe that the statement will be borne out by the facts that, with the possible exception of bath rooms and other small spaces which are required to be heated only intermittently and for short periods of time, space heating by gas which is sold at any ordinary domestic rate is an economic impossibility. This will hold true even with natural gas delivered to the residence at the lowest price that any reasoning individual may believe possible in New Orleans. We have permitted ourselves to drift into this situation by reason of ignorance, or by mental inertia, or a willingness to pay more for a convenience than it is worth, or by chicanery on the part of builders of cheap bungalows; or possibly the cause is a combination of these.

The following is hazarded as a statement of the limits of the economical uses of gas in a household of moderate size and depending on a modest income for its support:

Economically Justified.	Cooking. Heating water. Family laundry during warm weather. Intermittent, short-time heating of small rooms.
Not Justified.	Space heating (except as above specified) either by separate units or by furnace.

It must be admitted that gas has advantages as a household fuel which do not appear in an analysis of its cost on a b.t.u. basis (such as cleanliness, ease of manipulation, low cost of equipment, no storage provision required and the fact that you do not pay the bill until service is rendered) but even the total of these advantages must be very appealing if the family budget is consulted. With 14.000 b.t.u. coal retailing at $12.00 per ton, a million b.t.u's. can be purchased for 43c, while with gas at $1.30, a similar amount of heat units will cost $2.17.

For further comparison, assume natural gas delivered at an average net price of 80c per M.c.f. and containing 950 b.t.u. per cubic foot. One million heat units then will cost 84c. (I understand that a syndicate has proposed, informally, to supply customers with natural gas at 65c with a service charge of 50c. With an average consumption of 3.5 M.c.f. per month this would be:

$$50c + (3.5 \times 65c) = \$2.78, \text{ or } 80c \text{ per M.c.f.}).$$

For brevity, coal only has been used for the purpose of comparison with gas though it is probable that under some conditions oil as fuel would show even greater economy in house heating.

Coming now to the third indictment, the unfair burden which is placed on the normal user of gas, we already have paid our respects to the small user parasite who, without deliberate effort, or even knowledge in many cases, gets something for nothing (or less) under our archaic method of rate fixing. The following figures will assist in illustrating the point which I am attempting to make:

Round Figures Based on 1927 Records.

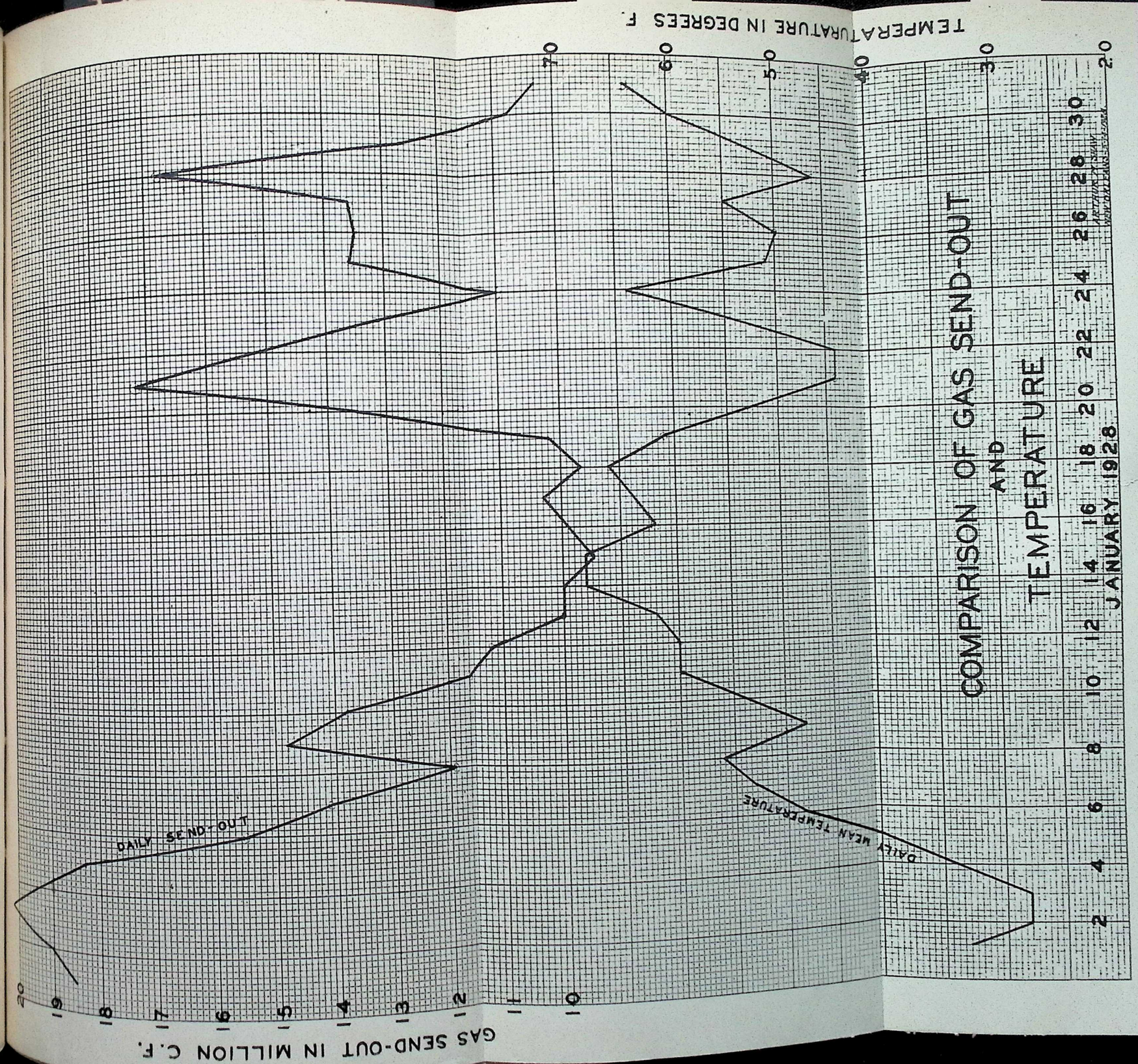
RESIDENTIAL BUSINESS ONLY.

Total monthly bills rendered	616,800
Gas sold, in M.c.f.	2,158,000
Average number of consumers	51,400
Average consumption per month	3.5 M.c.f.

	Number	% of Total
Consumers using less than the average	39,000	75.4
Consumers using less than 1 M.c.f.	9,000	17.4
Consumers using less than 200 C.f.	810	1.6
Monthly net bill for 200 C f.	$0.26	
Average monthly consumption of the low 50% (in number) of users	1.33 M.c.f.	
Average net bill of low 50% of users	1.73	
No. of consumers with net bill under $1.00		6000
No. of consumers with net bill under 50c		2300
No. of consumers with net bill under 25c		800

Considering that the actual "Customer Cost" as previously defined is variously estimated at from 40c to $1.00 and that 50c per month may be considered as a conservative estimate of what would be saved to the gas company if these small users were eliminated, we see that there are 2300 users in New Orleans who not only are getting their gas free but the rest of us are paying a considerable portion of the cost of keeping their names on the service list. By again referring to the chart showing the major fluctuations from July, 1925, to January, 1928, you will see that for seven months of the year (April to October incl.) the maximum demand of any one day is less than one-half the maximum demand on a really cold winter day, while the line which I have drawn as the "mean of low monthly records" and which might be considered as not far from a normal demand curve if space heating were eliminated, shows a daily demand of 6⅔ million c.f. per day, less than one-third of the maximum winter day demand. It does not require the services of an efficiency expert to show us "where we are at" under such conditions.

As has already been stated, it is economically practicable to supply storage capacity and excess pipe facilities to care for ordinary hourly fluctuations but it requires an unreason-



able investment to be prepared to serve as widely varying a seasonal demand as has been shown to exist in the New Orleans gas industry. In the preparation of this paper, an effort was made to reduce this additional plant and demand cost to actual cost to the consumer but it was soon found that this would lead to an additional lengthy discussion, so this interesting phase of the question will be left to some one who is better equipped to gather and interpret the details. From what has already been given, however, it is obvious that with a more nearly uniform demand, gas could have been furnished to customers at a substantially lower price in the past, and that in the future, this same desirable result may be obtained if we can lower the high peaks and thus make our present excess of plant capacity available for future normal increase.

Any attempt to impose a three part rate will result in a great storm of protest by those unthinking persons who will say that it is just another nefarious plan to raise their rates, but if such a rate is worked out with due consideration for the logical user and for the broader principles of economics, it should be given the support of every individual possessing brain capacity which will enable him to solve a very simple problem in arithmetic.

I shall close this paper with the parable of the two fishermen:

They had gone far down the bayou, early in the morning, to catch some fish, but luck had been against them and they started paddling home. After a long pull, they decided to try for just one or two little croakers; so, pushing up to the shady bank, they stuck their paddles into the mud to hold the pirogue in place and cast out their lines. Everything was so peaceful that they soon fell asleep and, as they slept, the tide changed and carried them gently toward the gulf. As the sun descended, the mosquitoes came out and one of them, with a well placed prod, awoke Pierre, who raised his head and looked around. Worried by the unfamiliar surroundings, he poked his companion and called: "Baptiste! Baptiste! We no here any more." Batiste woke up and when his eyes finally lighted on a familiar land mark, he replied: "By dam! We five miles from here!"

My fondest hope is that this effort may be like unto that of the lowly mosquito and waken the people of New Orleeans that "We no here any more," in fact, five miles may be a conservative estimate of the distance that we are "from here."

DISCUSSION

MR. PORTER: This paper by Col. Shaw will give the opportunity for a number of you to say something and I am going to throw this meeting open for those who wish to say something first. If by any chance the discussion should drag, I might point my finger at somebody, but I will give all an open shot at it first.

There have been a number of reports written on the gas situation in New Orleans. There has been a great deal of material in the papers on different phases of it, but there has been very little said along the lines that Col. Shaw has brought out in his paper, facts that are pertinent to any study, discussion and ultimate solution of the whole problem. There is no doubt but that the question of the economic use of gas is a very vital factor in determining a method of charging for gas, no matter what your base conditions may be.

MR. IRELAND: The great service that Col. Shaw has done tonight is to bring out a fact that is easily lost sight of; namely, that in the sale of natural gas, as with any other commodity, the selling price must ultimately be brought into close alignment with the cost.

We must all realize now, whether we did before or not, that a fixed rate per thousand cubic feet for natural gas in New Orleans does not bear very much relationship to cost. The same is true for any other place, but it is particularly true for New Orleans where, owing to climatic conditions which obtain in a narrow belt along the Gulf Coast, and almost nowhere else in the United States, we have very short and very mild winters with only a few cold days on which any great amount of gas or other fuel is required for space heating. On each of these few cold days the gas used per consumer is as great as in cities much further north, but, unlike these more northern places, we have no prolonged cold periods in which gas is used steadily for heating. As a consequence of the high demands on occasional cold days

and the very small annual use of gas for heating, the annual load factor of the domestic gas sold in New Orleans is already very low, and may be expected to be much lower when natural gas is distributed. You are all familiar with the term "degree-day", and the extreme difficulties surrounding the furnishing of gas for heating in New Orleans can best be illustrated by comparing the annual "degree-days" for New Orleans with those for other cities having about the same maximum day's use of gas per consumer as New Orleans:

(American Gas Association)

City	Annual Degrees Days
Birmingham	2527
Little Rock	2861
Shreveport	2097
Meridian	2527
Nashville	3550
Dallas	2455
New Orleans	1044

The chart which Col. Shaw has placed on the board illustrates very clearly the cause of the "high bills" concerning which there was considerable talk last winter. You can see quite plainly how the daily use of gas depends directly on the temperature, and how when the temperature went down the use of gas went up, and vice versa. It is something which it is difficult for all our friends to believe, but true nevertheless. Unfortunately, when we can so simply and easily obtain the use of a commodity like gas, we are prone to forget or to fail to realize how much of it we have used until the bill arrives; it is very difficult in that respect from other commodities which must be specially ordered every time they are required, and where value is therefore much more impressed upon the mind.

Col. Shaw has excellent authority back of him when he advocates the system of rate-making which he does, a system which would place on the consumers who create a condition such as the use of gas for space-heating in New Orleans the obligation to pay the costs brought about by the condition.

The National Association of Railroad and Utilities Commissioners, composed of members of all regulatory commissions in

the country, in annual convention at Dallas, Oct. 20, 1927, received and ordered made part of its Proceedings the annual report of its standing committee on Public Utility Rates, heartily approving "methods of charges for gas based on allocation of costs of service, so as to permit the gas industry of the country to develop its maximum possibilities in more extensive and more economical service to the public." This report relates so closely to the ideas so well developed by Col. Shaw that perhaps you will excuse the reading of a few extracts.

> "The use of gas rates based on the principles of allocated cost has increased until to-day we have- according to the latest rate list, some 516 schedules effective in 43 states based on fixed charge principles of rate making. Only one year prior the number of such schedules was 297 in 39 states."

> For many years, practically all gas companies had a stated charge for each measured unit, regardless of the amount of consumption by the individual customer. In days when the sole use for gas was for lighting, this form was adequate and produced no serious inequalities. In more recent years, however, the uses of gas service have expanded tremendously, in nature and in volume; and the ancient form of rate has become unsuited and inadequate, although progress to a sounder basis has been made slowly and with difficulty."

> "Gas companies have pointed out, for years past, that a varyingly large majority of their consumers are served at an actual loss (i. e., at less than operating costs), and this situation places undue burdens upon substantial users, obstructs community prosperity by enhancing the cost of fuels for industries, and retards development of the possibilities of the gas business itself, which could be better realized with forms of rates designed to attract new large consumers in competition with other fuels."

> "It seems to your committee that constructive and statesmanlike regulation demands that the Commission should aid in every way possible, through encouragement of reasonable and businesslike forms of rates, the full development of public utilities in their service to the people. Nothing could put state regulation on a more useful and firmer basis."

"A. The Underlying Principles:

The expenses and fixed costs incident to operating a gas company may be classified into three groups:

1. Customer Costs.
2. Demand Costs.
3. Commodity Costs.

The first group consists of the various items of expenses and fixed costs which are practically the same for each customer, no matter whether he uses a large amount of gas or only a few hundred feet. Included in this group are the expenses of reading, removing and repairing meters, bookkeeping, billing, collecting and other office expenses, together with the fixed charges on a part of the investment of the company.

The second group contains those expenses and fixed costs which vary according to the maximum hourly or 24 hour use of gas. This group includes almost all of the remaining fixed costs, other than those already included under customer costs.

The commodity costs, which make up the third group, consist of coal, oil and other supplies and those labor and expense items which vary directly with the amount of gas produced."

"With a straight meter rate of so much per thousand cubic feet, about one-third of the customers of a gas company are served at a loss, in that they fail to pay the bare operating expenses chargeable against them, without consideration of any return on the investment. For instance, on a rate of $1.50 per thousand cubic feet, a customer who uses only 500 cubic feet in a month will pay 75 cents. The customer cost to serve this customer will be more than $1.00 per month, the minimum demand cost will be more than 50 cents and the commodity cost will be about 20 or 30 cents. This makes a total of more than $1.70 with which the customer should be charged if he is to pay a full fair return upon the investment necessary to serve him. He therefore lacks more than $1.00 per month of paying his way; which dollar or more must be made up by some other customer if the company is to make a fair return.

There is another approximate one-third of the customers who, while paying the operating costs necessary to serve them, do not pay full fair return. The remaining third of the customers not only pay all of their own costs, but if the company is receiving a fair return, this

group must also pay all of the losses incident to serving the other two-thirds of the customers. For example, in a recent case, an official of a large company testified that one group of his customers not only paid their own way, including a full fair return, but contributed three million dollars a year in order to make up the deficits caused by other customes."

"Three Part Rate Fairest:

Except for one consideration (that it tends to increase the bills of all casual and irregular or "convenience" customers), the three-part rate shown in the last three columns of the above table immediately becomes apparent as the fairest, most accurate and most equitable of the rates shown. It comes closest to charging each customer with the cost of serving him. It appears to be as accurate as is possible without the expense of additional meters to actually measure or limit the demand."

"There remains for comment the first point mentioned above, the increase to the small customers, as a talking point against the installation of rates embodying the three-cost principles. The small customer is often referred to as the poor man. Such is not commonly the case. It should not require any detailed examination or calculation to convince anyone that the workingman or clerk, whose wife cooks meals for a good sized family, whose laundry is done at home and who cannot afford to eat out at restaurants, is naturally a larger user of gas than the well-to-do man who lives in a high priced apartment, where heat and hot water are furnished by the landlord, where few meals are cooked and where there is little use for gas except as an occasional convenience. Technically speaking, we should not take into consideration the financial condition of the customers in determining gas rates and charges. However, even if this is done, we are forced to conclude that there is no reason why the small convenience user should not be asked to pay his own way, rather than remain a burden upon the customer who really uses gas service. The three-part rate can well be stated as the best rate for the poor man."

"Your committee, while not recommending to regulatory commissions or to gas companies any rigid uniformity or standardized method of rates and charges for gas, which should remain a matter for the best busi-

ness judgment in each individual case in accordance with the local situation, does, however, heartily approve methods of charges for gas based on allocation of costs of service, so as to permit the gas industry of the country to develop its maximum possibilities in more extensive and more economical service to the public.''

Now, in applying the principles of cost allocation to the making of gas rates in New Orleans, it will be found that an excessively large proportion of the costs are occasioned by the consumers who use gas for space heating, not by reason of any intent or knowledge on their part, of course, on account of the reasons previously discussed. You can see what a serious problem would be faced by a manufacturer, for instance, if half his production and distribution facilities were idle for eleven months in the year, and yet that is the position in which the gas utility in New Orleans is placed. And so the equitable course is to follow the methods advocated so well by Col. Shaw, and to place these space heating costs on the users of gas for space heating. This would result in a domestic rate made up of, for example:

(a) a demand charge;
(b) a commodity charge of a fixed rate per M.C.F. for all consumption up to the average number of M.C.F. used for cooking and water-heating;
(c) a commodity charge of a much higher rate per M.C.F. for all excess consumption over that in (b), this excess being composed of gas used for space heating.

A rate of this type would permit of considerably lower rates to the consistent, all-year-round user of gas for cooking and water heating, and would place on the shoulders of the seasonal consumer of gas for space heating the costs which he occasions.

The introduction of natural gas will only accentuate the present condition, by reason of the fact that the sales of gas for cooking and water heating will decline on account of the greater thermal value of the natural gas, while the daily demand for gas for space heating on the few cold days in winter will mount by virtue of the greater amount of comfort attainable for the same money, even with an equality of rates per M.C.F. It is therefore entirely clear that sooner or later an alignment of ''price'' with ''cost'' must be made, and that this alignment must

inevitably bring the price of gas for space heating to a level much higher than the price for cooking and water heating.

PROF. GREGORY: Mr. President, I simply want to express my admiration for the paper which I think very valuable. Those of us who have had something to do with gas investigations have seen these points, possibly not as well and as clear as Col. Shaw. He has brought the matter to our attention in a very concise and very masterly way.

PROF. WILLIAMSON: Mr. President, I want to compliment Mr. Shaw's paper. As Prof. Gregory has said, he has covered his subject in a very masterly way, and I cannot add anything to it.

The line of investigation that Prof. Gregory and I followed did not cover rate making, so I am not prepared to say anything about that.

MR. TODD: I would like to ask Col. Shaw whether the temperatures recorded here are low temperatures or mean temperatures?

COL. SHAW: Those are supposed to be the mean daily temperatures.

While I am on my feet, I want to take occasion, as I should have done before, to express my appreciation of the assistance which I got from Mr. Ireland''s office. From the nature of the paper you can readily see that the gas company had nothing to do with its inception or preparation, though they did kindly furnish me with statistical data.

I also want to say that I thought I had conceived a wonderful, brilliant and entirely original idea in the three-part rate. I knew of course of the two-part rate, but I thought nobody had figured on the three-part rate. Darned if they didn't show me they had figured on that also and it was already in effect in some communities.

DR. WINSHIP: It seems to me you prepared a report a long time ago, Mr. Chairman. I would like to hear you talk.

MR. PORTER: I have already recused myself.

MR. RIESS: I am forced to say something, Mr. President. You are responsible for my appointment to represent this Society to serve on the Natural Gas Committee. As I told you at

the time I accepted the appointment, I did so very reluctantly and all I could offer was a little common sense, possibly tempered by a little technical training and a little technical knowledge. I am openminded in approaching any discussion on the gas problem. To date the committee has had only one meeting. At that meeting discussions were very general, and as far as it has gone, it has forced me to the conclusion that the problem is as much a legal one as an engineering one.

Before we can do much on the gas situation, our legal friends have to be consulted. Just how the committee should advise our Commission Council can be determined only after a full discussion of the problem.

Approaching the question in a broad way, we are to determine whether the present Public Service should serve the city or whether some arrangement should be consummated with outsiders. Just what will be decided I cannot as yet predict. I do know that the legal side is probably as important as the engineering side.

As I stated, the initial study would have to be legal to determine the relationship of the city to the Public Service, and then we can act properly in an effort to satisfy the users of gas in the City of New Orleaens.

I am not very optimistic as to the probability of any great change in the gas rate in the city. I believe there will be a scaling downward, but I believe there will be a disappointment when it is found we will not get gas as cheaply as the nearby cities that we are in competition with.

DR. WINSHIP: Mr. President, has Mr. Ireland or Mr. Shaw, either made an investigation as to what uses may develop for gas that would tend toward the constant use of it?

MR. PORTER: I was hoping you would say something along that line. You have been handling competitive fuel for some years.

DR. WINSHIP: I have not studied gas.

COL. SHAW: Any plan looking toward a lowering of our gas rates must, as I see it, include a consideration of some method of flattening the demand curve. I did work out, quite in detail, a plan which I believe would tend to flatten this curve but the plan was in such an embryonic state that I did not feel justified in placing it on paper. I think any plan that would compel this space heating user to assume all costs resulting from his erratic demands, would tend to flatten the curve.

PROF. WILLIAMSON: Don't you think to bring about a betterment of conditions in regard to domestic consumption we would have to do something to build up the industrial demand for gas?

COL. SHAW: The intent of this paper throughout was to discuss only the gas problem as it affects, and is affected by, the domestic user. Some of the points discussed are common to both domestic and industrial uses, but the latter is such a distinct problem that no effort was made to discuss it at this time. It is obvious that a great increase in industrial use of gas will tend to obliterate the high peaks resulting from domestic use. The new demand will have peaks of its own, though these probably would not synchronize with the domestic peaks. In considering the effect on the situation as a whole however, we should guard against the economic fallacy of charging indirectly some of the cost of serving residential users to the industries. If New Orleans were essentially and primarily an industrial center and if gas could be furnished to industries at a price leaving a wide margin between it and competitive fuels, then we might consider a rate adjustment which would discriminate in favor of the residential user. Such is far from the case, however. Industries have played a minor part in the past in the development of New Orleans, and we are only beginning to open this field for growth and improvement. If gas can be offered to industries at the lowest price at which it can be delivered, it should be a real competitor in the local fuel market and should be a factor in our industrial development, but if saddled with charges not forming a part of the cost of deliv-

ery, then it will be used only by certain specialized industries and will not assist in the commercial development of the city.

Again returning to "the man on the street," we all have heard expressions about like this: "Gas should be sold at the same price to residences as to industries. A cubic foot costs the same to make, no matter where it goes, and the pipes are there anyway, so why should there be a difference in price?" One might as reasonably claim that letters should be handled from Birmingham to New Orleans on the same unit weight basis as carload shipments of coal.

Of course the theoretically correct way would be to apply the same method used in marketing our electrical energy in a wholesale way, having the record made so that the rate could be adjusted to fit both the amount and the characteristics of the demand.

While it would not be practicable to apply this method in exact parallel to the domestic user of gas, it strikes me that there might be devised a plan which would approximate the idea.

If any change from our present system is to be made, we should not stop at the service charge, but put into effect a full three-part rate. My "embryonic idea" already mentioned was somewhat as follows:

Assume a base rate, which would be the maximum domestic rate, which for convenience we will assume to be $1.20 per M. c. f. Each customer would be billed monthly on this basis, with an additional monthly service charge of say 50 cents. At the end of some certain period, preferably a year, the monthly consumption, as shown by meter records, would be reviewed and a refund paid to those customers whose records were within the predetermined minimum range of variation. These customers would be paid the maximum percentage refund. Various other classes could be determined to whom refund in a decreasing scale of percentage would be paid. This refund

percentage would bear no relation to the total amount of gas used but would be controlled entirely by the characteristics of use as evidenced by the meter readings. This would entail some additional bookkeeping, but I believe a plan could be worked out which would not result in an undue addition to the clerical work of the industry.

If feasible, the plan would be of especial advantage to the really poor family in which the wife does her own work. If properly informed, she would be able to maintain almost an ideal demand curve, thus securing the lowest possible net rate. For instance, she would be advised that it takes more gas to cook a meal and to heat the bath water in winter than in summer. Knowing this, and also because it will help heat the rest of the house, she makes a fire in the coal stove on the very coldest days of winter, thus helping to cut down the peak demand. Even at the existing rate, gas undoubtedly is cheaper (as well as infinitely more convenient) than coal for short time, limited culinary operations if no credit can be claimed for the surplus heat radiated by the coal stove, but with economic conditions under which the extra radiation may be useful, the coal stove well may be preserved for special cases.

During the building boom of a few years ago, any number of small, cheap houses of the bungalow type were constructed with no flues or other provision for heating beyond the piping of gas to each room. In such residences, the renter is compelled to use gas for heating, even though he is in no position to incur such an extravagance.

A novel condition exists in Louisville, Ky., where a penalty is imposed on the large user. They depend on natural gas, and even when I lived there over twenty years ago, it was difficult to get sufficient gas in the residences during cold days. At present, a sliding scale of rates is used the larger user paying the higher rate.

MR. WEIL: Is that in proportion to the size of the house?

COL. SHAW: I am not sure whether the size of the house is considered or not, but the published rate indicates that the sliding scale is based only on the amount used.

MR. WEIL: Suppose they go away in the summer and don't use any?

COL. SHAW: The sliding scale applies only during the winter months when it is important that the residential use be curtailed as much as practicable.

MR. ANDERSON: I must confess to some confusion in my own mind as to the attitude of the paper with reference to the use of gas for space heating. In our household economy, as well as in the industries, we all know that the most expensive single item is labor. This fact, coupled with consideration of cleanliness and convenience, accounts for the very extensive growth of automatic and electrically operated household devices, such as oil-heating furnaces, mechanical refrigeration, etc. I feel sure that one of the chief reasons back of the demand on the part of the public for bringing natural gas to this city has been the feeling that it would afford a clean, convenient and *cheap* fuel for heating purposes, such as appears to be the case in a number of other cities.

And when I refer to heating, I do not mean heating by devices which discharge the product of combustion into the room, but I refer to the use of gas as a fuel for our furnaces or for other methods of central heating.

The point as made by Col. Shaw appears to be that space heating has all the characteristics of a very undesirable kind of load, but it seems to me that, in this city and with our peculiar climate, space heating is the one thing above all others almost for which we desire to use a convenient fuel-like gas.

COL. SHAW: My idea would not be to prohibit the use of gas for space heating but to adjust the rates so that this use of the fuel would carry its just proportion and thus reduce the financial load now carried by the normal user. For the fellow who can afford gas as a space heating fuel,—let him have it—at a proper price.

If we were to shut off gas absolutely and abruptly from all space heating, it undoubtedly would result in a large part of the present gas plant lying idle for twelve instead of eleven months of the year, though I doubt if the application of a rational three-part rate would have this effect. Some would continue to use gas for space heating in spite of the high rate, and others would require some time in which to adjust themselves to the new condition. During this period of transition, some elements of the plant doubtless would be discarded on account of obsolescence, while others would be required for full time operation as the result of the normal increase of demand caused by general growth. New Orleans is not going to stop where it is. It will be able to absorb any surplus that may be available and within a reasonable time. In other words, the adjustment would be almost automatic and would not work a hardship either on the vendor or the consumer.

PROF. WILLIAMSON: Mr. Chairman, I would like to ask a question. I think there are enough Public Utility men here to answer this question. I would like some Public Utility man who knows the figures, to give us the itemized cost for fuel per thousand cubic feet, cost of manufacture, cost of distribution to the consumer, etc.

MR. IRELAND: I have not those figures with me, but perhaps can come close to what you want in a little different way.

The annual fixed charges are made up of 7½% allowable return on the investment, 3.3% taxes, and 4% for renewals and replacements, or a total of 15% in round figures. If this percentage is applied to the gas rate of thirteen and a half million dollars and the result divided by the number of consumers, approximately 68,000, you will find that the fixed charges amount to about $2.50 per month. If every consumer paid a service charge of $2.50 per month, it would then be possible to sell manufactured gas at about fifty-five cents per M.C.F.

The control of the use of gas for space heating has been discussed. There are two ways of looking at this; one, the devising of some means of keeping these excessive demands under control, and the other to allow the consumer to use whatever he

wants, so long as he knows the cost and is willing to pay for it. The second way seems better, except for the extreme difficulty of convincing the space-heating consumer as to the magnitude of the costs which he occasions. Mechanical devices to control the demand of gas for heating have been tried in Kansas and perhaps elsewhere, but it seems better public policy to let the consumer have what he wants provided he understands and is willing to pay the cost. We must always come back to the economic truth that sooner or later the "price" must be brought into line with the "cost," and therein lies the value of the form of rate recommended by Col. Shaw.

PROF. WILLIAMSON: My reasons for asking that question have been brought out in the points just made by Mr. Ireland. I have often wondered what would happen if we could have a plant devised by which there would be an increased consumption of gas by the industries, and thus help to keep down the peak of the load on these cold days. Whether we bring natural gas to the City of New Orleans, or whether we continue to use manufactured gas, on the basis of our present consumption there will be certain costs which cannot be lowered to any appreciable extent. It seems to me we must look to the development of a large industrial demand for gas before the household consumer may expect to secure any substantial reduction in his bills. Professor Anderson spoke of the question of the cost of labor in connection with household economy, and that is a point which should be emphasized. Natural gas as a fuel for firing home heating plants is used quite extensively in places where the natural product is available. If it could be secured at a reasonable price many persons would be willing to pay more for the gas than for other fuels, on account of the convenience and great saving of labor.

COL. SHAW: I think Prof. Williamson's idea is right. Without large industrial users to form a market, it would obviously be impracticable to bring natural gas to New Orleans and retail it at anything like the prices which have been proposed. If an industrial market on a reasonable scale exists, or can be created, I believe that our chances of getting natural gas for New Orleans are good, but without such a market, the outlook does not appear to be very promising.

MR. PORTER: I would just like to say that the three-part rate as mentioned by Mr. Ireland, was used, and I believe still is to some extent in Kansas. I think the Doherty interests were the first to make a study and make recommendations and put into effect the three-part rate.

There has been practically a three-part rate in use in electricity in a great many places. They have taken the load factor and connected load in electricity to form a demand charge.

In water rate structures of the Sewerage & Water Board they have always used what we call a modified three-part rate that has two items of charge, one a service charge, and the other a charge per thousand gallons of water, but that service charge varies with the size of the meter, so the service charge is partly a service charge and partly a demand charge.

MINUTES OF MEETING AND BUSINESS OF THE SOCIETY

Minutes of Special Meeting, Board of Direction, May 1, 1928.

The meeting was called to order about 12:10 p. m. with Prof. F. H. Fox, Vice-President, in the chair, and the following members were present: Messrs. Porter, Meunch, Todd and Muth.

Mr. Porter recused himself and Prof. Fox acted as Chairman.

Letter of April 26th from the Mayor of the City of New Orleans, requesting that the Society appoint a representative to confer with the Commission Council on the natural gas situation, was read.

On motion of F. A. Muth, seconded by Mr. C. G. Meunch, it was voted that the Board appoint Mr. John L. Porter representative of the Society.

There being no further business, the meeting adjourned.

Yours very truly,

F. A. MUTH, Secretary.

Minutes of the Special Meeting of the Board of Direction, May 5, 1928.

Referring to the minutes of the special meeting of the Board of May 1, 1928, the various members of the Board were advised that Mr. John L. Porter, who had been appointed by the Board as representative on the Committee of Fifteen to study the natural gas situation, reported that he felt his duties were such that he could not give the proper attention to the work of this committee. He requested that the Board appoint someone else in his place. All members of the Board were canvassed by telephone and it was unanimously agreed that the President of the Society make the appointment. Therefore, Mr. John Riess was appointed by President Porter.

F. A. MUTH, Secretary.

Minutes of Board of Direction, May 14, 1928.

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

The minutes of the previous meeting were read and approved and bills on hand were ordered paid, including bill for premium on insurance on library.

Letter relative to the American Engineering Congress to be held in Tokio in 1929 was read and the Secretary was instructed to reply.

The matter of the new Code of Criminal Procedure was taken up, and on motion duly seconded, the following resolution was adopted:

"RESOLVED, That it is the sense of the Board of Direction of the Louisiana Engineering Society, that there should be a revision

of the criminal procedure in the State of Louisiana, and that the efforts of the Commission on the Code of Crimnial Procedure are hereby endorsed.''

The matter of the outing to Gulfport was taken up by Mr. W. B. Moses, chairman of the Committee on Entertainment and Outings, and on motion duly seconded, it was voted that if in the opinion of this committee sufficient favorable responses were not received, he was authorized to notify the membership that the outing would be called off.

There being no further business, the meeting adjourned.

F. A. MUTH, Secretary.

Minutes of the Society, May 14, 1928.

The meeting was called to order about 8:15 p. m., John L. Porter, President, in the chair, F. A. Muth, Secretary, and 87 members and guests present.

The minutes of the previous meeting were read and approved.

The usual monthly report of the Committee on Employment was submitted; also the report of the Committee on Entertainment and Outings. Members were advised that unless sufficient responses were received, the outing to Gulfport would not be held.

The technical exercises of the evening consisted of a splendid paper on New Orleans and its Gas, by Col. A. M. Shaw. This was followed by considerable interesting discussion. A rising vote of thanks was then tendered the speaker.

There being no further business, the meeting adjourned to the usual collation.

F. A. MUTH, Secretary.

The Proceedings of the Louisiana Engineering Society

Published bi-monthly, February, April, June, August, October, December, under the auspices of the Committee on Publication.

DOUGLAS ANDERSON, Editor.

The Louisiana Engineering Society is not responsible for any statement made or opinion expressed in this publication.

Subscription, $2.00 per annum Single copy, 35 cents

ADVERTISING RATES

	ONE YEAR	HALF YEAR	ONE ISSUE
Full page	$50.00	$28.00	$10.00
Half-page	28.00	15.00	6.00
Quarter-page	15.00	10.00	4.00
One-eighth page	10.00	6.00	2.00

For the back outside cover add 50 per cent to the above rates. For the inside covers add 25 per cent to the above rates.

Address all communications to
Douglas Anderson, Editor, Tulane University,
New Orleans, La.

Entered as second-class matter July 27, 1916, at the Post Office at New Orleans, Louisiana, under the Act of August 24, 1912.

Acceptance for mailing at special rate of postage provided for in section 1105, Act of October 3, 1917, authorized August 1, 1918.

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PROCEEDINGS
OF THE
LOUISIANA ENGINEERING SOCIETY

VOL. XIV. AUGUST, 1928 NO. 4

CONTENTS

EDITORIAL NOTES AND COMMENT: PAGE
The Gulf Coast Seawall 143
Action of Sea Water on Reinforced Concrete 144
PAPERS AND DISCUSSIONS:
The World's Longest Concrete Seawall. *By D. H. Shaw* 146
Discussion 151
Reinforced Concrete; Its Permanence and Protection with Relation to the Action of Sea Water. *By Lloyd G. Frost* 156
MINUTES OF MEETINGS AND BUSINESS OF THE SOCIETY 167

EDITORIAL NOTES AND COMMENT

The Gulf Coast Sea-wall. At the April meeting of the Society, Mr. H. D. Shaw, Chief Engineer of the Road Protection Commission of Harrison County, Mississippi, presented a motion picture showing the methods of construction of the reinforced concrete sea-wall which extends from the west end of Pass Christian to the east end of Biloxi.

Mr. Shaw's statement in connection with the motion picture, and the discussion thereupon, have just now become available for publication and are contained in this issue of the Proceedings.

This wall is 24 miles in length and is today the longest reinforced concrete sea-wall in existence. It is of the step type, having the general features but differing decidedly in certain details from the type known as the DeMuralt System, according to which system a wall of considerable length was built on the coast of Holland in 1905.

In co-operation with Col. A. M. Shaw as consulting engineer on the project, detailed studies were made of a similar type of sea-wall on the New Jersey coast. There were failures in this wall, the causes of which were determined quite definitely by Col. Shaw, and these causes were eliminated in the design prepared by Mr. Shaw.

The wall is of pleasing design and adds greatly to the appearance of the water front, as well as affording opportunity for further extension of landscaping and beautifying the shore line. Its chief function, however, is to protect the shore from the severe ravages of tropical storms which occur with a somewhat irregular periodicity along the Gulf Coast. In this respect the wall has yet to stand its crucial test.

Action of Sea Water on Reinforced Concrete. Some time ago Mr. Lloyd G. Frost, now Chief Bridge Designer for the New Jersey State Highway Commission, submitted for publication in the *Proceedings* a paper on the above subject. As it has been the policy of the Society to have papers read and discussed at one of the regular meetings before publication, this one was held in reserve with the hope that Mr. Frost might be able to present it in person. As this is not possible, the paper is being published in this issue.

Mr. Frost believes that not enough attention is given by engineers to the problem of the permanancy of reinforced concrete structures which are subjected to the direct action of sea water or to atmospheric conditions on account of the proximity of the structures to sea water, particularly in warm climates.

Atmospheric moisture near salt water causes corrosion and rapid destruction of unprotected iron and steel.

Cracks in reinforced concrete, which would permit such moisture to penetrate to the reinforcing steel, would bring about similar results. A number of causes which produce these cracks are presented and discussed. Overloading, as one of the causes, calls for the adoption of special methods in the design.

Cracks due to chemical disintegration may be prevented by the incorporation of certain substances in the concrete

mixture. Reinforcing steel should be galvanized to prevent corrosion. Certain portions of the structure should be given coats of paint or asphaltic cement.

This is a subject of interest and great importance to all engineers who have to do with the design and construction of such reinforced concrete structures.

It is hoped that discussions of Mr. Frost's paper may be submitted for publication in subsequent issues of the Proceedings.

PAPERS AND DISCUSSIONS

THE WORLD'S LONGEST CONCRETE SEA-WALL

By H. D. Shaw.

Read before the Society April 9, 1928

It is with profound appreciation that I appear before you this evening, as I realize that the honor of being invited to address this organization is not to be lightly esteemed. It has been a matter of some concern to me to decide just how to treat the subject that I am here to discuss. At first I conceived the idea of going through all the liteature and other data in my possession and giving a technical presentation of some of the problems involved in shore protection work, but I soon discovered that my ability to give a discussion of this nature is too limited; especially, in view of the fact that occasions of this kind are entirely too brief to make such an attempt of any appreciable value. I was also impressed with the belief that engineers generally get quite enough of technical details in their routine practice and it is, therefore, somewhat of a relief to them to hear discussions on engineering projects on the basis of the practical details and from what we might call a human-interest view-point. I have, therefore, decided to tell you the story of my work in the simplest possible manner and to follow that recital with the moving picture films and the lantern slides that I have provided; as I think that you will find in these pictures a very comprehensive and interesting presentation of the work that I have just completed. I feel also that these illustrations will tell the story much more effectively than any verbal discussion.

It would be interesting to review the story of man's efforts to prevent the erosion of shore lines and to retard the shifting of beaches, as such a story would reveal some wonderful demonstrations of genius; but would also portray a much larger assortment of crude and inefficient attempts. The fact is, the vast majority of cases where shore protection schemes have been carried on are characterized by either partial or total failure. To account for this regrettable record would necessitate a tedious

research through the history of the past several hundred years, and even such a research would be inaccurate and perhaps, to some extent, misleading. I am fully persuaded, however, that these failures, like many of the mistakes common to the engineering profession, have all served a very useful purpose because they have contributed to our experimental education. I would not have you get the impression that the engineering profession has not accomplished anything really worth while in its efforts to solve some of these great problems, as I could cite you many instances where creditable success has marked its endeavors. From the earliest records made in China about the year A. D. 25, on down through the centuries as civilization developed and men followed their natural desire to live upon the sea shores, the matter of coast protection has been of vital concern. I think it is proper here to mention that the longest sea-wall in the world was constructed by one of the provinces of China in the 9th century. This wall is 30 feet in height, 180 miles in length, and it stands today as a monument to the genius of that ancient people.

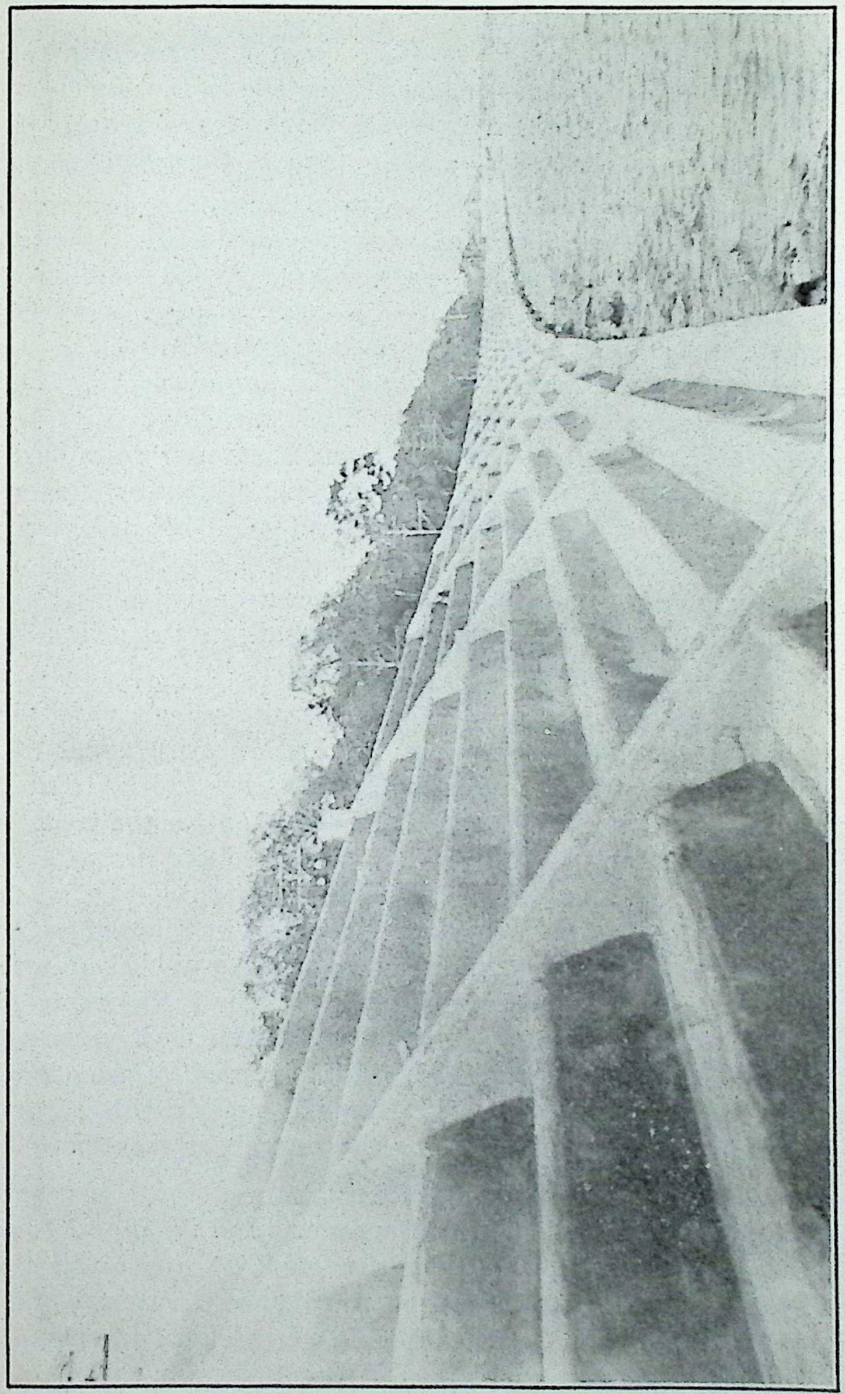
On the Mississippi Gulf Coast, particularly in Harrison County, the matter of protecting the shore line from the periodic encroachment of tidal waters, has been discussed for many years, and during the twenty-two years that I have been a resident there I have been deeply absorbed in the development of public sentiment as it was influenced by the recurring tropical storms and the resultant damage. While this sentiment gradually became favorable to some sort of protection, yet until a few years ago property values were not sufficient to make possible the tremendous cost of any efficient plan. The situation became acute, however, after the storm of 1915, when over fifty per cent. of the beach roadway, running from the west end of Pass Christian to the east end of Biloxi, was completely destroyed; and I well remember walking over a part of this district immediately after, and as I saw the disaster that had been wrought and the many miles of what had been a beautiful driveway stretching like a melancholy waste before me, I was deeply impressed, as it seemed that this situation might be considered a challange that the Lord had made to the people of the Mississippi Coast to

stir them into action. Human history is punctuated with monumental achievements that have sprung from great natural disasters.

As the effects of this calanity softened somewhat, our people made an attempt to take a forward step, with the result that a law was passed in 1915 by the State Legislature, by the provision of which we hoped to accomplish something. Engineers were employed and even contracts let, but it was found that the law was unconstitutional, which halted further activities for a considerable period. The entrance of the United States into the great World War operated to postpone further efforts, so that the whole roadway along the beach was re-built in a more or less temporary way.

In 1923 the economic conditions of the entire South had become such that the people of Mississippi Gulf Coast felt that the time was at hand when they should undertake this great problem in a much more serious and comprehensive way than had ever before been contemplated. A committee of leading citizens, including many of the best attorneys, was formed at a public mass meeting, and to this committee was given the duty of devising some legislation that would not only be constitutional, but would make the solution of this problem economically possible.

As a result of the work of this committee, a law was drafted and enacted by the Legislature of 1924 authorizing the Governor of the State to appoint a commission, and the county was authorized to issue bonds in sufficient amount to meet the cost, and these were to be liquidated from the income of the county's share of the State gasoline and motor license tax. The county was also given the right to impose an additional tax of its own to supplement this fund if necessary. The Road Protection Commission, which is commonly known as the Seawall Commission, was promptly appointed. They organized immediately and after conducting a hearing for a week or ten days with engineers from different sections of the country, I was fortunate enough to be given the appointment as designing and supervising engineer. At a later time, after the preliminary details had been worked out, the commission employed one of our distinguished

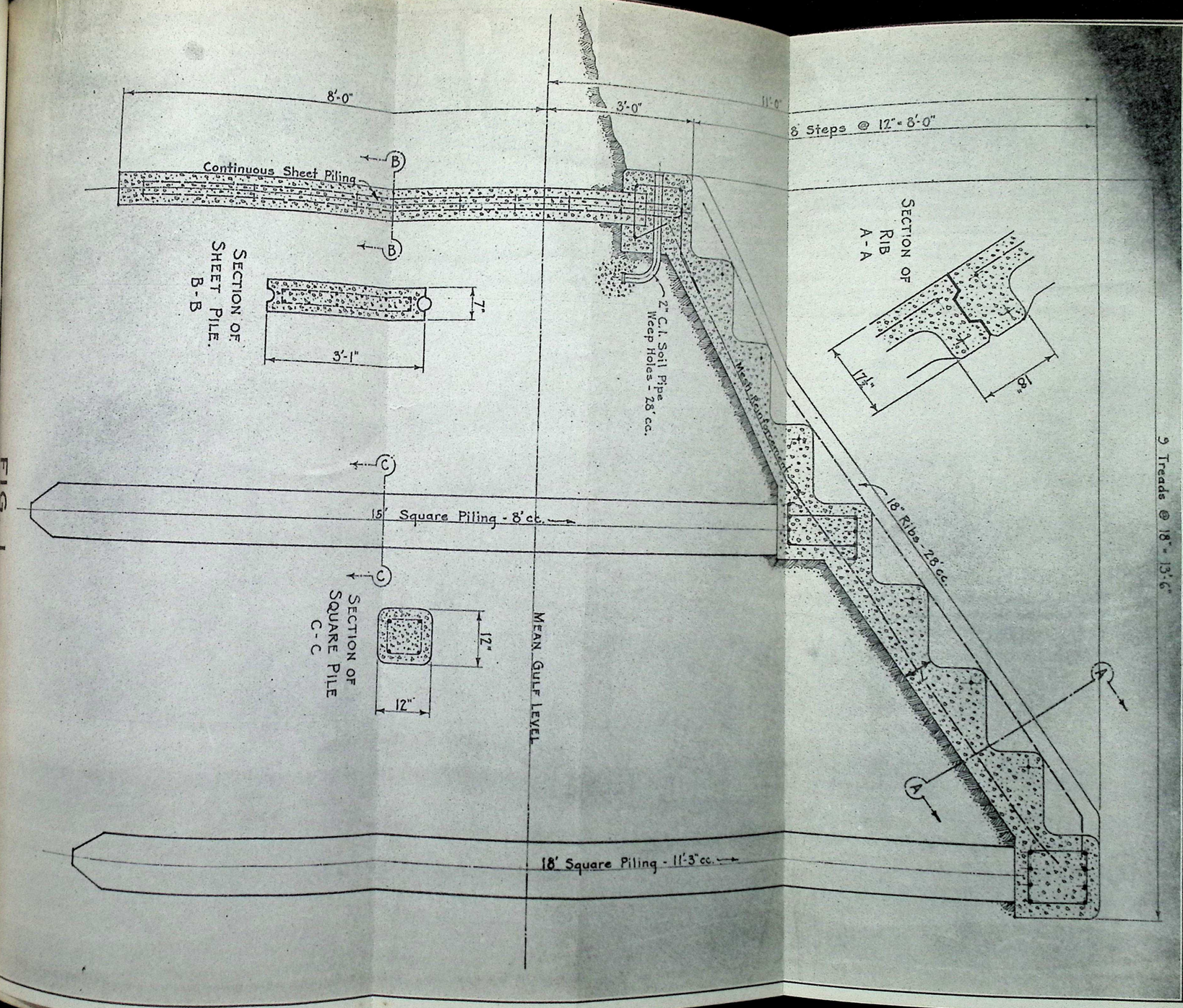


fellow members, Colonel A. M. Shaw, as Consulting Engineer, whose co-operation and advice I have found to be invaluable, and I take this opportunity of expressing my sincere appreciation for the assistance that he gave to me and to the commission.

My first instructions were to present to the commission sketches of various designs of sea-walls and shore protection schemes and to discuss these from every possible standpoint. Following this process I prepared a brief treatise on various types, accompanying it with quotations and illustrations as compiled from various engineering authorities, and placed these data in the hands of each commissioner. This was followed up by a series of discussions, in which we all took part, and it was finally decided to adopt the step-type wall, having the general features of what is known as the De Muralt System. This system was designed by a Dutch engineer by the name of De Muralt, and a wall of considerable length was built accordingly on the coast of Holland in 1905. Subsequent reports indicate that this structure has served its purpose wonderfully well.

The details of our wall as I finally worked them out are quite different from those used by Mr. De Muralt, and these details will be more or less understood by reference to Figure No. 1. It would be instructive if I had the time to analyze the technical merits of the step-type wall and its special effectiveness for the conditions on the Mississippi Gulf Coast; but on account of the fact that my part of this program is nearing its allotted period, I take the privilege of referring you to a paper published in the Transactions of the American Society of Civil Engineers for 1924. This paper was written by Mr. M. M. O'Shaughnessy, City Engineer of San Francisco, and is entitled "Ocean Beach Esplanade of San Francisco." You will find in this paper a very comprehensive treatise along the line above mentioned.

I would call your special attention, however, to the matter of appearance, as the very nature of our coast and its appeal to the pleasure-seeker and the home-builder made it imperative that our system of protection be such as to enhance the beauty of the coast line rather than detract from it. I will also cite the fact that Ernest Matthews, in his book "Coast Erosion and Protection," rates the step-type wall as being first in order of merit



over every other type. In my advocacy of this type, I am following what appears to me to be the best judgment of eminent engineers who have studied the matter; and to their opinion I have added such conclusions of my own as I have been able to formulate.

I would emphasize the fact that in the construction of our wall, which is the longest concrete sea-wall in the world, being 24 miles in length, we faced many problems, both technical and economic. In addition to these vital factors, we had the whole population of the county to reckon with, as it is easily conceived that a public enterprise of such vast importance and involving the expenditure of three and one-half million dollars created a situation that was almost overwhelming, especially to a local engineer of very limited experience. Then I would have you remember also that I had very few similar projects to guide me in my efforts from an engineering standpoint; and none at all so far as the special legislation and financing affected my work. I mention these points simply to recall the fact that some mistakes were natural under these peculiar conditions; yet I feel proud that the whole program was consummated well within the available funds; that we have a complete and exhaustive record of the whole procedure; and that the public as a whole has pronounced it very good. With these things in mind, my fervent hope is that what has been accomplished in this work will serve somewhat as an inspiration to other sections of our country that are confronted with shore protection problems and thereby move them to concerted and effective action; and to the engineering profession I would dedicate my work, however imperfect it may be, with the hope that it may serve at least to direct a more general study along the lines of these long neglected problems.

Discussion.

THE PRESIDENT: Gentlemen, you have made it unnecessary for me to speak for you, to say that I know we enjoyed Mr. Shaw's paper. Any of us who has been along the Gulf Coast for the last ten or fifteen or twenty years and has seen the amount of damage done there by storms, appreciate what this sea-wall is going to mean to that section.

COLONEL SHAW: It was suggested that I speak on one point and that was the step-type of sea-wall on the New Jersey Coast. I investigated that quite thoroughly in the spring of 1926 and I think that I found the weak point which caused its failure. It was not primarily in the support of the wall. The wall was designed with the idea that the toe would be supported by a continuous line of creosoted sheet piling. The piling which was driven back of the wall was of wood, primarily intended only for support during construction. The back filling was of sea sand, ideal for the purpose and ample to carry the load of such a wall, even though that load should be augmented by the pounding of heavy seas. The back filling was put in hydraulically and there was no evidence that there was any failure due to the sand back filling being inadequate to carry the weight resting on it.

The failure (where failure occurred) quite obviously was due to an accidental breach of the wooden sheet pile toe wall. Heavy seas dashed against the main wall causing spray to pass over the top and fully saturate the sand back filling. This water, being impounded, found an outlet through the break in the sheet piling, and it was not long before the induced current washed away a sufficient amount of the sand back filling to permit the wall to topple over landward. It was probable that the impact of the heavy seas contributed to the failure, but it is doubtful if the old and partially decayed wooden piles would have supported even the dead weight of the wall after the removal of the sand backing.

I made quite an extensive tour over the Jersey Coast before Mr. Shaw's design was finally adopted and this particular wall which Mr. Shaw showed in the photograph was the only one which I could find which showed creditable work either in design or quality of workmanship. Each of the other walls inspected was done by some one who obviously had an idea of his own which he wished to try out. On most of the jobs visited, it appeared very doubtful if either the design or the materials employed were very good in the first place and it was apparent that they soon became worthless. It should be noted however that these remarks concerning works on the New Jersey coast concern structures designed and built prior to 1924. Since that time the New Jersey state authorities have realized the necessity

of coast protection and have created a special organization of technical men to handle the situation.

MR. SHAW: I think it proper that I give you a few statistics to enable you to get a more definite conception of the magnitude of our project: There were 121,200 cubic yards of concrete requiring 185,000 barrels of cement, 63,500 cubic yards of sang, and 98,000 cubic yards of gravel. The reinforcement consisted of 5,510 tons of rods and 1,330 tons of expanded metal, making a total of 6,840 tons of steel. The drainage system required the laying of 41,900 lineal feet of pipe, and the structure is supported by 41,697 concrete piles and 29,261 square piles.

MR. KLORER: What did the wall cost per foot for varying heights? I would like you to tell us what were the engineering principles that determined the length of the spacing of those vertical beams, or rather the division bars, and the other point, what was the engineering reason that determined the slope?

MR. SHAW: In answer to the first question I will state that the construction of this project was divided into two contracts, resulting in a difference in the lineal foot costs. In addition to this fact, the wall is of two heights, 75% of it being 11 feet in height and 25% being 8 feet in height; that is, above mean Gulf level. Under the operation of the first contract the 11-foot wall cost $29.17 a lineal foot and the 8-foot wall $23.78. Under the second contract the costs were $28.02 and $23.37, respectively. These costs included all administrative and engineering items.

In answer to the second question as to the spacing of the vertical beams or expansion joints, the distance of 28 feet was selected because the expanded metal used for reinforcement comes in standard widths of 7 feet and the distance of 28 feet enabled us to provide the necessary laps and prevent cutting of the sheets and consequent waste. I might add that to make these panels longer would have necessitated a steel form-work that would have been more or less unwieldly.

In answer to the third question as to the slope; I arrived at this in the following manner: Sections of the design were made on cross section paper for various slopes and the areas of these sections were designed to insure the same slab strength. It was found that the slope of 1½ to 1 gave us the required strength

with a minimum amount of concrete. This slope also is slightly less than the angle of repose of the soil fill and thereby gives us the full bearing power of the soil with just enough earth pressure to equalize the weight of the structure. I might also add that a fortunate coincidence in this connection is the fact that this slope is practically the same as is used in ordinary building steps.

THE PRESIDENT: Are there any further questions?

MR. KOCH: Did you take into account the effect of impact from the force of the waves when you designed your structure?

MR. SHAW: The only definite data we had on this point consisted of a series of observations by the late Colonel Gailliard of the United States Army, from which it appears that the maximum wave force on the east coast of Florida produced an impact of 633 pounds per square foot. We can safely assume that on the Mississippi Gulf Coast, which is more or less protected by a chain of islands with which you all are familiar, the force would be of considerably less intensity than that mentioned. We, therefore, arbitrarily selected a figure somewhere between 650 and 680 pounds per square foot as being greater than any impact to which our structure would be subjected. This is further augmented by the usual factors of safety and as the slab was designed independent of the supporting fill, we can depend on the additional support of the fill as mentioned before.

MR. KOCH: For what loads did you figure your piles?

MR. SHAW: The piles underneath the structure were not intended primarily as supporting members as they were considered principally as first anchors to the structure, but they will render supporting strength sufficient to hold the structure in place in case of local wash-outs. I might say that the correctness of this assumption has already been proved by an actual demonstration.

MR. KOCH: You don't anticipate any trouble from undermining or tide water?

MR. SHAW: Contrary to popular opinion, mostly on the part of laymen, tidal forces along the Mississippi Coast show no tendency to undermine structures below the elevation of approximately 3 feet above mean Gulf level, as the water beneath this

plane is apparently more or less inert even in heavy storms. Above the 3-foot plane, however, the littoral current generated by the sand and tidal forces which strike the shore at oblique angles and the re-action of the shore become destructive to degrees varying in direct proportion to the intensity of the generating forces.

MR. JOHNSON: Were holes dug out there that would probably be dangerous to the beach?

MR. SHAW: We required the dredges that made the hydraulic fill behind the wall to operate beyond a distance of 1,000 feet from from the shore line in order to protect the small children that play along the edge of the water. Of course, the dredging operations resulted in a series of holes more or less parallel to the shore and it will likely require several years for these holes to refill by natural processes.

REINFORCED CONCRETE—ITS PERMANENCE AND PROTECTION WITH RELATION TO THE ACTION OF SEA WATER

By Lloyd G. Frost.

During the period covered by the writer's experience, there has been apparent a widespread tendency among the rank and file of engineers to consider any structure composed of reinforced concrete of standard specifications and designed in accordance with the accepted theory, as permanent and free from any requirement of subsequent inspection or care. This argument has been advanced innumerable times in comparing the respective advantages of reinforced concrete and structural steel.

The most superficial study of existing literature on the subject of reinforced concrete will show that much investigation has been devoted to determining the causes of disintegration and failure of reinforced concrete. The mass of writings accumulated is tremendous and would require a lifetime of constant application to digest; but a study of the more important papers will convince the unprejudiced engineer that reinforced concrete is far from being a permanent and universally reliable building material as designed and built under present conditions, and in accord with accepted theory.

A very considerable portion of this literature has to do with failures and destructive agencies; a perusal of a partial list of failures and structures requiring replacement and repair leads inevitably to the conclusion that in reality our knowledge of reinforced concrete is as yet far from sufficient to allow of designing any structure of this material with the assurance that it will be permanent.

Reinforced concrete is unique among building materials in that of all those standard materials now in use, it is the only one that is manufactured in place in the structure, and in the use of which the engineer must design, not only the structure but the material of which it is composed as well.

The writer's experience has taught him that many reinforced structures are designed by engineers whose sole qualification is a certain facility with the formulae of the accepted

theory; these formalae, coupled with a specification for a standard mix of mechanical proportions, have covered a multitude of sins. Much concrete, in some cases in important and expensive structures, has been placed composed of materials and in proportions totally unsuited to the conditions it has to meet, though the design was technically in accord with modern practise; the result has been, or will be, in some proportion, eventual failure, or expenditure of large sums for repairs.

Professor Swain lists no fewer than thirteen causes of failure and hastens to add that there are probably others.

The suitability of reinforced concrete for any structure where there is an alternative material available, should receive careful and extended consideration for the particular case and conditions to be met before a decision on its use is made. In how many cases has the determination upon use of this material been left to individuals or bodies to whom reinforced concrete is little more than a name, a Shibboleth as it were, for all that is desirable in a material of construction, and the engineer given no alternative but to prepare a conventional design to meet the required conditions of loading and cost?

The writer has always been deeply interested in concrete but has never been wholly in accord with the belief that it is universally a permanent material; perhaps because in his early experience he had the opportunity of observing numerous examples of its fallibility.

Reinforced concrete and plain concrete have in numerous instances proved to possess qualities of reliability and permanence in a marked degree; and in other cases, identical conditions have failed signally to live up to expectations and promises.

There can be no doubt that the engineer should consider well and carefully each individual case in which reinforced concrete suggests itself as the solution of a problem; and having determined on its use, proceed with his design only after having considered every condition that may affect the life and integrity of the structure, and after having provided for these conditions as far as present knowledge and experience will permit.

Particularly is this true of concrete or reinforced concrete subjected to the action of sea water, or in the vicinity of sea water in warm climates.

The first of these conditions, having to do with the disintegration of cement under the action of sea water, has been the subject of remarkably wide and painstaking study and experiment. A study of the existing literature demonstrates conclusively that the primary causes of this action have been well established; all authorities seem to be in accord that the disintegration is due to the attack by sulphates on the free lime in the cement. (*William C. Atwood and A. A. Johnson, Mems. A. S. C. E., in a paper before the society with discussion, Transactions, A. S. C. E. Vol. 87, Page 204).

Upon the best method of prevention the authorities cited are not so well in accord, but two methods seem to have been established as ameliorating or preventing this disintegration. These will be cited later.

Reinforced concrete, or plain concrete, affected by sea water may fail from one or both of the following causes:

1. As before stated, disintegration from attack on the free lime in the cement by sulphates in the sea water, or because of improper design or composition.

2. Mechanical destruction from expansion of the reinforcement caused by corrosion.

It has been stated that the first cause and suggested remedies have been widely and conclusively dealt with; it is the intent of this paper to deal with the second named cause and means of prevention.

The writer has observed many such cases, as in handrails of bridges, the lower surface of beams and slabs, in retaining walls, sea walls, etc. In some cases the concrete which had spalled off was in good condition, apparently retaining all of its original strength. In others the effects of disintegration were apparent in varying degrees.

It does not necessarily follow when the spalled-off concrete is sound, that the concrete was intrinsically impervious to chemical disintegration. It is probable that in many cases

corrosion of the reinforcement and consequent destruction was of such rapidity as to prevent the appearance of disintegration.

In the other case noted, it is likely that corrosion caused or aided by incipient disintegration hastened the ultimate failure.

The two methods for prevention of chemical disintegration recommended by authorities as noted above, are as follows:

1. The use of a very dense and rich concrete, well compacted.

2. The addition to the concrete of a sufficient quantity (determined by chemical analysis and test) of silicious material to combine with the free lime in the particular brand of cement used to prevent the attack by sulphates. There appears to exist a preponderance of evidence and authority in favor of the second method.

Assuming the employment of either of these methods, and a relative protection of the cement from disintegration, there remains the second course, corrosion of the reinforcing steel, to be dealt with to prevent failure. It is the intent of the writer to show that either of these methods may prove entirely inadequate unless the second named cause is given special attention.

It is well established that atmospheric moisture in localities bounded by or near sea water, is inimical to unprotected iron and steel. Corrosion and destruction proceed very rapidly under these conditions. The abnormal expansion of metals under the effects of this rapid deterioriation is familiar to all engineers.

If there exist in any reinforced concrete structure any cracks, however small, penetrating to the reinforcement, that permit the moisture-laden atmosphere to reach the reniforcement, corrosion may be set up, and it will continue until destruction of the surrounding concrete takes place. These cracks may be due to one or more of the following causes:

1. Alternate expansion and contraction of the materials over a wide range of temperature.

2. Shrinkage after removal of forms, particularly if removed too soon.

3. Volumetric changes due to alternate wetting and drying of the surface.

4. Overloading.

5. Carelessness or ignorance in design.

6. Incongruity of the two materials.

The first condition may be prevented to a considerable extent by the careful and rational use of temperature reinforcement. The effect of this reinforcement is not to prevent cracks but to minimize their severity by distributing them with a certain uniformity and multiplicity.

The second condition will be prevented as near as may be by the effect of the temperature reinforcement, by leaving form work in place a sufficient length of time and keeping the surface moist for a certain period.

With a few exceptions, the third condition may be partially or entirely prevented; this will be dealt with later.

Overloading is a condition that can and should be prevented in any reinforced concrete structure; the low and uncertain Modulus of Elasticity of reinforced concrete, coupled with the uncertainty of what occurs under stress, make it extremely important to keep within the allowable load limits and preserve the theoretical factors of safety.

There are many cases where poor design is conducive to cracking; particularly is this true at the supports of Tee beams and columns under eccentric load. The only preventive here is the selection of a designer with a thorough knowledge of the subject.

The writer is not wholly content with much of the accepted theory and practise of design; practically the entire fabric is empirical and while, on the whole, it should and in most cases does give safe and satisfactory results, it yet leaves much to be desired as a practical working basis for the rational proportioning of reinforced concrete structures. There is still a demand for extended tests, investigations and inspections, a need for further experience and study before our present ignorance of what actually occurs in a reinforced concrete structure under stress is diminished.

The accepted theory of reinforced concrete design considers a structure composed of two materials, of widely varying properties assumed to act together under stress. Concrete, strong in compression, is weak in tension; its Modulus of Elasticity, while assumed for purposes of design to be constant, is widely variable, from as low as 1,500,000 to as high as 5,000,000; these conditions vary not only with the proportions of cement and aggregates, but with different grades of cement, quality of aggregate, amount and kind of water, conditions of mixing and placing, etc., etc.

The present theory then, taking into consideration the low volume of concrete in tension, utilizes this material for compression only, and in tension, provides for the use of steel, a material of constant Modulus of Elasticity, regardless of its composition, having great ductility. Owing to its assumed high properties of bond (which may or may not be realized in a structure), as stated before, the concrete is assumed to act in unison with the steel. No value is given the concrete in tension, and the steel is assumed to take all of it, which it must do to develop its working strength.

Let us consider the effect of this condition on a rectangular, simply reinforced beam of 1-2-4 concrete, the simplest form of structural member.

Numerous tests have established that "first cracks" appear in concrete, reinforced with varying percentages of steel, at the same "stretch" as in plain concrete. This stretch is found to be equivalent to about 0.00012 the length of the piece, corresponding in standard 1-2-4 concrete to a stress of between 3500 and 4000 pounds per square inch in the steel in tension. At this period the concrete has *failed in tension* and further loading places all the stress on the steel except that it is believed that a decreasingly small area of concrete remains in tension as the neutral axis moves upward. Until the appearance of first crack the neutral axis is found to assume a position corresponding to that in a plain concrete beam in which the steel has been replaced by concrete in amount equal to the amount of steel multiplied by the ratio of the Moduli of Elasticity of the respective materials. In standard 1-2-4 concrete this ratio is taken at N=15.

The following constants are in general use in the design of 1-2-4 concrete:

Ratio of Moduli of Elasticity, n=15.

Position of neutral axis below extreme fibre in compression, k=378.

Depth from extreme fibre in tension to center of tensile stress, J=875.

Unit stress in concrete, Fc=650 pounds per square inch.

Unit stress in steel, Fs=16,000 pounds per square inch.

Assume a rectangular beam, 30′, 00″ span; live load, 1900 pounds per foot of beam; dead load, including beam, 1300 pounds per foot.

Breadth B=15″, depth over all=60″.

Then d=52″, kd=19.66″, $A_s = \frac{M}{Fs\ j\ d}$

$M = \frac{1}{8}\ Wl^2 = 3200 \times 900 \times 1.5 = 4{,}320{,}000''$.

$A_s = 5.95$ sq. ins.

Position of neutral axis at first crack $= \frac{60 + \frac{(6 \times 15)}{15}}{2} = 33''$.

Concrete in tension at point of first crack=33x15=495 sq. ins.

Extreme fibre stress of concrete in tension=Fct.

$S = \frac{4{,}320{,}000}{52} = 83{,}000.$

$Fct = \frac{83{,}000 \times 2}{495} = 335$ lbs. per sq. in.

This value for concrete in tension is above the average which can be assumed as existing in ordinary concrete. It is therefore evident, from tests and from the accepted theory, that the concrete must fail in tension, by cracking, before stress in the steel has exceeded one-fifth of the allowable.

It is recorded that the first cracks are so small as to be invisible to the naked eye. Immediately following the noted tensional failure, however, there is a very sharp break in the deformation curve due to the transfer of the tension formerly carried by the concrete to the steel with its higher modulus of elasticity. The deflection from this point will increase according to the ratio n=15 until the steel has taken its full load. It is evident that the cracks will widen, with the transfer of the load to the steel.

There exists a certain amount of arch action in a reinforced concrete beam, particularly in those of relatively short span and great depth. In such beams under certain conditions, a varying Modulus of Elasticity in the concrete will cause a pronounced increase in the compressive stress in the concrete. The amount or extent of this action is indeterminate, and its effect on tensional cracks purely a matter of speculation. It is probable that in some cases this arch action may tend to alleviate the extent of tensional failure, as it will maintain the lower modulus of the concrete for a longer load period than when such action is not present.

The indeterminate nature of this action, however, precludes its consideration in viewing the possible effects of tensional failure.

The writer has observed many cases of cracking on the lower surface of beams and slabs and near the tops and bottoms of columns under eccentric loading; in the majority of cases these were undoubtedly due to the failure of the concrete in tension.

There is a plastic flow in concrete; observations extending over a long period of time tend to show that this flow increases over these periods. At what period it ceases is not determined. It probably varies under different loading conditions and designs, as do all other factors affecting concrete. That it exists, however, and to a considerable extent, is indisputable, and it would appear that this flow would tend to widen cracks due to tension, as there would exist no flow in concrete below the neutral axis.

The designer is confronted at the outset, in view of the above, with the knowledge that tensional failure and cracking will occur in any reinforced concrete member having steel in tension, when designed according to the accepted theory, and with the necessity for protecting the reinforcing steel from the action of any corrosive agent acting through these cracks. There exists also the probability that this condition will be aggravated by a combination with one or more of the others herein stated.

There now arises the question of protective methods to be used. The writer believes that protection can be provided by the use of one or more of the following:

1. The addition to the cement selected of a sufficient amount of silicious material to combine with the free lime in resisting

the action of sulphates in the sea water. This method will be efficacious only when combined with one of the following:

2. Galvanizing of all reinforcing steel.

3. Painting the surface of the concrete.

4. Impregnating the surface of the concrete with a coat of asphaltic cement.

A combination of the first two methods, use of a chemically impregnable concrete, and galvanized reinforcing steel, would in most cases produce eminently satisfactory results, in proportion to the extent with which the concrete resisted disintegration.

It is possible that either of the latter methods will to a certain extent impede complete ultimate hydration of the concrete. However, sufficient strength should be developed before application of the skin coat to preserve the factor of safety and it does not appear that sufficient impediment or arrestment of ultimate hydration would occur to impair the life or integrity of the structure.

Either method may be put into practise without excessive cost by spraying. The difference in cost of the paint will be to a certain extent offset by the necessity of heating the asphaltic cement.

With the surface of the concrete in proper condition at the time of application, and the use of a spray of sufficient power to thoroughly fill all the surface pores of the concrete, combined with occasional inspection to determine the condition of the protecting coat, the concrete will be as near permanent in character as present knowledge will permit us to make it.

Referring to the six causes of cracking listed, it will be observed that the use of a protective covering such as described would provide adequate protection against all or any one of them. Both paint and asphaltic cement are highly elastic and of long life.

CONCLUSIONS

1. That the use of reinforced concrete for any structure subjected to the destructive action of sea water or other agents, should receive careful consideration for each particular case and be adopted only after having been demonstrated as being

superior to any other available material in economy, permanence, and safety.

2. That all such structures in or near sea water must be specially designed and receive special consideration for protection against, (a) chemical disintegration and (b) corrosion of reinforcement.

The writer wishes to offer for discussion the following recommendations:

1. That all plain concrete structures, or any portion of a reinforced structure that is subject to constant or intermittent immersion in sea water, be constructed in accordance with the following outlined specifications:

(a) The kind of cement selected for use in any part of any structure subject to immersion in sea water shall be analyzed and a sufficient amount of silicious material, to be selected by the engineer, shall be added to combine with the free lime in resisting the action of sulphates in the water. Wherever possible test specimens shall be made and subjected to rigid tests, using the corrected cement, and results carefully tabulated.

(b) All reinforcing steel used in these portions of the structure is to be galvanized according to standard specifications.

2. That all plain concrete or reinforced concrete structures situated in localities where they will be subjected to atmospheric moisture from sea water or the portions of structures in (1) above high water line, are to receive, as soon as may be possible after completion, one or more coats of paint or asphaltic cement, the composition of which shall be satsifactory to the engineer.

* * * * *

The writer recognizes that the views expressed, the conclusions reached, and the recommendations made herein, will not be in accord with the views of many of his brother engineers; the position that reinforced concrete is not a permanent material and the necessity for painting and protecting it, will not meet with agreement in many quarters.

The writer is forced to conclude by experience and observation however that all concrete structures, wherever situated, would be improved by painting or protection, and that in a

majority of cases it is not only advisable but necessary. Certain it is that any reinforced structure of importance should be carefully inspected at frequent intercals during its early life, in order to determine its success, to predict and, if possible, to prevent its failure.

It is logical to attempt to prevent any cause contributing to the failure of a structure when that cause can be foreseen. It is the purpose of this paper to call attention to conditions that exist, and to provoke, if possible, discussion and investigation, to the end that our knowledge of the various properties of reinforced concrete may be increased.

MINUTES OF MEETINGS AND BUSINESS OF THE SOCIETY.

Minutes of the Society, June 11, 1928.

The meeting was called to order about 8:15 P. M., Mr. Walter B. Moses, Treasurer, in the chair, F. A. Muth, Secretary, and 61 members and guests present.

The minutes of the previous meeting were read and approved.

The Society was advised as to the action of the Board in appointing a committee to investigate H. B. 399 relative to legislation affecting the status of civil engineers in this State.

On motion, duly seconded, the following motion was unanimously carried:

"Moved that it is the sense of this meeting that any legislation looking toward the registration of civil engineers should be withheld until it can be considered by the professional engineers concerned."

On motion, duly seconded, it was voted to recess during the months of July and August.

The meeting was then turned over to the Local Chapter of the American Society of Mechanical Engineers, Mr. James M. Todd, Chairman.

The technical exercises of the evening consisted of a superspeed film showing the work of the "Aeronautic Research Institute of the Tokyo Imperial University." Supplementing this film was another film of American manufacture of the superspeed type. The explanation of these films was made by Prof. James M. Robert and Dr. D. S. Elliott of Tulane University.

The meeting then adjourned to the usual collation.

F. A. MUTH, Secretary.

Minutes of the Board of Direction, June 11, 1928.

The meeting was called to order with Walter B. Moses in the chair and the following members were present: Messrs. Lanphier, Muench, Todd and Muth.

It was announced that owing to the illness of President Porter he would be unable to attend this meeting.

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

On motion, duly seconded, it was voted that inasmuch as the regular meeting of the Society would be held under the auspices of the American Society of Mechanical Engineers that that Society would be invoiced for the expense of the meeting.

Mr. Charles M. Brough was transferred to Non-Resident Junior Member.

Mr. Laurence K. Nelson was transferred to Member.

Mr. Charles Kirschner was reinstated as Member.

The resignations of Mr. F. P. Elizardi and Mr. J. V. Haverkamp were accepted with regret.

Mr. P. J. Dromgool was changed to Non-Resident Member.

The matter of introduction into the Legislature of H. B. 399 to provide for the creation of a State Board of Engineering Examiners to supervise the practice of civil engineering was brought to the attention of the Board.

On motion, duly seconded, it was voted that a copy of this bill be secured and that it be investigated, also that a committee of not more than three persons be appointed by the President, this committee to make necessary trips to Baton Rouge and special meetings of the Board to be called when necessary in order to discuss the merits of the bill and the action which may be required to assist it or oppose it as the interest of the engineers concerned may justify.

On motion, duly seconded, the following names were ordered to ballot:

Resident Members.

George H. Burt
Samuel Chapman Collins
Callender Faysoux Hadden
Arthur F. Shuey

Resident Associate Member.

Scott Thompson

Non-Resident Junior Member.

Henry W. Page

Transfer From Student to Junior Member.

William P. Oster

The attention of the Board was called to prizes of Junior Memberships of this Society offered to the most outstanding students in the Louisiana State University and Tulane University for the school year just ended. These prizes were won by Mr. Henry W. Page of Louisiana State University and Mr. William P. Oster of Tulane University.

There being no further business, the meeting adjourned.

F. A. MUTH, Secretary.

The Proceedings of the Louisiana Engineering Society

Published bi-monthly, February, April, June, August, October, December, under the auspices of the Committee on Publication.

DOUGLAS ANDERSON, Editor.

The Louisiana Engineering Society is not responsible for any statement made or opinion expressed in this publication.

Subscription, $2.00 per annum Single copy, 35 cents

ADVERTISING RATES

	ONE YEAR	HALF YEAR	ONE ISSUE
Full page	$50.00	$28.00	$10.00
Half-page	28.00	15.00	6.00
Quarter-page	15.00	10.00	4.00
One-eighth page	10.00	6.00	2.00

For the back outside cover add 50 per cent to the above rates. For the inside covers add 25 per cent to the above rates.

Address all communications to
Douglas Anderson, Editor, Tulane University,
New Orleans, La.

Entered as second-class matter July 27, 1916, at the Post Office at New Orleans, Louisiana, under the Act of August 24, 1912.

Acceptance for mailing at special rate of postage provided for in section 1105, Act of October 3, 1917, authorized August 1, 1918.

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PROCEEDINGS
OF THE
LOUISIANA ENGINEERING SOCIETY

VOL. XIV. OCTOBER, 1928 NO. 5

CONTENTS

EDITORIAL NOTES AND COMMENT: PAGE
A New Wood Preservative 169
Short-Circuiters 170

PAPERS AND DISCUSSIONS:
Zinc Meta-Arsenite. Its Development and Use in Timber Preservation. *By Kenneth M. Bailey* 174
Discussion 185

MINUTES OF MEETINGS AND BUSINESS OF THE SOCIETY 192

EDITORIAL NOTES AND COMMENT

A New Wood Preservative. The subject of Mr. Bailey's paper, printed in this issue of the Proceedings, is Zinc Meta-Arsenite, a wood preservative which is represented to have such excellent qualities as to entitle it to a place of the highest rank among the various substances which are used for this very important purpose.

Wood preservation is a subject of intense interest, and to no locality more than to this section of the country. For here we have in a very high degree all of the well-known factors which are conducive to decay in structural timber.

The qualities which a good preservative must have to meet the needs of the situation are:

Low cost,
Ease of production in large quantities,
High toxicity,
Permanence.

The paper proceeds to set forth in detail how Zinc Meta-Arsenite, or ZMA, meets each of the above specifications.

With regard to toxicity, it does not prevent the attacks of the teredo in salt water, but is claimed to be very effective against the termite, or white ant, which in recent years has been causing such great destruction in and about the City of New Orleans.

One of the great difficulties with the use of chemical salts as a wood preservative has been its solubility, with consequent tendency to leach out of the wood, more or less rapidly, when in contact with water or with moisture in the soil. This results in a lack of permanence, which as noted above, is one of the most necessary qualities of a good preservative.

In his discussion of the paper Mr. Charles M. Kerr takes the position that the real criterion of permanence is the test of time with the material in actual use and under the actual conditions to which its may, on the average, be subjected. So far, the tests upon Zinc Meta-Arsenite, though they have been conducted with the greatest care and elaboration, are laborotory tests, although some of these, for instance, the pole stub test at Matawan, New Jersey, were made under severe conditions and over a period of three years.

ZMA should appeal to the prospective house builder in this city where destruction due to termites has been so much in evidence these last few years. It is colorless and can be painted over.

SHORT-CIRCUITERS

As Observed by
VLADIMIR KARAPETOFF,
Professor of Electrical Engineering, Cornell University
(With acknowledgments to The Wiley Bulletin, October, 1928)

Q. What is a short-circuiter?

A. A short-circuiter is a person who is both conceited and impatient enough to believe that long endeavors of humanity along a certain direction have been unnecessary and that he has a satisfying short-cut solution.

Q. Give a simple example of short-circuiter.

A. In politics a short-circuiter usually advocates some naive sweeping reform hoping that it will remedy some admittedly unsatisfactory state of affairs. According to him, life imprisonment or death penalty for any crime whatsoever

would wipe out law breaking in a few years. Abolishing tariff on imports would equalize wealth; prohibition of divorces would bring about universal marital happiness; penny postage on foreign letters would establish peace and good-will among nations, etc.

Q. Are short-circuiters confined to certain groups of population more than to others?

A. Wherever there is a complex vital problem to be solved, an intense widespread interest, or a group of earnest and devoted workers, the short-circuiter invariably makes his appearance. He is like an insect pest or parasite that accompanies certain forms of life.

Q. What does a short-circuiter do in science?

A. Out of his own inner consciousness he "discovers" a "law" supported by only a few insufficient and scattered facts, and annoys the profession by his letters, manuscripts, talks, and complaints, claiming that the long, painstaking work of other scientists in his same field is unnecessary, and is simply due to their limited horizon and lack of imagination.

Q. Do you find short-circuiters in fine arts?

A. Certainly. They claim that a long training in color, form, or sound, is unnecessary, and that the expression of a human soul should be spontaneous and artless. They create pictures and musical compositions of crudest and most incomprehensible forms which are forgotten as soon as produced.

Q. But were not real geniuses in art also revolutionists who rejected the old standards and traditions, and sought new paths? How are we to distinguish them from short-circuiters?

A. A real genius first masters the existing art and then, having found it insufficient, seeks new forms. Wagner and DeBussy, in their young years, wrote excellent compositions in the then existing style and became masters of classical harmony and strict forms before inventing their own. Moreover, a genius is endowed with an infinite capacity for work, and does not seek short paths, but only different paths.

Q. Are there short-circuiters in business?

A. Appalling monthly statistics of business failures are an emphatic affirmative answer. Where an old-line company

has spent many years in building up an organization and developing a reliable product, a short-circuiter embarks blithely to "beat the trust," only to find himself on the rocks of implacable economic laws.

Q. What about men like Martin Luther and other protest- and reformers? Were they not disgruntled short-circuiters?

A. We can apply to them the two tests mentioned for painters and composers above. These reformers first became thoroughly versed in the teachings of the then established church before breaking with it. Having formulated a new doctrine or interpretation, they spent their lives in strenuous unselfish endeavors, practicing and preaching the new faith. However, history of religion has also recorded many deluded short-circuiters who built their houses on sand and whose farcical doctrines are long forgotten.

Q. Can short-circuiters be classified into types or species?

A. The most common species are as follows: the slippery fish, the crown-of-thorns man, the elbow-push individual, and the shadow of a statue.

Q. What do you mean by the "slippery fish" type of short-circuiter?

A. He keeps on modifying his claims and theories in proportion as valid objections are pointed out to him, so that one can never pin him down as to what he really advocates.

Q. Do you mean a voluntary martyr by the "crown-of-thorns" man?

A. There is an inherent sense of fairness among the masses and an inborn sympathy for the underdog. The short-circuiter takes advantage of these sentiments and wears a mask of one persecuted by the conservative, orthodox, or self-seeking experts in the same line of endeavor. This policy usually secures for him some following among other amateurs and malcontents, and he enjoys this illusion of real leadership.

Q. Probably by the "elbow-push" individual you mean one who will not listen to others or care what they think of him or his scheme, and who unscrupulously or foolishly follows his ideas.

A. Yes, there are many examples of such short-circuiters among deluded inventors and political dictators.

Q. What do you mean by the "shadow-of-the-statue" type of short-circuiter?

A. A short-circuiter of this type hides his ignorance behind the glamor of some really great man or men. He quotes them redundantly in his talks and writings, regrets that their works and ideas are not better known or understood, and intimates that he himself humbly follows in their footsteps or sits at their feet. In this way he gains for himself a certain amount of respect and sympathy on the part of those who themselves are ignorant of the actual work of these great men, and only knows about them by reputation.

Q. How can short-circuiters be eradicated?

A. Using an expression common in economic entomology, these pests can be only controlled, but not exterminated, because they lay their eggs in inaccessible places, particularly in the minds of uncritical, uneducated and lazy persons.

Q. How can their number and activities be controlled?

A. The torch light of real education is their strongest destroyer, education not in facts, but in history of civilization and in the processes by which humanity slowly, painfully, and patiently has risen to its present level of culture. Every little acquisition, be it in natural sciences or in the principles of morals and justice, has meant a long and circuitous path, and one familiar with this path in his own line of endeavors will not be so liable to give credence to a "sure cure or money refunded" in some other line. Another effective remedy is to confront two or more short-circuiters who claim different solutions for the same problem, and let them fight it out among themselves, leaving earnest people alone.

Q. Do you think that by ridiculing or hampering short-circuiters in their self-expression, some high-grade original thinkers may also be unwittingly thwarted?

A. Undoubtedly, and for this reason it is better to be tolerant towards short-circuiters, remembering that any of us is liable to be one in a line of knowledge with which he is not familiar.

Moreover, as the old saying goes, a few fleas are good for a dog, and a short-circuiter or two sometimes help to keep a group of serious people from becoming too serious.

PAPERS AND DISCUSSIONS

ZINC META-ARSENITE
Its Development and Use in Timber Preservation

By KENNETH M. BAILEY

Read before the Society, September 10, 1928

By way of a foreword, I wish to speak of a statement made by a very eminent poet, that has gained some notoriety. I allude to the oft repeated line: "Build a better mouse trap and man will make a beaten path to your home." But times have changed, so mouse trap or not, that path would not mature for many years if left away from the highway. It must be brought to the lanes of commerce.

To-night I am bringing a mouse trap out to the traveled ways. It is a wood preservative that has come through four years of research, after many others had been eliminated, and should be of interest to you here in the South, where all the factors conducive to decay of wood are present; that is, moisture, temperature, air and food. You don't think of the factors but you do see the results in incipient decay on all sides; everywhere you see money being spent on renewals, the largest cost of which is consumed by the labor charge. And all of this can be prevented by a small additional first cost that will insure to you a life of your lumber equivalent to its mechanical life.

And the time has come when all timber, exposed to the weather, must be treated if we would conserve the progressively diminishing supply against the moment when the benefits of reforestation will have been felt. Outside of the economies involved, it has become a duty to us to preserve structural timber. Realizing this we look about for suitable preservatives and, finding them, we wish to obtain some pertinent information thereto. That is my mission to-night, to tell you of one that is commercially available at your elbow. To do this let us go back some four years and analyze the needs of one of the largest consumers of poles in the United States, the Western Union Telegraph Company, and see what caused this pri-

vate research which culminated in a superior wood preservative.

This utility owns some 214,000 miles of pole line and spends annually $4,000,000 in reconstruction, most of which is the cost of replacing decay in old lines. For the seven years prior to 1920 they had resorted to a creosote brush treatment. This was far from satisfactory and in 1920 they went to open tank butt treatment and erected their first plant. By 1924 they had three plants treating approximately 300,000 poles each year.

These poles were mostly cedar and chestnut and are well adapted to such a treatment. The supply of chestnut, however, because of the blight, was almost destroyed, and there seemed only a question of time before cedar poles would only be economical in restricted areas. Therefore it was necessary to turn to the yellow pine pole, which must be treated full length.

Their specifications called for 12 pounds of creosote, and with this being used altogether, the quantity of creosote consumed would be enormous and the cost unbelievable. This is evident when we see that a 20 ft. pine pole absorbs six times as much creosote as a butt treated chestnut pole.

Consider what the effect on the industry would be, if all the large utilities should adopt full length treatment of creosote.

Coal tar creosote is a by-product of the coke industry and constitutes but 3 per cent of the distillation. Its quality and quantity varies with the demand for the other distillation products and with the amount of coke that can be utilized. It cannot be produced for its own sake. As it is, approximately 55 per cent of the amount used is imported. During the war most of the foreign supply was cut off. This was a serious calamity and in itself would cause uneasiness to large consumers. Each year the demand for treated timber increases and there is no diminution of treating plants. So the ultimate end probably means that the cost of creosote will rise to a prohibitive figure.

Therefore it seemed imperative that a substitute should be found.

Having concluded that the situation warranted an investigation, the Telegraph Company organized a staff consisting of chemists, pathologists, foresters and engineers, under the direction of their chief chemist, Dr. L. P. Curtin.

A preservative would have to have certain qualities to possibly fill the needs of the industry. These are:

1. Low cost,
2. Available in unlimited quantities,
3. High toxicity,
4. Permanence.

The first three requirements were rather easily filled from among the inorganic salts.

But the last, permanence, presented a problem, because the low forms of plant life that decay wood can only digest soluble material. And soluble materials leach out until a point is reached when a sufficient quantity to inhibit growth of fungi is not present. This is the point where all salts broke down heretofore, except in arid climates.

But it was discovered that these forms of plant life evolve a substance, acidic in character. This acid changes the cellular structure of wood fibres into a soluble form, thus permitting digestion.

Through utilization of this discovery, it is expected to revolutionize the wood preserving industry.

For it is now possible to inject, not a water soluble salt, but an acid soluble one, into the timber.

Held in solution by excess acid, the aqueous solution, possessing no body, can be injected under pressure, with permeation into the inmost fibres. Then the water and acid evaporate and the salt precipitates throughout the wood cells. It remains inert until such time as the wood is attacked by fungus. Then, with the evolution of acid, the weak salt is dissolved, digested, and the fungus dies. There is not time for any growth.

Similarly these acid soluble compounds when eaten by insects, are dissolved by the acidic character of their digestive tracts. The poisonous effect is immediately exerted.

It might be well to call attention to the fact that an independent German investigation has contemporaneously made

the same discovery. Dr. Falck, in the August 18, 1927, issue of "Zeitschrift für Angewandte Chemie," speaking of insoluble salts says: * * * wherefore it may be concluded that it has been dissolved by the secretions of the fungus and made available for assimilation. The solubility of a poisonous substance is, therefore, no criterion of its ability to preserve wood."

The laboratory studies, to prove that wood rotting vegetation produced acids, were very exhaustive. They were carried on both by fungus growing on wood and in nutrient media. The growth in the latter is very rapid.

The cultures for these experiments were obtained from the U. S. Forest Products Laboratory and included all those that destroy commercial wood.

Nutrient media of Agar-malt, Agar-starch and gelatin-sugar were prepared in duplicate. These were colored with a suitable indicator such as litmus. Into one a transplant of fungus was introduced. As this grew the indicator changed from blue to red, indicating acid production. Then, upon dissolving this in hot water and introducing a base the original color was restored. The uninoculated medium, of course, had retained its original color.

This experiment was repeated with other indicators such as methyl orange, congo red, methyl red, sodium alazarin sulfonate, propyl red, rosilic acid and neutral red. In all cases an acid final color was obtained except in several cases where the entire indicator was destroyed.

Next, small lengths of pine were boiled three hours in sodium carbonate to neutralize the natural wood acids and then soaked in sodium alazarin sulfonate until they were red and finally sterilized with a 20-pound steam pressure. These were then placed in test tubes upon which were growing pure cultures of a wood-rotting fungus, fomes annosus. Within 24 hours growth had commenced on the colored sticks and the acidic reaction was already apparent. In three weeks there was approximately a 4 inch growth and decolorization. Then, upon being held in ammonia fumes, the original red was restored to the sticks.

Further experiment showed that difficult soluble carbonates could be dissolved by these fungus acids.

Agar-malt sirup gels were prepared and into these gels a strontium carbonate precipitate was introduced. Such gels without strontium transmit light, while the one containing the strontium assumes an opaque appearance. Then it was inoculated with fomes annosus. As growth proceeded, the opacity disappeared and the jelly became translucent. The carbonate had been dissolved.

This was repeated with calcium carbonate, with identical results.

Quantitative tests proved the acid evolved in some cases was of a strength equivalent to a 0.36 per cent solution of concentrated acetic acid in water.

In the development of the preservative many salts were studied. The best results were finally obtained with arsenites of copper, which are insoluble in water and very toxic to fungi. Commercially these salts are known as Scheele's Green and Paris Green. In 1925 a number of poles were butt treated and placed in the lines. But since these preservatives were corrosive to metal and could not be used in pressure cylinders, further search was necessary.

Finally Zinc Meta-Arsenite was developed. This preservative does not corrode iron, is inexpensive, very toxic and practically non-soluble, probably 25 parts per million parts of water. On the other hand, it is easily made soluble by all of the fungi studied.

Zinc Meta-Arsenite is formed by bringing together a solution of arsenous oxide and water with a solution of zinc acetate. ZMA is formed together with acetic acid and this is used as a treating solution. After impregnation, the acetic acid and water evaporate, and white Zinc Meta-Arsenite is precipitated in the wood fibres.

Sections of wood treated with these salts show heavy deposits in the medullary rays and resin ducts. This is where the fungus attack is most severe. Lighter deposits were found in the cells and cell walls. This was ascertained through studies of photo-micrographs under a 1500 diameter magnification.

To give an idea of the extent of distribution, quantitative tests were made on a number of sections cut from the center of pressure treated poles. Assuming the amount at 1 inch from the outside as 100 per cent, then at 2 inches there was 74 per cent, and at 3 inches this was 49 per cent.

The lowest toxicity points at which fungus growth can be prevented in parts per ten thousand resulting from these experiments are:

Zinc chloride	35
Copper sulfate	15
Paris green	4
Scheele's green	4
Bichloride of mercury	1½
Arsenious oxide	1½
ZMA	2

In July, 1928, experiments were made which demonstrated the effectiveness of these preservatives under most unusual and severe conditions.

A number of yellow pine sticks (2″x4″x30″) were treated with various preservatives as shown in Table I.

Table I—Treating Data for Accelerated Tests
(Pressure, 100 Pounds per Square Inch)

Treatment.	Preservative	Strength Solution %.....	Duration of treatment, hours...	Average treatment temperature Deg. F.....	Absorption preservative solution Lbs./cubic ft.....	Preservative in timber Oz./cubic ft.....
A	Untreated	—	—	—	—	—
B	Copper Arsenite; Scheele's green and Paris green; hot treatment only.....	2	2.00	153	27.36	8.8
C	Copper arsenite - fluoride; hot treatment only.....	2	2.25	162	28.32	9.1
D	Zinc chloride; preferably hot treatment	5	2.25	149	29.60	23.7
E	Zinc meta-arsenite; cold treatment	2	2.25	52	32.54	10.4
F	Copper aceto-arsenite; Paris green; cold treatment	2	2.25	54	32.28	10.3

It is to be noted that the two cold treatments resulted in a greater absorption of solution than did the hot treatments.

The zinc chloride treatment was about 50 per cent greater than is standard practice. Eight ounces is standard, but sap wood contents will run much higher.

These sticks were then split into smaller ones approximately 3/8" square by 6" long.

A representative pair of each treatment was then boiled in distilled water for one hour. Then it was rinsed in distilled water and again boiled. This was repeated the third time. An untreated stick was given the same treatment.

They were then placed in test tubes containing agar-malt syrup which had been inoculated with a culture of formes annosus.

The results four weeks later were as follows:

A. Untreated—fungus growth covered the stick for four inches.
B. 2 per cent copper arsenite—no growth.
C. 2 per cent arsenite-fluoride—0.4 inch feeble growth. This died at the end of 2 weeks.
D. 5 per cent zinc chloride—similar growth as the untreated, but only one-fourth the distance.
E. 2 per cent meta-arsenite—no growth.
F. 2 per cent aceto-arsenite—no growth.

A noticeable fact in treatments B, E and F was that the fungus in the malt media seemed to shrink from the treated stick.

Since zinc chloride with a 23.7 ounce treatment broke down, then this boiling test may reasonably be placed at 10—15 years of life.

We come now to a series of tests that duplicated field conditions, except that the rate at which the preservative was lost was accelerated. This was accomplished by greatly increasing the surface in proportion to the volume. Approximately a 65-to-1 ratio was obtained.

Southern yellow pine sticks were treated with a number of preservatives, and after seasoning for two months, these were split into pieces 1/8"x 3/8"x 2" and a few 3/8" square by 6" in length. One batch was analyzed for preservative contents and the others were exposed to the weather on racks at Chattanooga, approximately 15 feet above ground. Holes were bored in the trays to permit drainage. Chattanooga's mean annual rainfall is 51 inches. In summer it becomes very warm and there is considerable frost in the winter.

This was in September of 1926. At the end of four months and ten months these sticks were analyzed for percentage of original contents. The numerical results are shown in Table II.

Table II—Quantity of Preservative in the Wood

Treatment.	Preservative	Unweathered	After Exposure 4 Months[1]	After Exposure 10 Months[2]
		Ounces per cubic foot		
A	Copper arsenite	7.0	6.9	6.2
B	Sodium fluoride	9.2	5.1	Trace
C	Barium carbonate	24.0	12.6	10.3
D	Zinc chloride	23.0	4.6	2.2
E	Zinc meta-arsenite	10.5	10.6	10.5
F	Copper aceto-arsenite	8.7	8.4	8.0
		Pounds per cubic foot		
HA	California petroleum, density at 38° C., 0.936	16.3	.....	15.0
HS	Texas petroleum, density at 38° C., 0.905	13.4	.....	10.6
I	English coal-tar creosote, density at 38° C., 1.068	26.2	18.8	15.0
J	American coal-tar creosote, density at 38° C., 1.056	23.2	19.7	14.9
N	Same as J	17.2	11.7	10.9
O	Same as J	10.4	6.5	5.5

[1] September 1, 1926, to January 1, 1927.
[2] September 1, 1926, to July 1, 1927.
See graphic chart at end of article.

Individual treatment results at the end of ten months are as follows:

A. Copper arsenite, the loss was approximately 11 per cent.
B. Sodium fluoride, over 95 per cent loss in ten months.
C. Barium carbonate, this resulted in a loss of 54 per cent.
D. Zinc chloride, about 90 per cent of the original zinc chloride had been washed out.
E. Zinc meta-arsenite, three analyses failed to show an appreciable loss.
F. Copper aceto-arsenite, the contents had diminished by 9 per cent.
HA. California petroleum, the loss was 8 per cent.
H. Texas petroleum, the loss was 20 per cent.
I. English creosote, was diminished by 43 per cent.
J. American creosote, lost 26 per cent.
N. American creosote, lost 36 per cent.
O. American creosote, lost 48 per cent.

These tests showing the rate of loss are particularly important. Loss may come about through vaporization in vola-

tile oils and leaching in water soluble salts. Either way a point is reached when there is not a sufficient amount of preservative left to inhibit the growth of fungi.

It was felt desirable to find if these ten months weathered samples could resist a fungous attack. Several types of cultures were used.

Type X was made by placing sticks in a test tube in which was a fungous transplant in 5 cc. of gel.

Type Y was made by placing four sticks horizontal in a petri dish in which was a fungous transplant in 10 cc. of gel.

The results are as follows:

A. Copper arsenite, no attack on cultures.

B. Sodium fluoride, cultures X and Y were freely attacked.

C. Barium carbonate, type X, fungous growth to a height of 1¼", then died. The wood was not attacked, but it seemed that the gel had ascended by capillarity.

D. Zinc chloride, culture X, light growth on three sticks to a height of 1¼"; at the end of a month these died. On one stick there was a 5" growth.

E. Zinc meta-arsenite, showed a perfect resistance.

HA, HS, both weathered and unweather wood treated with petroleum, were vigorously attacked.

I, J. N and O, on the unweathered wood, the poisonous fumes from the creosote killed the fungi at a distance of ½".

On the weathered sample a reduced toxicity was apparent. A fungous growth grew on culture X for a distance of approximately 1". It was nourished by the gel that had ascended the stick by capilarity. The stick was not attacked. This died after two weeks.

The principal interest in this was the decreased toxicity of creosote due to the evaporation of the low boiling fractions.

Zinc chloride is accepted as a standard salt treatment and its service is placed at from ten to fifteen years. Since it was attacked, the only conclusion which can be drawn is that a

month of this accelerated weathering test is the equivalent of a year's exposure. This would place Zinc Meta-Arsenite with an unlimited life, for its loss was not measurable.

At Matawan, N. J., there is a test bed in which decay organisms and termite attack are unusually severe. Untreated chestnut and cedar poles are found to lose ⅛″ to ¼″ per year, and untreated pine even more. Stubs of all three of these woods, tank treated with arsenites, have been in this test bed for three years; to date they are sound.

Poles, butt treated with the copper arsenites, have also been in service lines for 2½ or 3 years.

On the strength of these experiments, the zinc treatment was adopted by the Telegraph Company for pressure treatment of pine poles.

The specifications call for a quarter pound of salt per cubic foot. This gives a factor of safety of twenty. To obtain an equivalent treatment with zinc chloride would necessitate four and three-eighths pounds. This does not take into consideration the solubility of zinc chloride.

This treatment may be used with either air seasoned or artificially seasoned wood. It is in all respects similar to standard pressure treatment used for creosote.

The treated timber is clean and colorless. If desired, it can be painted over. Its use in this connection has been approved by one of the largest manufacturers of lacquers in the United States.

To further the study of the zinc treatment a pressure plant was built at Chattanooga. The results from this plant enabled the Telegraph Company to train the men who would handle the preservative commercially.

The Telegraph Company, however, has no interest in the commercial end. Their rights were given to the Curtin-Howe Corporation, who sponsors its treatment. Their method is to license certain plants for its use, erect there a mixing unit and employ a graduate chemist to supervise the impregnation. This is a safeguard for the consumer. This corporation delivers the preservative to the treating company at a standard price.

To date, three commercial plants and one private railroad plant have been equipped and are in operation.

The advantages of the zinc preservative are numerous and may be enumerated briefly:

1. It is economical. The amount of creosote oil necessary for an equivalent protection costs from three to four times as much as ZMA.

2. It is permanent. This latter feature alone will commend it. This means that now for the first time commercial operations for a salt treatment can be carried on.

3. It is highly toxic to all forms of decay organisms. This includes all of those known as "dry or wet rot."

4. It saves labor and freight. For instance, in a 10,000 pole order recently filled it is estimated that upwards of seven hundred tons of freight were saved.

5. It is clean, colorless and odorless. It can be used either for exterior or interior construction.

6. It does not corrode metal.

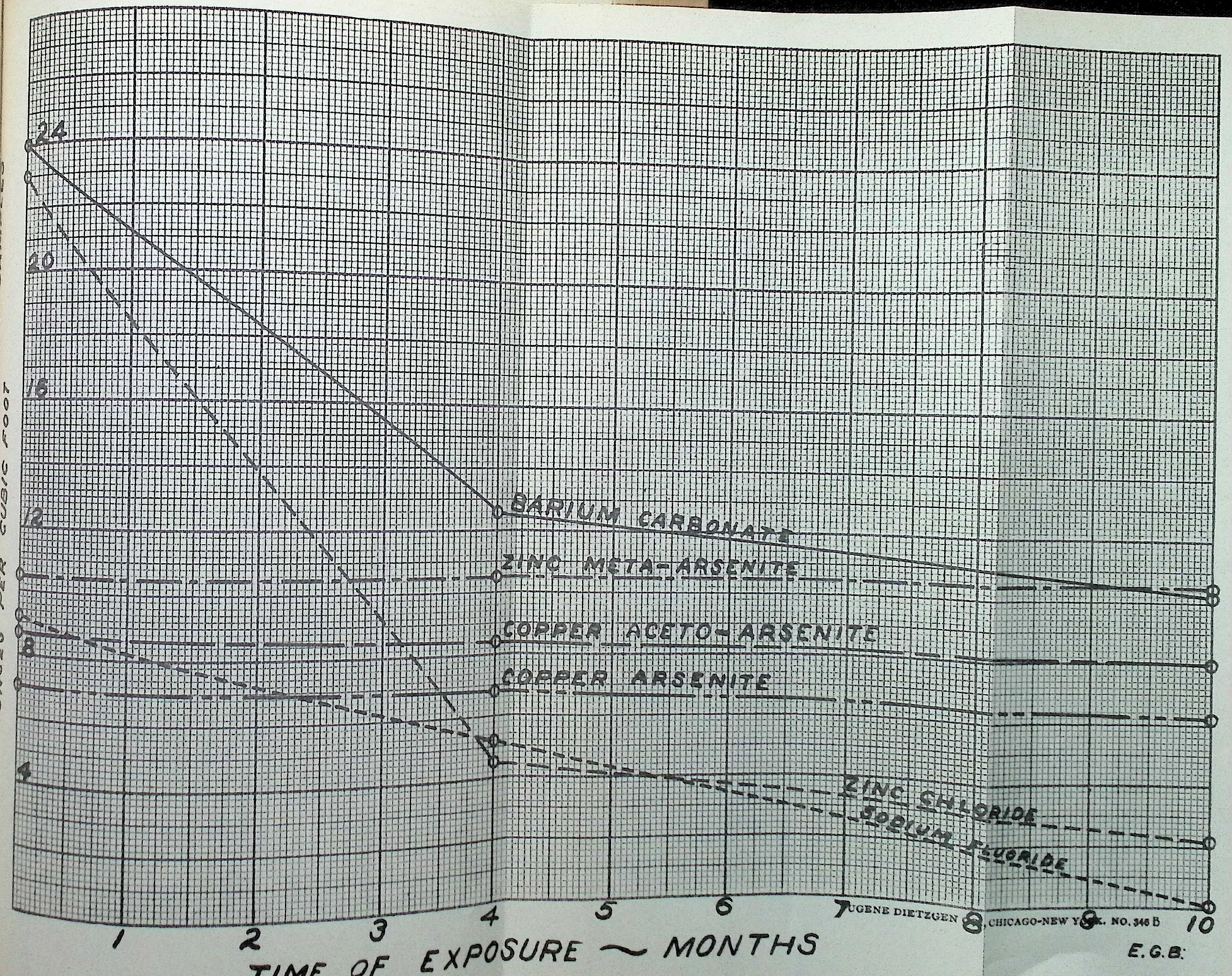
7. It does not affect the strength of the wood.

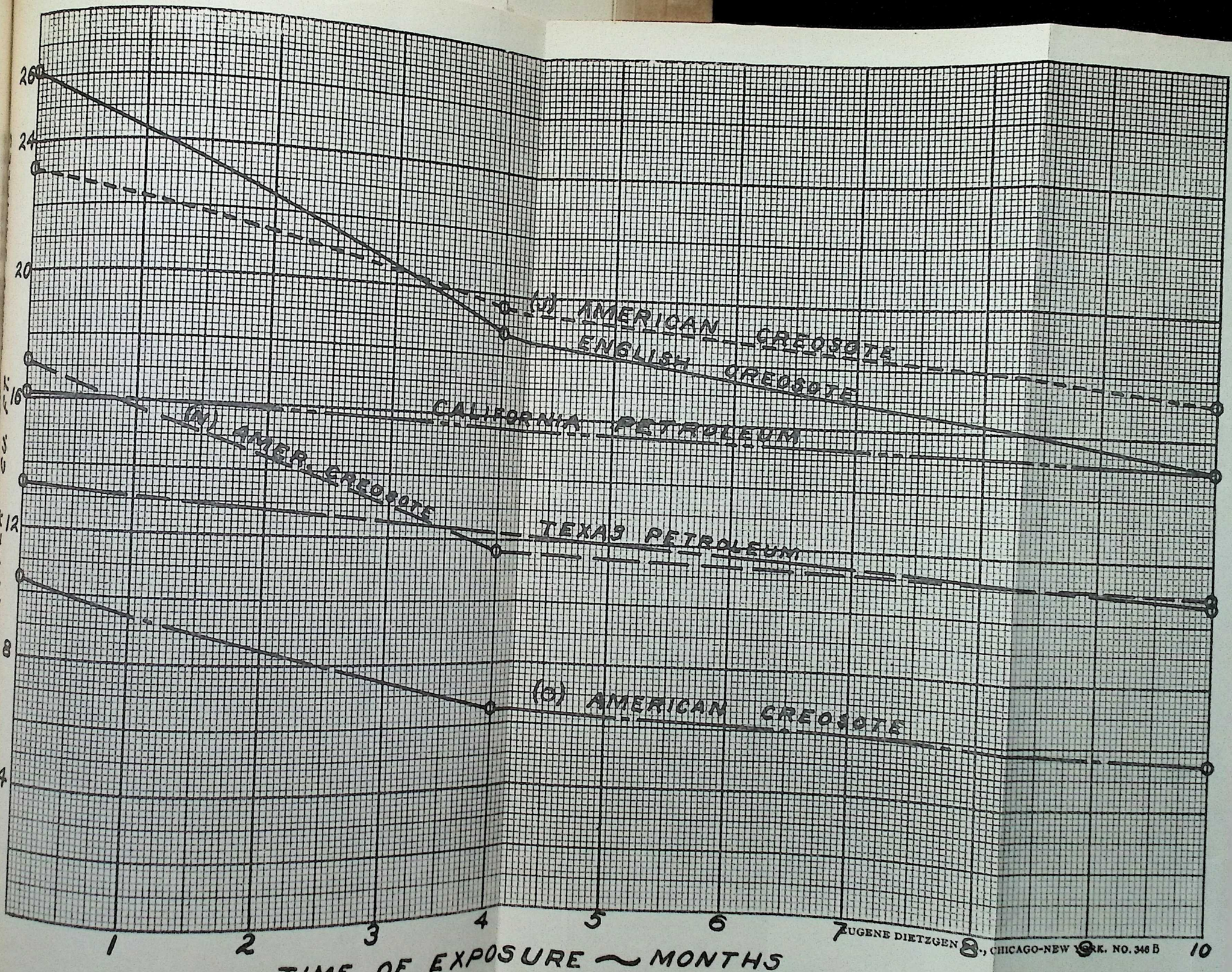
8. It will stop termites or "white ants."

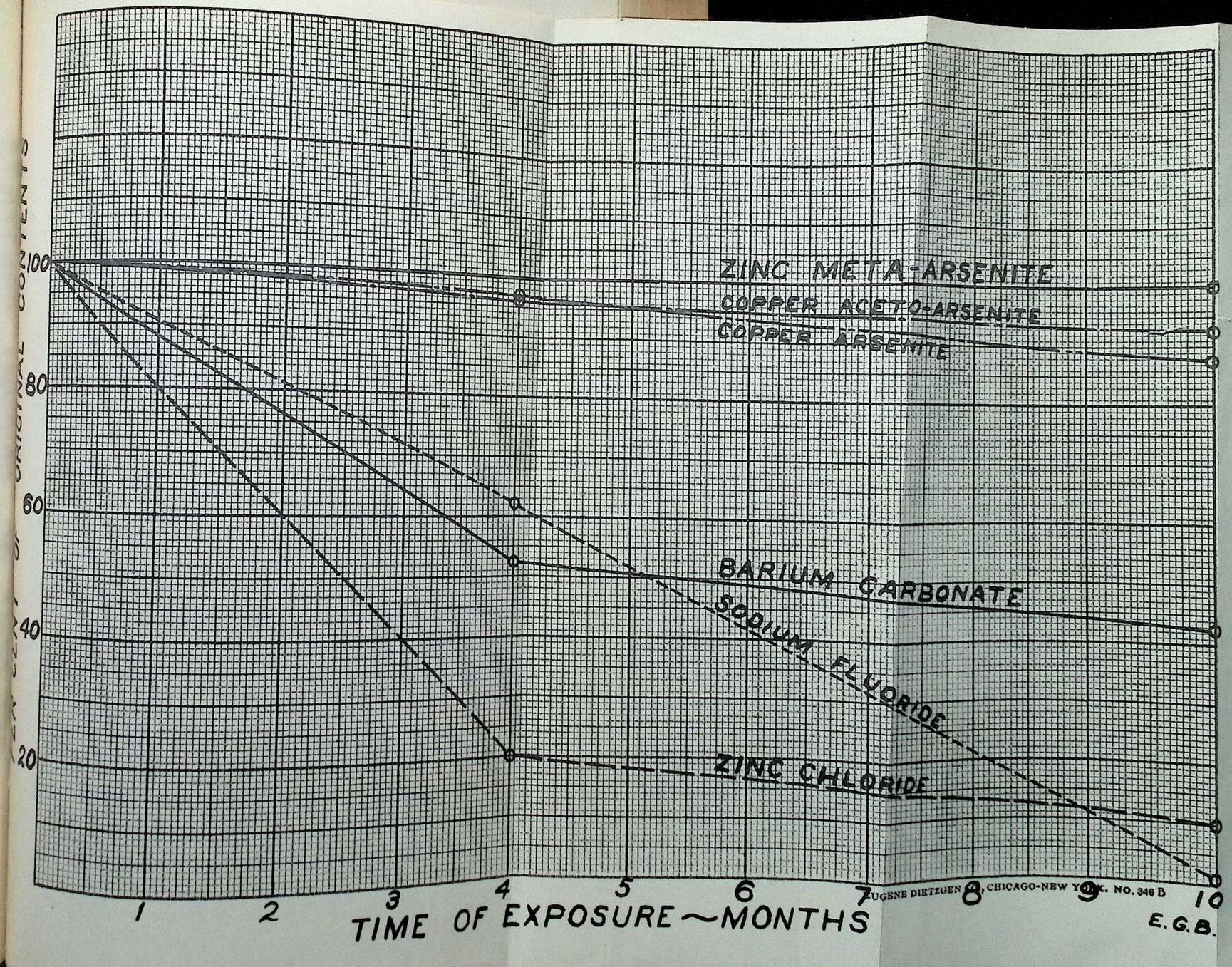
9. It can be painted over.

Throughout, these weathering tests of the arsenite preservatives were carried on in comparison with others whose service records are known and accepted. As long as we have relativity with us, comparison must be our yard stick. So it must not be construed that any reflection has been meant toward other preservatives used. Their record will stand always as a refutation of any aspersions that may be cast. These experiments were those of a customer and not a promoter. As such they have all been published in Industrial and Engineering Chemistry by Dr. L. P. Curtin, chief chemist of the Telegraph Company.

But it is gratifying to know that Zinc Meta-Arsenite retains its toxicity undiminished by exposure to the weather.

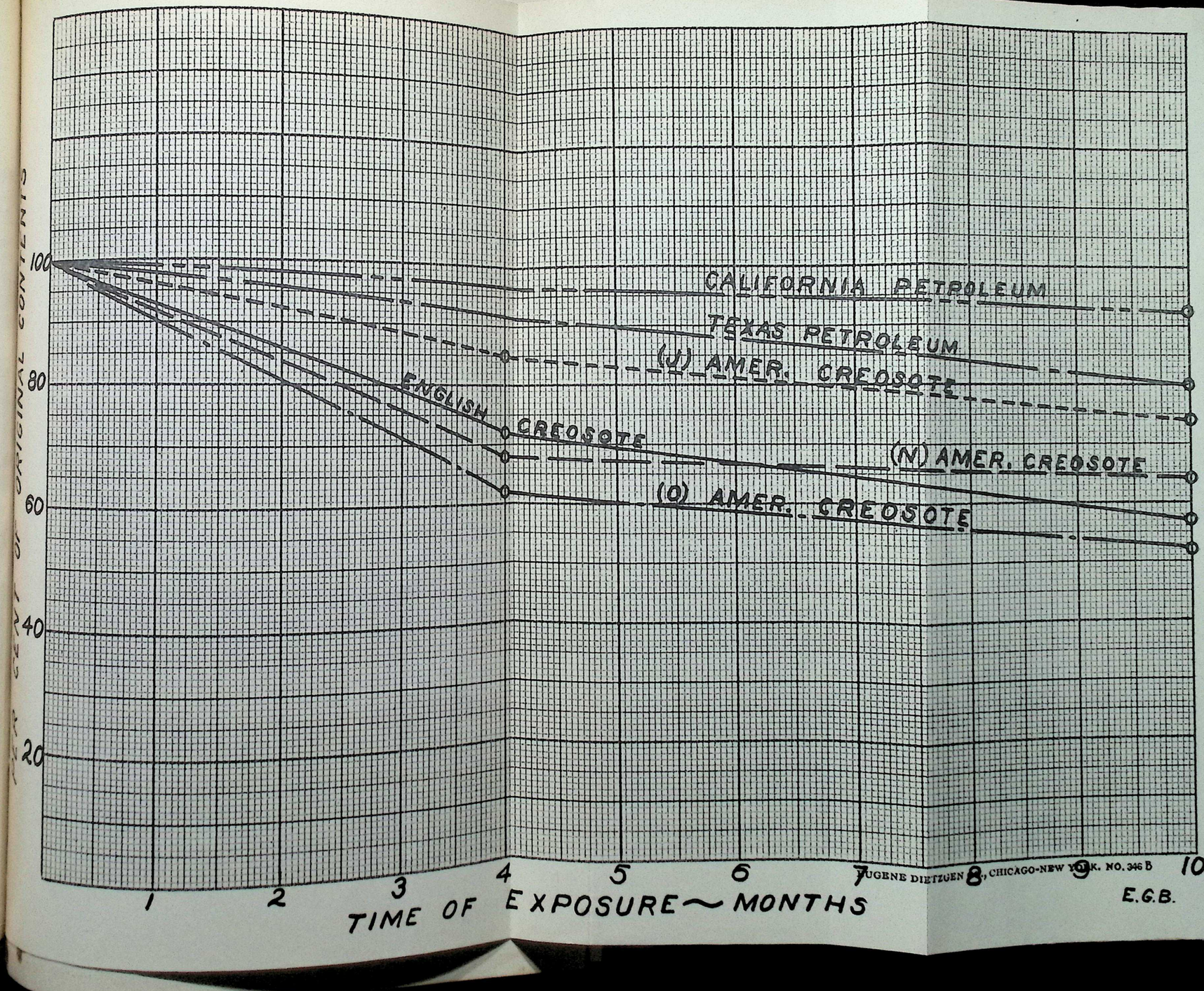



(d) AMERICAN CREOSOTE
ENGLISH CREOSOTE
CALIFORNIA PETROLEUM
(a) AMER. CREOSOTE
TEXAS PETROLEUM
(b) AMERICAN CREOSOTE
TIME OF EXPOSURE — MONTHS
EUGENE DIETZGEN CO., CHICAGO-NEW YORK. NO. 346 B
E.G.B.



EUGENE DIETZGEN CO., CHICAGO-NEW YORK. NO. 346 B

E.G.B.


CALIFORNIA PETROLEUM
TEXAS PETROLEUM
(J) AMER. CREOSOTE
ENGLISH CREOSOTE
(N) AMER. CREOSOTE
(O) AMER. CREOSOTE
100
80
60
40
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10
TIME OF EXPOSURE ~ MONTHS
E.G.B.

Discussion

THE PRESIDENT: A great number of us are interested in the preservation of wood, particularly in this section, and it is very gratifying to be told that something has been found which seems to answer all the requirements. Perhaps some of our members have had practical experience with some of these preservatives, or possibly have knowledge of some of the other tests that have been made with this zinc meta-arsenite. In any event, we will be very glad to hear from any of our members who have anything to say on this subject.

MR. BRASELMAN: Have you any tests showing extent of penetration, equivalent or similar to that of zinc chloride?

MR. BAILEY: The first one is a negative test, in which you spray a solution of starch and iodine on the wood. In the presence of an arsenite, the color fades immediately. Second, dip a piece of treated wood in copper sulphate and hold over ammonia fumes. A green color will result, similar to the one that I am showing you here. The third, silver nitrate dissolved in hydrogen peroxide, and then sprayed on a piece of wood, will show up a reddish brown color.

MR. YOUNG: Can it be used in salt water?

MR. BAILEY: No. It cannot be used in salt water because of the presence of the teredo. A preservative such as creosote is repulsive to him. A preservative like ours is so clean that he cannot help coming to it.

MR. HAMILTON: Is your preservative the same which is used by the Anaconda people?

MR. BAILEY: It is not the same. Theirs is, I think, a copper sulphate that they place in the ground. It eventually washes away.

MR. BRASELMAN: I would like to ask how much salt you use per cubic foot to equal a 12-pound treatment of creosote.

MR. BAILEY: I don't think I can quite answer that. Some engineers specify 12-pound treatment and some 8-pound treatment, according to their belief or experience. We put in a quarter of a pound of salt per cubic foot, which on the basis of our test we know gives us a factor of safety of twenty. In other

words, experiments showed that our zinc arsenite treatment could stop rot as low as two parts per ten thousand. We place in forty pounds per ten thousand. The salt does not cost very much and we wish to be on the safe side.

MR. BRASELMAN: What is the cost relative to creosote?

MR. BAILEY: That depends on the specifications and the market price of oil. A 10-pound treatment, for example, at 14 cents per gallon, would bring your cost to 16 cents per cubic foot. Our would cost 6 cents, or a saving of 10 cents. Our price does not vary. It is consistent at 6 cents per cubic foot or $5.00 per thousand.

MR. PORTER: What will your solution do in the presence of a soil that is acid?

MR. BAILEY: Acid soil can have no effect on it.

PROFESSOR GREGORY: The paper to-night was splendidly prepared and has been presented in a pleasing way. The speaker of the evening is to be congratulated on the way he has handled the subject.

This subject is of especial interest to engineers of this section. Pioneer work in the use of preservatives for wood was done in the South; we have a notable example of it in the Lake Pontchartrain trestle of the Southern Railway, which was built in 1883, and has been in continuous use for 45 years. The structure is about six miles long.

The timber used was all Southern pine; most of it is long leaf, but some of the material would be classed as loblolly, as the grain is exceedingly coarse. All holes were bored and all framing was done before treating with creosote. The specifications under which the creosoting was done are quoted in a recent article by the speaker in Engineering News-Record for September 6, 1928. This article gives in some detail the results of tests of beams from the structure, made during the past few years.

The bents of the Pontchartrain trestle were originally 15 feet long, but the demands of modern equipment and heavier traffic have made it advisable to double the original number of supports. The supports are not the only parts which have been increased. Originally, the cross-ties were supported by six stringers 30 feet

long and 6x16 inches in cross-section. These have been reinforced by adding two 8x16 stringers, one on either side, while the original stringers were moved a little nearer the center line of the structure. As time has passed, changes have been made and a few timbers have been replaced. Of 6,908 stringers in the original structure, 194, or about 2.8 per cent, have been replaced up to March, 1928.

The tests above referred to were made in 1909, 1912, and 1928. The results are given in considerable detail in the article referred to above, so it will only be necessary to give the summary and the conclusions here:

Table II—Comparison with New and Freshly-Treated Timber

Tests Pontchartrain Trestle	No. of Beams	ACTUAL LOAD at Elastic Limit	ACTUAL LOAD at Maximum	Stress in outer fiber at elastic Limit	Modulus of Elasticity
1909	14	21,357	40,851	3,049	1,469,000
1912	10	26,500	38,275	3,760	1,288,200
1928	12	27,500	42,875	3,940	1,422,500
Treated loblolly pine	108	.....	.....	2,972	1,278,000
Treated longleaf pine	44	.....	.....	4,690	1,690,000
Untreated loblolly pine	21	.....	.....	4,231	1,705,000

Lower three values obtained from Circular 115, U. S. Department of Agriculture, Forest Service, by W. Kendrick Hatt.

It will be seen from these figures that the creosoted material which has been in use for 45 years, in a warm climate, with high annual rainfall, compares favorably with new untreated wood, and also with recently treated wood of the same general characteristics.

MR. BRASELMAN: Have you done any work with, or do you recommend brush treatment?

MR. BAILEY: We do not permit brush treatment. Should a check come into the material, your brush treatment would be worthless. It would naturally fail, and we would get a black eye.

MR. KERR (Discussion submitted): My absence from the city upon the occasion of the presentation of Mr. Bailey's paper not only deprived me of the pleasure of hearing a very interesting talk, but prevented me from engaging in the general discussion that no doubt followed.

I wish I could have had the opportunity of discussing certain features of this paper at the time of its presentation, as there are several points of interest in regard to timber treatment that are worthy of consideration, and which the engineer must weigh carefully before he forms any definite decision in regard to processes or types of preservatives. Then, again, Mr. Bailey, in his enthusiastic rendition of the value of the particular product in which he is interested, tends to be rather harsh in his comparisons with other preservatives. This attitude is, of course, unintentional upon his part, and the purpose of this discussion is to emphasize some facts in regard to timber preservation.

The generally accepted theory of timber preservation is that after the timber has been thoroughly sterilized the preservative used must not only thoroughly penetrate the wood, but it must be at least partially soluble in order that it may readily function. This means that the food value of the timber must be destroyed, and an agent of destruction be ever present so that attack by any element may be effectively discouraged, even so far as incipient growth of any fungus is concerned. In other words, the generally accepted theory of effective timber preservation advocates the prevention of the formation of destroying fungus, or the initial discouragement of insect attack, by the ready solubility of the poison in any liquid. The theory advanced in the paper under discussion, however, presents a different thought in regard to the prevention of decay, when it is assumed that the fungus virtually commits suicide after formation by furnishing the necessary agent by which a water-soluble chemical is dissolved.

The preliminary laboratory work of the Western Union Telegraph Company in developing this theory has been excellently conceived and well and efficiently conducted. There is no doubt that the research work carried on in connection with this proposition goes far beyond any similar efforts, in the development of a wood preservative. The important and convincing factor that is lacking is the complete absence of service records, which only adequate time and usage can supply. Past experiences have definitely demonstrated the fact that accelerated laboratory tests cannot be accepted as conclusive, and the possibility is ever present that actual service tests may not confirm the conclusions de-

duced from comparatively recent and short time experimentations.

It is not my purpose in submitting this discussion to question in any way the merits of the zinc meta-arsenite theory of treatment as advanced by Mr. Bailey. My sole purpose is to suggest caution in the too ready acceptance of hitherto unproven theory and the breaking away from certain old time methods and standards, which have definitely proven their value by the acid test of time.

During the past decade, innumerable types of preservatives of accepted value in the laboratory, have proven absolutely ineffective in actual service, and out of the maze of experimentation, two preservatives have successfully withstood every test to which they have been subjected and have justified the confidence that the impartial wood preservative industry now accords them.

Accelerated laboratory tests have previously demonstrated the fact that rapid evaporation of the lighter components of coal-tar creosote may be expected. Subsequent actual tests, however, extending over long periods of years, conclusively demonstrate the fact that the preservatives remaining in the timber effectively prevented attack from all sources. Tests made locally upon the 45-year-old stringers of the New Orleans & Northeastern Railroad bridge definitely demonstrate the value of coal-tar creosote. Without doubt the original amount of creosote initially injected into these particular timbers decreased by leaching and evaporation during the early years of their active life, but that which remained in the wood was sufficient to establish an enviable record of service, practically unparalleled in the history of modern construction. The records of our own efficiently run Board of Port Commissioners will reveal instances where creosoted piling after 20 years of active service in our wharves have been salvaged and redriven in permanent work. The east approach of the Louisville & Nashville Railroad bridge at the Rigolets, but recently built, contains some of the salvaged piling from the old trestle built many years previously. Innumerable instances could be cited of the proven value of this preservative.

The same may be said of zinc chloride. Tests under actual service conditions demonstrate that this salt is an effective pre-

servative, and that its value as a preservative is not seriously affected by extreme leaching. In fact, accelerated tests of this salt are directly detrimental to its value as a preservative, and leaching is very much over-emphasized.

These two preservatives, coal-tar creosote and zinc chloride, possess the first three qualities stressed by Mr. Bailey: low cost, availibility in unlimited quantities and high toxicity. The fourth requisite of modern practice, the term permanence as applied to present day structures is indeterminate. The "permanent life" of any man-made creation. to be economically efficient, should cover its period of active service value, up to the time when obsolescence unfits it for further use. The accepted standard preservatives have proved that they will meet this requirement, and until any suggested substitute has likewise given physical demonstration of its value on equal terms, it should not be advocated and accepted without limit or question, as the cure-all of the weaknesses of timber construction, that is, destruction by decay and insect attack.

Comparisons are odious, and I believe that there is no necessity of questioning old-established standards of proven value to their seeming discredit in the advancement of personal interests. Every article of value should carry its own weight, and stand, as it were, upon its own feet, and prosper or fall by the service records that it will or will not establish, to justify the contention of its sponsors.

While the laboratory tests admittedly demonstrate that a new theory of apparent value has been advanced, and that the results so far obtained justify the continuation of the present line of experimentation, there are some questions that should be answered in regard to the value of the general application of this type of preservative. If all fungi emit acid secretions, which will set up the reactions necessary for their destruction, zinc metaarsenite should be of value for some purposes. There may be types of fungi that give off alkali secretions. Should this be the case, what protection to the timber could be expected? It is understood that samples of timber treated with this chemical proved ineffectual against teredo attack. What effect will it then have upon that enemy of timber in the warmer climates where the

termite is destructive, and of more serious menace than the germs of decay themselves? There is no definite record that termite attack is prevented by timber so treated and we must, of necescity, withhold our judgment until adequate tests may be made throughout a sufficiently long period of time.

In submitting these remarks, I wish to be understood in the light of offering constructive criticism alone . We are all interested in the promotion of new ideas, and the advancement of all and any experiments that will react favorably upon the activities upon which we are engaged. My sole criticism of the propositions as presented is that the author of the paper has been unjustly severe in his allusions to accepted standard preservatives, and that until these standards prove ineffectual, they should not be discredited. We are open-minded, and naturally inquisitive, especially in regard to questions pertaining to present day construction, and we, therefore, thoroughly investigate and lend our earnest efforts towards the development of any proposition of merit submitted. We will judge it, however, strictly upon its own merits, irrespective of competitive comparisons, and if we are impressed with its value, it will be because of its self-evident virtues, and not because of the alleged weaknesses of its alternates.

The proof of the pudding is in the eating thereof, so let us approach and judge this subject of timber preservation with open minds, and base our conclusions upon cold facts and accept any and all suggested processes and preservatives in the light of their proven value.

MINUTES OF MEETINGS AND BUSINESS OF THE SOCIETY

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

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

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

The President announced that he had appointed Mr. A. T. Dusenbury to represent the Louisiana Engineering Society on the Intracoastal Canal Committee, as requested by the Young Men's Business Club of New Orleans.

The membership of Mr. R. E. Chesnut was changed to Resident Member.

Letter from the Commissioner of Public Utilities was read, with which was enclosed a tentative draft of an ordinance relative to requirements for permits for making gas connections. The Board felt that the Society could not endorse an ordinance of such importance without further study, and on motion duly seconded, it was voted that the President appoint a committee of three to study the proposed ordinance and report at the next meeting.

There being no further business the meeting adjourned.

F. A. MUTH, Secretary.

Minutes of the Society,
September 10, 1928.

The meeting was called to order about 8:10 p. m., John L. Porter, President, in the chair, F. A. Muth- Secretary, and 53 members and guests present.

The minutes of the previous meeting were read and opproved.

Reports were received from Chairmen of the Committees.

The technical exercises of the evening consisted of a paper on "The Development of, and Timber Preservation with, Zinc Meta-Arsenite," by Mr. Kenneth M. Bailey. Interesting discussion followed and the speaker was tendered a rising vote of thanks.

The meeting adjourned to the usual collation.

F. A. MUTH, Secretary.

Minutes of the Board of Direction,

October 8, 1928.

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

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

The President announced that in accordance with authority of the previous meeting, he had appointed the following committee to investigate the proposed ordinance providing for permit for gas inspections: Prof. W. B. Gregory, Chairman; Mr. John J. O'Neil and John Riess.

The matter of the annual smoker was brought up by Mr. W. B. Moses, of the Entertainment Committee, requesting information as to the type of entertainment for the next smoker. On motion duly seconded, it was voted that the Resident Members be circularized, to secure from them an expression of their opinion as to the type of smoker they desired.

There being no further business the meeting adjourned.

F. A. MUTH, Secretary.

Minutes of the Society,

October 8, 1928.

The meeting was called to order about 8:10 p. m., Mr. John L. Porter, President, in the chair, F. A. Muth, Secretary, and 99 members and guests present.

The minutes of the previous meeting were read and approved.

Reports were received from the Chairmen of the Committees.

The death of Mr. George C. Schoenberger was announced, and on motion duly seconded, the following committee was appointed by the President to draft resolutions:

Professor W. B. Gregory,

Mr. John Klorer,

Mr. Gervais Lombard.

This was a joint meeting with the New Orleans Chapter of the American Institute of Radio Engineers.

The technical exercises of the evening consisted of an interesting address on "An Outline of the Underlying Principles of the Vitaphone, Movietone and Television," by Mr. Pendleton Lehde and Mr. A. A. Schiele.

An interesting discussion followed these addresses and a rising vote of thanks was tendered the speakers.

The meeting adjourned to the usual collation.

F. A. MUTH, Secretary.

The Proceedings of the Louisiana Engineering Society

Published bi-monthly, February, April, June, August, October, December, under the auspices of the Committee on Publication.

DOUGLAS ANDERSON, Editor.

The Louisiana Engineering Society is not responsible for any statement made or opinion expressed in this publication.

Subscription, $2.00 per annum Single copy, 35 cents

ADVERTISING RATES

	ONE YEAR	HALF YEAR	ONE ISSUE
Full page	$50.00	$28.00	$10.00
Half-page	28.00	15.00	6.00
Quarter-page	15.00	10.00	4 00
One-eighth page	10.00	6.00	2.00

For the back outside cover add 50 per cent to the above rates. For the inside covers add 25 per cent to the above rates.

Address all communications to
Douglas Anderson, Editor, Tulane University,
New Orleans, La.

Entered as second-class matter July 27, 1916, at the Post Office at New Orleans, Louisiana, under the Act of August 24, 1912.

Acceptance for mailing at special rate of postage provided for in section 1105, Act of October 3, 1917, authorized August 1, 1918.

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PROCEEDINGS
OF THE
LOUISIANA ENGINEERING SOCIETY

VOL. XIV. DECEMBER, 1928 NO. 6

CONTENTS

EDITORIAL NOTES AND COMMENT: PAGE

Talking Pictures and Television ... 195
A Telephonic Incident ... 197
February Meeting Postponed ... 197
New Members ... 198

IN MEMORIAM:

Resolutions on the Death of Major George C. Schoenberger ... 199
George C. Schoenberger—A Tribute. *By Gervais Lombard* ... 200

PAPERS AND DISCUSSIONS:

The Underlying Principles of Movietone and Vitaphone. *By Pendleton Lehde* ... 202
The Basic Principles of Radio Television. *By A. A. Schiele* ... 208
Discussion ... 218
Our Evening with the Telephone Company ... 220
Discussion ... 228
A Telephonic Incident ... 232

MINUTES OF MEETINGS AND BUSINESS OF THE SOCIETY ... 235

EDITORIAL NOTES AND COMMENT

Talking Pictures and Television. Two very instructive and interesting papers on these subjects were contributed to the October meeting of the Society: "The Underlying Principles of Movietone and Vitaphone", by Mr. Pendleton Lehde, and "The Basic Principles of Radio Television", by Mr. A. A. Schiele.

Such rapid progress has been made in the development and use of Movitone and the Vitaphone that we are now calling them "Talkies" in place of "Movies." The person of conservative tastes who desires to use his imagination even to the

slight extent permitted by the titles and the very obvious movements of the lips of the actors, is now denied even this privilege; for, what they do not tell you by these two methods, they now talk at you from the screen.

To one who really cares for good moving pictures, the addition of the speaking voices is not pleasing, but the "talkies" have come to stay, and it is only a matter of time when many of the present unpleasant features will be eliminated.

As Mr. Lehde points out, the device which has made possible these rapid improvements in the operation of the "talking movies" is the three element vacuum tube. He then describes in essential detail the principles involved in the two methods.

The Vitaphone is essentially a phonograph synchronized with the moving picture, while in the Movietone the sounds are first converted into light impulses and these are photographed on a "track" along the film at the side of the picture itself. After development and printing the process is reversed, the varying light impulses, when the picture is being shown, being directed upon a photo-electric cell, which converts them into electrical vibrations, which in turn are amplified and converted into sound at the loud speaker.

While Television, either by wires or by radio, has by no means reached the stage of simplified operation as is the case with radio, still as laboratory apparatus in the hands of skilled operators it has reached a high degree of perfection, and its future development and use will be dependent upon the improvement of the various devices which enter into the complete apparatus. This television should not be confused with the several methods now in use for the transmission of pictures by telegraph or by wireless. Television, as properly understood and as described in Mr. Schiele's paper, consists in the transmission of a full and complete picture of the subject, with all movements, changes of expression, etc., as they actually occur. For example, if the present rather complicated but highly perfected apparatus could be attached to our telephones, we could not only hear the voice of the person at the other end of the line, but could see his face like a small moving

picture in a frame about three times the area of a postage stamp.

A Telephonic Incident. Under this title there is published in this issue of the *Proceedings* a couple of letters which, it is thought, would be of interest to the members of the Society on account of the fact that the November meeting was given over to a visit of inspection to the new machine switching exchange of the Southern Bell Company on Baronne Street, as well as to the Main manual exchange on Poydras Street.

Furthermore, Dr. Brown Ayres was for nearly a quarter of a century connected with Tulane University as Professor of Physics and Electrical Engineering and as Dean of the Academic Colleges, and he was the founder of the College of Engineering. A great many of the members of the Louisiana Engineering Society were pupils of his. He also served as the technical expert for the Bell Company during the eighties when the suits for infringement of patents were being tried throughout the country.

Dr. Bell's letter is interesting as showing the quiet simplicity of the man and his keen sense of humor, qualities so often observed in men who are truly great.

February Meeting Postponed. At the meeting of the Society held December 10, it was voted to postpone the February meeting from the second Monday to the fourth Monday, February 25th, owing to the fact that the regular meeting would fall on the night before Mardi Gras, and also to the fact that the Committee on Technical Papers desired to use the February meeting as the occasion for the presentation of a paper on "Electric Welding of Steel Buildings and Bridges" by Mr. Frank P. McKibben, Consulting Engineer for the General Electric Company.

Arrangements have been made to hold this meeting in the Assembly Room of Gibson Hall, Tulane University, at 8:00 P. M., February 25.

The local chapters of the A. I. of A., the A. S. C. E. and A. S. M. E., as well as members of the Louisiana Architectural

Association and of the American Institute of Electrical Engineers are invited to attend this meeting.

New Members. The following names have recently been added to the membership rolls of the Society:

New Members.

O. Gordon Frick, 1702 Prytania St., with U. S. Engineers Office.

Claire W. Ricker, Tulane University, Professor of Electrical Engineering.

Non-Resident Members.

Walter I. Neel, 1006 N. 2nd St., Monroe, La., City Engineer of Monroe.

Transfer from Student to Resident Member.

Arthur J. Naquin, Jr., 624 Audubon St., Railway Equipment Engineer, New Orleans Public Service.

Resident Student Members.

Louis Caron, Jr., 1715 Napoleon Ave.
Howard M. Craig, 2533 Calhoun St.
Theodore L. Estorge, 614 State St.
John B. Geiger, 902 Eighth St., Gretna, La.
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Alvin E. Hotard, 829 Lafayette Ave., Gretna, La.
Harold H. Jaquet, 4501 S. Rocheblave St.
Evan W. Mahoney, 806 Belleville St.
John K. Mayer, 1728 Carrollton Ave.
Nelson W. Tremblay, 2025 Jena St.
All Senior Engineering students in Tulane University.

IN MEMORIAM

Resolutions on the Death of Major George C. Schoenberger.

On September 24, 1928, this community was shocked to learn that Mr. Geo. C. Schoenberger, Chief State Engineer, had suddenly passed away apparently in the fullness of health and activity. He was a member of this Society and personally known through his official position to practically every engineer in the State of Louisiana. Those who knew him intimately knew him as a man of modest demeanor and sterling qualities; one who was gentle yet withal firm in his dealings with his fellow man.

His intimate knowledge of the flood problem of the Lower Mississippi, his conscientious and unswerving application to the solution of that problem, and the dependence placed on his shoulders by the people of the Valley, make his passing away a distinct and well nigh irreparable loss to this State.

And to those loved ones he left behind, his family, it is difficult to express the terms that would fittingly measure the loss sustained by them.

This Society, therefore, in resignation to the stern mandate which removed from our midst a professional brother endeared to all of us by his amiable personality, here records its great sorrow and offers its condolence and sympathy to the members of his family in their bereavement.

JOHN KLORER,
GERVAIS LOMBARD,
W. B. GREGORY,
Chairman.

GEORGE C. SCHOENBERGER

A Tribute.

By GERVAIS LOMBARD

Major George C. Schoenberger was State Chief Engineer of Louisiana for four years prior to his sudden taking away on September 24th, 1928, and member of the Board of State Engineers for eleven years in all.

Major Schoenberger was a native of Louisiana; he was born in Plaquemines Parish, at Buras, in January, 1875, on the banks of the Mississippi River not far above its mouth.

Early in life Major Schoenberger seemed inspired with an ambition to help harness and control the mighty Mississippi, and, after receiving his early education in the local schools of Buras, he attended Louisiana State University, and graduated with high honors from its course in Civil Engineering ,equipped to undertake what he had chosen as his life's work. Then he immediately applied himself to the task with his full capacity, which was very great. He was employed by the Board of State Engineers on survey work upon the Mississippi River Levee System until 1902, when he changed over to the U. S. Engineers in charge of bank protection and other river regulation work in the New Orleans area.

Upon the death of Assistant State Engineer Marshall P. Robertson, in November, 1917, Governor Ruffin G. Pleasant appointed Major Schoenberger to succeed him as a member of the Board of State Engineers. It was then that Major Schoenberger's executive ability, sound judgment and winning personality were given an opportunity to become effective. Still greater scope for his talents and ability came with his appointment by Governor Henry L. Fuqua, in 1924, as Chief State Engineer to succeed the late Major Frank M. Kerr, who died in the spring of 1924.

The exhausting services rendered by Major Schoenberger during the high water fight of 1927 and his subsequent unceasing and herculean efforts in behalf of the passage of the National Flood Control measure of 1928, were the crowning achievements of his very full and extraordinary useful life, but

they proved fatal to his health. He knew not what it was to rest. His zeal, his initiative and his indefatigable energy carried him beyond the limits of human endurance.

Though cut down at the zenith of his usefulness to the community, the State and the Nation, the levees he built and the measures he helped shape for future flood control will stand as lasting monuments to his memory.

PAPERS AND DISCUSSIONS

THE UNDERLYING PRINCIPLES OF MOVIETONE AND VITAPHONE

By PENDLETON LEHDE.

Read before the Society, October 8, 1928.

In view of the great general interest in talking pictures it was thought that an explanation of the present day systems in use would be interesting to the members of this Society.

The idea of synchronizing voice and pictures is not a new one and the recent accomplishments represent the efforts of a dozen men extending over a period of twelve to fifteen years. The chief obstacle in the accomplishment of the task was the inability to faithfully reproduce the voice with sufficient volume and clarity to be acceptable to the public. The audion or radio vacuum tube has made this possible, particularly since the development of the three element vacuum tubes with higher outputs, commonly referred to as power tubes. The voice amplification method used in the various synchronizing systems is identical.

There are two well known systems of talking pictures on the market at the present time, namely, Vitaphone and Movietone, and a third about ready for commercial use, the Photophone.

The Vitaphone system has been developed and sponsored through the efforts of Warner Brothers and the Western Electric Company. The Movietone system was developed principally by Mr. Theodore W. Case, of the Case Research Laboratory, New York City, and the commercialism undertaken by Mr. Wm. Fox, of moving picture fame. Both systems use Western Electric amplification. The third system, known as the "Photophone," has been sponsored and developed by the Radio Corporation of America and the General Electric Company.

The Vitaphone system is a combination of improved motion picture projector and the usual phonograph disc record. The record used is about twice the diameter of the ordinary record,

rotates at half the speed, and contains a sufficiently long sound track to operate for the same length of time as the average pciture reel.

The making and showing of talking moving pictures is divided into three steps: recording, processing, and reproducing.

In recording talking pictures greater precautions are necessary as all extraneous sounds must be eliminated, the acting must be well rehearsed so as to avoid interruptions and repeats and, of course, music and other effects must harmonize. Studios have been completely reconstructed,—sound proofed,—which in some cases required the erection of new buildings, using brick walls to separate the various studios, and each studio must have walls covered with Celotex, soft plaster, Monk's cloth, draperies, or some combination of two or more of these.

The lights and camera are arranged as usual and the microphone which is used to pick up sounds is screened from the camera yet placed so that it will be in the range of the desired sounds. The microphone is connected to an audio amplifier which in turn is connected to an electro-magnetic recording stylus. As the camera begins to operate the wax disc rotates and the recording stylus, actuated by sounds picked up by the microphone and amplified by the amplifier, cuts an impression in the wax disc.

In the processing, the film negative is developed and printed in the usual manner and from it positives are made. The wax record is likewise converted into the usual form of disc record.

In reproducing the moving picture projector is driven by an electric motor which likewise drives the phonograph turn table. The record and the corresponding film both have an indicated starting point and if started in synchronism will remain so. The film is projected on the screen and the sound from the rotating record is picked up by means of a device known as an "electro-magnetic pick-up."

This electro-magnetic pick-up is just the reverse of the electro-magnetic recording stylus. The electric impulses, generated by the movement of the needle over the sound track on the

record, pass into the amplifier, where they are stepped up to a high level and conducted to four large exponential type horns actuated by electro-dynamic reproducing units. These latter units are improved telephone receivers, the diaphragms of which project their sound into large horns. The horns are suspended immediately behind the picture screen. The sound coming from the screen gives an impression of realism.

Incidentally, it is necessary to use a specially developed cloth for this screen. It is woven in such a manner that it will reflect the light yet will allow the sound waves to pass through without giving the impression of being muffled.

The film and record system has several advantages and likewise disadvantages. Without going into details it might be mentioned that it is not necessary to synchronize the sound with the picture in every case. Frequently it is possible to take the picture or at least parts of it and later project this picture and arrange the musical score separately. This is possible due to the sound being recorded on a separate wax disc, and not on the film, itself.

Correspondingly, one of the disadvantages in a synchronized picture is that should a section of the film be destroyed then the sound and the picture are out of synchronism. Likewise the wax record must be handled carefully and not allowed to be scratched, otherwise unpleasant sounds will be introduced.

The Movietone system records the sound directly on the film. The sound track is 1/10 of an inch wide and is adjacent to the sprocket holes in the film. The picture is photographed in the usual manner but the sound recording is accomplished by a different method.

The microphone picks up the sounds, they are amplified in the customary manner, and the amplified electrical impulses are conducted to a flashing lamp wherein the electrical impulses are converted into corresponding light impulses which are in turn projected on the sound track.

The Movietone film is recorded, processed and reproduced in the same general manner but this more interesting method of sound recording is used:

The amplified electrical variations corresponding to the original sound are conducted to a flashing lamp, termed "Aeo" light. This Aeo light consists of a quartz bulb one and one-eighth inches in diameter and six inches long, one end being rounded, the other end serving as a base for the conductors. Two elecrtodes are mounted close to the rounded end and one of these electrodes, the anode, is made of sheet nickle about an eighth of an inch wide and a quarter inch long. Opposite this anode is a U shaped cathode of platinum, coated with a mixture of alkaline earth oxides.

At the time of manufacture the bulb is evacuated and helium gas introduced in sufficient quantity to produce a concentrated glow around the cathode, when a potential of 350 volts and a current of 10 milliamperes is applied. This Aeo light is maintained in a slightly luminous state by an exciting battery and the electrical variations from the amplifier corresponding to the sound are superimposed on the bulb and the corresponding glow emitted is proportionate to the potential impressed.

This device is the heart of the recording system and is the faithful converter changing the amplified sound from electrical impulses into light impulses. The Aeo light is inserted in a metal tube, in the end of which is a quartz slit which presses very lightly against the film at the feed sprocket in the camera.

The slit through which the light passes consists of a piece of quartz about .2 of an inch square and 20 mils. thick. One surface of this piece is coated with a silver film and a slit ruled across it having dimensions of .10 inch x .0006 inch. A protecting glass cover is cemented over the silver coating, then ground down to about one-thousandth of an inch thick. The Aeo light is mounted directly back of this slit and as close as possible. The modulated light is projected through this slit and on to the sound track on the film.

In the processing work the negative is developed in the usual rack and tank. The printing is accomplished by the usual automatic continuous printers but the sound track is not printed at the same time as the picture. Masks are installed which protect the sound track while the picture is being

printed. The sound track is shifted with reference to the picture to provide proper synchronism on projection. The reason for this is that in the camera the distance from the center of the picture to the sound slit is 7¾ inches, while in the projector this distance is increased to 14½ inches.

In the developing it is necessary that the film be kept exceedingly clean otherwise dust particles will adhere to the film and cause ground noises.

Since the picture and the sound are printed separately on the film, it is possible to cut and edit it, as is done with the ordinary film.

In the reproduction of the Movietone film the sound track is moved through a linear beam of light. The variations or modulations corresponding to the sound recorded vary the light intensity passing through. These light variations are directed upon a photo-electric cell, which concerts the light variations into corresponding electrical variations which in turn may be amplified and changed into sound at the loud speaker.

The photo-electric cell is a most interesting development and consists of an evacuated bulb with elements mounted therein. The glass envelope is silver-plated and used as a concentrating reflector. This device operates in such a manner that when a light beam is projected into it, its electrical resistance changes in proportion to the intensity of the light. A photo-electric cell is mounted in the lower section of a standard projection machine and a 25 watt, 12 volt, straight coil filament lamp is arranged so that a beam of light is projected through a slit upon the sound track, and the modulated light passing through the film falls upon the cell. This photo-electric cell is connected to a three stage amplifier which is in turn connected to the Western Electric amplifying system and the loud speakers.

In both systems described it has been found necessary to refine the mechanical parts of the camera as well as the projection machine. Mechanical filters are required to obtain uniform motion of the turn table for the record and likewise uniform motion at the sound sprocket.

Incidentally, it might be well to mention that a film travels past the main projection beam in a series of steps or "jerks" whereas the sound track must pass in front of the corresponding light beam with uniform motion.

In conclusion your attention is directed to the three outstanding devices which have made possible present day talking pictures: the audion or radio vacuum tube,—the Aeo light and similar flashing cells, and the photo-electric cell so essential in reproduction.

It is unnecessary to mention the vast possibilities of the talking picture. Improvements are being developed daily and while certain installations in use at the present time may not be all that could be desired, it will be admitted that the progress made has been most gratifying.

THE BASIC PRINCIPLES OF RADIO TELEVISION

By A. A. Schiele.

Read before the Society, October 8, 1928.

Scientists have been striving for years to develop equipment which would permit sight at a distance, television. As early as 1847, Blakwell succeeded in transmitting simple line drawings and specimens of handwriting over a telegraph line. The problem in television is to convert light waves in a given sequence into electrical impulses on the transmitting end, and to reverse this process on the receiving end. The early inventors used the selenium cell to convert the light waves into electrical impulses. Due to the lack of sensitiveness and slow action of these cells the early investigators were seriously handicapped, and though television was not achieved, some remarkable results were obtained, considering the limited facilities at their disposal. One of the most successful systems was that of Korn, who, in 1907, established a regular service between London and Paris. The first picture transmitted was that of King Edward VII.

In a brief paper, it is impossible to give due credit to the many scientists who have contributed to the advancement of the art by new discoveries or improvements in existing apparatus. While the details and applications may differ, the basic principles of all the various systems are the same. I will, therefore, confine my remarks to a description of one of the simple systems.

Television, as it exists to-day, is not a new invention—rather, it is the co-ordination of various units of apparatus that in large measure have been borrowed from other branches of science. The development of the three-electrode vacuum tube is largely responsible for present developments in television, because it provided a means of amplifying the feeble electric currents used until they were strong enough to be sent out and actuate the recording mechanism at the receiving instrument.

There are three methods by which television may be accomplished. In the first method, a photograph is taken of the person whose image is to be transmitted. This photograph is

placed in the transmitting machine, where the high lights and shadings of the picture are converted into electrical current of varying intensities by a device known as a photo-electric cell, which might be termed the "eye" of the transmitter. They are then sent on to the receiving instrument where they are converted back into light waves, and recorded on a photographic film. The photograph is not received at once as a complete picture, but is transmitted and received a line at a time. After a period of from seven to twenty minutes, the picture is complete. This might be termed tele-photography.

In the second system, a moving picture film is substituted for the photograph used in the above system. The film is run through the transmitted, where it is transformed into electrical impulses and appears on the screen of the receiving instrument at once as a complete picture with actions. We will call this telemovies.

The third method is the one that can be correctly termed television. In this system the person whose image is to be transmitted is placed in front of the "eye" of the transmitter, (photo-electric cell). A source of intense artificial light or sunlight is permitted to illuminate the face of the person who is being televised. The reflected light from the subject's face is intercepted by the photo-electric cell or "eye", where it is converted into electrical impulses, and then transmitted to the receiver. On the screen of the receiving instrument, the person's image appears against a pink background. Any motions on the part of the subject before the transmitter are immediately reproduced as such in the received image. With certain modifications, all of the above systems can be used with either "radio" or a telephone line as a connecting medium between the transmitter and receiver.

The essential units of a radio television transmitter consist of the following:

A modulated continuous wave tube transmitter.

A source of light.

A photo-electric cell.

A scanning disc, rotated by a synchronous motor.

TRANSMITTER: The vacuum tube transmitter may be that of any good broadcasting station, but it will be necessary to replace the transformer or impedance coupled speech amplifier of the station with one of the resistance coupled type, in order to secure uniform amplification over the wide band of frequencies (approximately 27 K. C.), required for satisfactory television.

LIGHT SOURCE: The electric arc is used in the majority of systems as a source of illumination.

PHOTO-ELECTRIC CELL: There are several types of photo-electric cells available. One type consists of an evacuated glass vessel about the size and shape of a 75 watt Mazda lamp, equipped with a UX type base. The inner surface is silvered and covered with a deposit of potassium hydride. This deposit completely covers the inner surface, with the exception of a small area or window about 1½" in diameter. Mounted in the center of the cell is a small circular plate; this forms the anode, and the potassium coating on the inner surface of the cell, the cathode. These cells have the property of decreasing their resistance when exposed to light. This action is due to the fact that a negatively charged body loses its charge when exposed to ultra-violet light. The cell is mounted in an enclosure so that only the reflected light from the image of the person that is to be televised can enter the window of the cell, thereby causing its resistance to rise and fall in accordance with the variations in light entering the cell. These variations will be governed by the areas of light and shade in the image to be transmitted. This cell is connected to the input of the resistance coupled amplifier previously mentioned where the feeble impulses generated by the cell are amplified sufficiently to actuate the transmitter. These amplified currents from the photo-electric cell are used to modulate the "carrier" of the transmitter, in the same way that the "voice currents" generated by the microphone modulate the "carrier" of the regular broadcasting transmitter.

There is a great difference, however, between ordinary broadcast of music or voice and the broadcast of television. The first is a one dimension or straight line affair, while the second has two dimensions, length and width. The music is a series of suc-

cesive signals, transmitted one after the other; the picture must be a complete square. No one has found a means of transmitting an entire picture instantly. Instead, an optical illusion is utilized, the same lilusion which makes movies possible. It is called the resistence of vision. When the eyes see an object, the image is retained for a fraction of a second after the object has been removed. Because of this property, if approximately sixteen pictures are shown the eye each second, and each succeeding picture is slightly different from its predecessor, the eye is deceived with an illusion of movement.

In television, the image to be transmitted is divided into numerous small areas referred to as "lines", a term borrowed from the printing trade. In making "cuts" or half-tones of pictures that are to be printed in papers and magazines, the picture is photographed through a glass plate ruled with equally spaced vertical and horizontal lines; this is called a screen, and is referred to as a screen of so many lines per inch, such as 24 lines, 60 lines, etc. As the lines run both vertical and horizontal, the screen will be divided into a large number of squares of uniform size, in the case of a 24 line screen, each square inch of the screen would contain 576 small squares.

In television, the process of "lining" or dividing the image is accomplished by means of a large mental disc, rotated at high speeds by an electric motor of the synchronous type. This disc, known as a scanning disc, is mounted between the source of illumination and the image to be televised. This disc contains a series of 24 or more holes, arranged in the form of a spiral. The distance between the outer and inner end of the spiral on the disc used at present is 1½", hence the received pictures are of this size. Jenkins has improved upon this by mounting a magnifying glass in front of the scanning disc, which increases the size of the received picture to 4" square, but this is the maximum at this time.

The operation of the scanning disc is as follows: With the disc at rest, and adjusted so that one of the holes is aligned with the beam of light, we will get a small beam or pencil of light falling upon a small area of the object to be televised; if the disc is now rotated by hand through a few degrees, the beam

will pass across the picture as a band of light in a horizontal plane. We will thus have scanned the picture from left to right, or vice versa, and this will correspond to one "line".

As previously mentioned, the holes in the disc are laid out in spiral formation, so that each succeeding hole that passes the beam of light when the disc is rotated, is describing a circle with a radius smaller than the preceding one; therefore, the pencil of light, as the successive holes in the disc pass by, falls on the object in a plane slightly lower than the preceding one. The holes in the disc are spaced a sufficient number of degrees apart so that the pencil of light from one hole will have passed across the object in a horizontal plane and off to the side before the next hole has started a second pencil of light across the picture. Thus the picture is completely scanned from left to right and from top to bottom once for each revolution of the disc.

The reflected light from the televised object is focused on the photo-electric cell, and as each small section of the object is illuminated by the light beam, the intensity of the light reaching the cell will vary in accordance with the areas of light and shade in the televised object. The photo-electric cell converts the light variations into electrical impulses by varying its resistance with the changes in illumination. The number of holes that can be used and the number of pictures which can be transmitted each second, that is, the speed at which the disc can be revolved (for each revolution transmits one complete picture; depends primarily upon the sensitiveness of the photo-electric cell.

There is also another limiting factor; the width of the channel required to broadcast television depends upon the number of "lines" per picture and the number of pictures per second. If the transmission is to be confined to a single broadcast channel (10 K. C. wide), the maximum number of pictures per second is 15, and there cannot be more than 24 "lines" to the inch. An idea of the amount of detail in such a picture may be gained by examining a newspaper photograph. These average sixty lines to the inch, while half-tones for printing in magazines on high grade paper will run from 110 to 150 lines per inch. By using very sensitive photo-electric cells, pictures of 36, 48 and

60 lines per inch are being broadcast, but this requires anywhere from one to four channels each 10 K. C.'s wide. With the present congestion of broadcast channels, this is a serious disadvantage. In addition to this, special receiving units are required, as the regular broadcast receiver, (in order to be selective as to voice or music), is only designed to cover a band of frequencies 10 K. C. in width.

To summarize, the operation of the transmitter is as follows: The beam of light from the "arc" is passed through the openings in the scanning disc, and illuminates the object to be televised. The reflected light waves from the object enter the photo-electric cells, where they are converted into electric impulses; from here they are fed into a vacuum tube amplifier of the resistance coupled type. The output of this amplifier is then fed into the modulator tubes, where it is super-imposed upon the carrier of the transmitter and then radiated out into space, and may be received by anyone within the range of the station, provided the proper receiving equipment be used.

RECEIVING APPARATUS

The equipment required for the reception of radio television will consist of the following:

A radio frequency amplifier and tuning units, designed to give uniform amplification over the required band of frequencies.

A resistance-coupled type audio amplifier with sufficient amplification to properly actuate the neon glow lamp.

A neon tube, or lamp.

A scanning disc, with the same number of holes as that of the transmitter; it must be rotated at the same speed as the transmitter.

A means of controlling the motor speed to permit synchronizing the receiving disc with that of the transmitter.

RADIO FREQUENCY AMPLIFIERS For the reception of television signals on regular broadcast frequencies, where the pictures are not more than 24 lines per inch, the radio frequency part of a regular broadcast receiver may be used. A number of the transmissions are on short waves, and to receive these, a short wave receiver is required. In the reception of pictures of more

than 24 lines, if distortion is to be avoided, a special form of radio frequency amplifier must be employed. It must be designed to deliver uniform amplification over a band of frequencies 40 K. C. or more in width, depending upon the number of "lines" to the picture, and the number of pictures transmitted per second.

Resistance-Coupled Amplifiers This can be the conventional type that was very popular in broadcast circles about a year ago; the last stage should be a 171 tube or larger, and the filament and plate supply must be "pure" D. C.

Neon Tubes This consists of a tubular shaped glass vessel, in which are mounted two metal plates, approximately 1½" square. The plates are mounted in a vertical plane, a slight distance apart. They are insulated from each other and a lead from each plate connects with a contact pin in the base of the tube. The tube is filled with "neon" gas, and when a sufficient potential is applied, to the plates of the tubes, this gas ionizes and the plate that is at the higher potential, glows with a pink light; the other plate remains dark. In the system under discussion, the plate of the neon tube becomes the "screen" on which the image appears, and will, therefore, be referred to hereafter as the "screen".

Scanning Discs This must be a duplicate of the transmitting disc; it must rotate at the same speed and in the same direction, and have the same number of holes. The speed of the disc is synchronized with that of the transmitter by short-circuiting a portion of an external resistance that is inserted in series with the motor. This speed will range from 450 to 1260 revolutions per minute, depending upon the station from which the "broadcast" is being received. This disc might be compared to the shutter on a moving picture projector, which permits the picture to remain on the screen for a fraction of a second, then closes, shutting off the light until the next picture is in position, when it re-opens to allow the second picture to be projected on the screen.

The receiving process is the reverse of that of transmitting. The picture or image that was dissected to be transmitted must be re-assembled into a complete picture. The carrier wave of

the transmitter is intercepted by the receiving aerial, passed into the radio frequency amplifier, thence to the detector, where the signal is de-modulated. The audio component of the signal is transferred to the resistance coupled amplifier and the output of this amplifier actuates the neon tube, causing it to glow in response to the variations in the incoming signal. Interposed between the neon lamp and the observer is the scanning disc. The neon tube is mounted behind the scanning disc in line with the holes in the disc, so that each time one of the holes in the disc passes in front of the neon tube, the observer sees a part of the neon tube plate through the hole in the disc. The holes in the scanning disc are very small. Therefore, each hole permits only a small portion of the neon tube plate or "screen" to be observed, but as the disc is rotated, the spiral formation of the holes permits the entire plate surface ($1\frac{1}{2}''$ square) to be viewed once for each revolution of the scanning disc.

Due to the persistence of vision, previously mentioned, the eye is deceived into believing that the screen is glowing with different intensities at various points on its surface; thus giving the required contrast of light and shading in the reproduced image. That this is purely an illusion may be proven by removing the scanning disc and examining the tube plate; it will be found glowing uniformly over its entire surface.

It takes considerable time to explain the action of the scanning disc, but its operation is extremely rapid; as an example, take the following case: A scanning disc with 60 holes is used to receive a television broadcast transmitted at the rate of 15 pictures per second. Therefore the number of impulses per second equals $60 \times 15 = 900$. This means that when we view the neon tube plate ("screen") through the scanning disc, our vision is interrupted 900 times per second and after each interruption our vision is shifted so that we are viewing a different section of the screen. In view of the foregoing, we can appreciate the necessity for exact synchronism in the operation of the scanning disc at both the transmitting and receiving stations.

In addition to operating in synchronism, the disc must rotate in the same direction and in correct phase. Otherwise, the received image will be divided into two halves by a vertical line.

Assuming the received image is that of a man's face, we will find that half of his nose will appear at both the right and left hand edges of the screen while in the center of the screen his two ears will appear one on each side of the vertical dividing line; this is an extreme form of distortion due to the disc motors operating "out of phase". This distortion is similar to that experienced when the framing device on a moving picture projector is incorrectly adjusted; in which case we find the picture on the screen divided into two halves by a horizontal line, with half of the actor's body above the line and the other half below the line. The problem of proper synchronism has been the subject of much study and investigation, but this phrase of television still offers opportunities for great improvements.

A few of the methods used to secure synchronous operation are as follows: First, controlling the motors of both discs by means of an electrically driven tuning fork; second, by using a piezo electric crystal to control a three-electrode vacuum tube oscillator, the output of each in turn controls the disc motors; third, by the use of special forms of synchronous motors.

When the motors at both the transmitting and receiving stations are controlled by a timing impulse sent out by the transmitter, satisfactory synchronism is obtained, but there is a disadvantage in the use of this method, in that it requires an extra pair of wires or an additional radio channel to convey the synchronizing or controlling current. As the above methods are both costly and complicated, the sets offered to the general public do not use those methods. Instead, a variable speed motor is employed at the receiving station, and it is adjusted so it will rotate slightly slower than that of the transmitting disc.

Inserted in the motor circuit is a speed regulating resistance; by means of a conveniently located switch, this resistance is periodically short-circuited, thereby increasing the motors speed. By opening and closing this switch in the proper sequence, the tendency of the image to pass off the screen either to the right or left is overcome and the picture remains in the center of the screen.

The foregoing description covers the simplest type of television apparatus. Several scientists have developed systems

which are vastly superior to the simple system described, amongst whom we may mention

Dr. Ives of the Bell Laboratories
Baird of Scotland
Swinton of England
Alexander of General Electric Laboratories
Jenkins of Washington
Conrad of Westinghouse, and others,

but as yet most of these are not available to the public.

Some of these systems give images that are faithful reproductions of the original; one or two permit pictures in colors to be transmitted, and one laboratory is developing a method which, if successful, will permit life size images to be reproduced. From results obtained at present from the last mentioned system, the engineers who are carrying on these investigations feel confident that success will crown their efforts.

At the present time, television is not ready for the general public; it can be compared to our early radio broadcast where one had to be a real experimentor to succeed in obtaining results from the crude apparatus available at that time. If you have a fancy for experimental work, then television will prove an interesting hobby, but it has not reached the stage where you merely "press the button."

Numerous kits to build television sets are available, and several manufacturers are offering complete factory built television sets, but the consensus of opinion of our leading scientists is that television is not ready yet to be offered to the public as a commercial proposition.

In receiving television broadcast, it is not sufficient to know what broadcast station is transmitting and its wave length. It is also necessary to know at what speed the scanning disc must rotate, and the number of holes the disc must have for that station. For the benefit of those who may wish to tune in for these broadcasts, there is given below a list of stations, together with the necessary data to permit adjusting the apparatus to receive them.

In closing, I will quote a humorist who stated that: "The owner of a two tube set will soon be able to get everything a picture house can offer except the ultra-polite ushers, the lobby

statuary and the *optimist* outside the box office who tells you there are plenty of good seats inside." I would say that this humorist was something of an optimist himself.

LIST OF STATIONS BROADCASTING TELEVISION.

Call Letters	Location	Wave Length In Meters	No. of Holes in Disc	Speed of Disc R.P.M.	No. of Pictures per Second	Schedule
WGY	Schenctady, N. Y.	379	24	1260	21	Sunday 10:15-10:30 P. M.
2 XAF	Schenctady, N. Y.	31.4	24	1260	21	Tuesday, Thursday, Friday, 1:30-2:00 P. M.
2 XAD	Schenctady, N. Y.	22	24	1260	21	
3 XK	Washington, D. C.	46.7	48	900	15	Monday, Wednesday, Friday, 8:00-9:00 P. M.
WRNY	New York City	326	48	450	7.5	5-10 minute periods every hour station is on the air.
2 XAL	New York City	32	48	450	7.5	
9 XAA (WCFL)	Chicago, Ill.	61	48	900	15	10:00-11:00 A. M. daily, except Sunday.
WMAC	Chicago, Ill.	447.5	45	900	15	11:30-12 P. M. daily.
4 XA (WREC)	Memphis, Tenn.	——	24	900	15	Irregular
1 XAY (WLEX)	Lexington, Mass.	62	48	900	15	9:30 P. M. daily.
8 XAV	Pittsburg, Pa.	62.5	60	960	16	Irregular

Discussion

A VISITOR: What is the extent of development in television? How far have they gone in getting scenes?

MR. SCHIELE: Jenkins of Washington is now transmitting moving pictures three times a week by television. These pictures are not the regular half-tones such as you would witness in the ordinary moving picture theatre, but are merely a black image against a white back-ground, so that they appear as silhouettes. Furthermore, the subjects used are relatively simple, such as a child rolling a hoop, bouncing a ball, or something that does not involve a great amount of detail. The Westinghouse Company, through station KDKA, will be on the air with a series of television motion picture broadcasts in the near future. WGY and WRNY are on, on an average of three times a week with both still pictures and televised images. Due to the limitations previously mentioned, it is impossible at this state of development to secure a picture that is "life size". The received image will only be 1½" square; this small size renders it impossible to televise scenes such as football games or similar events.

Television at the present time, is about in the same stage of development that broadcasting was in 1920. At that time, those of you who were experimenting with radio probably recall that it was considered quite a feat to obtain the simplest forms of sound, such as someone whistling, or a much-abused phonograph record, the reproduction of which could not be classed as musical entertainment. In turn, if you are satisfied to receive rather incomplete pictures, and in some cases, only hazy outlines, then television will prove of interest to you at this time; but if you are expecting the same amount of entertainment out of television that you are now receiving from a high-class broadcast receiver, you are going to be disappointed.

DR. ELLIOTT: Are there any statistics at present giving number of manufacturers now engaged in the production of television equipment?

MR. SCHIELE: At present time there are approximately fifteen or twenty systems that are being perfected, a number of which are expected to be placed on the market in the near future. Jenkins expects to have a television receiving set available for the Christmas trade, and there are a number of sets in kit form that can be purchased at the present time. The Bell Laboratories, Westinghouse Electric, Jenkins, Baird of Scotland, and the R. C. A. have developed systems that should in the near future materialize into commercially practicable forms, though at the present time they are only in the laboratory stages.

A MEMBER: I am familiar with the short-comings of radio broadcast reception and know that static causes considerable interference. What effect would these atmospheric disturbances have on television?

MR. SCHIELE: Static causes interference in television reception, and manifests itself in the form of lines running across the picture. However, static of an intensity to be very objectionable when listening to music does not create the same amount of disturbance in television work, due to the fact that the static is received at irregular intervals, which gives the pictures a sort of mottled back-ground. Fading is of more serious disadvantage than the static, for, in the case of fading, sections of the picture will be lost.

OUR EVENING WITH THE TELEPHONE COMPANY

The regular monthly meeting of the Society was given over to a visit of inspection to the new Raymond Exchange and the Main Exchange of the Southern Bell Telephone Company. This meeting was planned and arranged by the Committee on Technical Papers through the courtesy of Mr. C. A. Stair, Louisiana Manager, and other officials of the Bell Company.

The function began with a brief meeting of the Society in the Assembly Hall of the Raymond Exchange, at which short addresses were made by Mr. Stair, Mr. Copeland and Mr. Weinstein, giving general facts and statistics about the telephone business and explaining the general technical processes involved in the design and operation of the telephone switchboard and its most modern development, automatic or machine switching.

MR. STAIR'S REMARKS

Mr. President and Gentlemen of the Louisiana Engineering Society:—I want to say that we are very glad to have you with us this evening as our guests, and we are more than pleased with the suggestion made by one of your members that we have some one or more persons in our organization explain the operation and the whys and wherefores of what we call the dial system, technically known as machine switching. We are very glad to do that, and we have two gentlemen, one of whom will first undertake to talk to you about the telephone service and equipment from its very early stages up to the present manual multiple system, and he will be followed by the gentleman who will talk on the dial system.

It might not be inappropriate for me to cite a few facts and statistics with respect to the telephone industry in this country and in the world, but I shall touch only on a few of the high spots.

The telephone was invented fifty-two years ago, in 1876. At that time the voice was carried a distance of from one room to another. To-day, there is no limit to which it may be carried, as witnessed by our European conversations daily. In the be-

ginning, or rather when the telephone was invented, there were only two in the world. Now there are something close to thirty million telephones in operation in the world. The Bell System itself in the United States has of this number about fourteen million; other companies, approximately 9,000 in the United States, are serving something over four million subscribers, all connected with the Bell System, making a total of owned and connected telephones served by the Bell System in this country or more than eighteen million. There are a few, perhaps 200,000, not connected with the Bell System. Approximately sixty per cent of all of the telephones in the world are in the United States. Europe has about twenty-eight per cent of the telephones in the world.

In 1876 there was practically no investment in the telephone business, there being only two telephones, and whatever it cost to put them together. If you gentlemen have not seen a model of the first telephone, you may see one in one of the windows downstairs in this building, and it is rather a crude affair.

At the end of 1927, the Bell System had invested in the telephone business three billion four hundred million dollars.

In 1876 there were only two stockholders. At this date there are about 440,000 stockholders in the Bell System in the United States, and one of the most interesting things about that is that not a single sockholder of the 440,000 owns 1% of the stock in the System. It has more stockholders than any other company, there being several thousand in Louisiana.

With your President's permission, I am now going to introduce to you a member of our organization who will talk to you on the subject of telephone equipment from the period when the telephone was first invented through the period when various types of equipment were used to what is known as the multiple manual common battery equipment and its operation. Following this talk, another member of our organization will undertake to explain to you something about the history, as well as the operation of what is commonly known as the dial system. Both of these gentlemen will be glad to have you ask any questions in connection with their talk or their description of the operation of the two systems concerning points that may not be entirely

clear to you. It will be preferable, however, I think, to have you wait until after both talks have been completed, and then ask the questions you desire to have answered.

The necessary arrangements have been made when this part of the meeting will have been finished to conduct all of the members of your organization present through this building, in which the dial system has been installed and is in operation, and following that, to take you through the building immediately adjoining, in which manual equipment is installed and in operation. Representatives of the Company who are competent will explain the operation of both the dial and manual systems and also, what is to my mind the most interesting operation of all, the manner in which connections are made from dial equipment to manual equipment, and vice versa.

Following the completing of your visit through the two offices, you are expected to repair to our dining room on the second floor of the adjoining building and there partake of a little supper which we have prepared for you.

I will now introduce, as the first representative who will talk to you, Mr. B. B. Copeland, to be followed by Mr. Sam Weinstein.

MR. COPELAND'S REMARKS.

GENTLEMEN: The subject assigned to me to-night is the evolution of the telephone switchboard, and as the gentleman who prepared this program very wisely limited my time to ten minutes, I shall be unable to do more than give you a general outline of the switchboard development in non-technical terms. The evolution of the switchboard, like the evolution of man, is a very long story, indeed.

For the two years succeeding the invention of the telephone, service could only be given between two people, one connected to each end of the line. Even at this early date, the necessity for inter-communication was realized, and in 1878, at New Haven, Connecticut, the first commercial switchboard was placed in service, having twenty-one subscribers. This switchboard was a box-like arrangement with each line terminating on an arm similar to a rheostat arm. This could be rotated and connected to points in the arc of its circle which were connected with the

other twenty lines, thereby affording a switching arrangement so that any two lines could be connected together.

In 1879, a switchboard was installed in New York City using boy operators, and this switchboard was similar in appearance to a stock broker's board and the switching was done by means of pegs. Needless to say, the experiment of using boys as operators did not prove successful, and they were replaced at an early date by girls.

About this time there was still another arrangement for switching whereby the subscriber would press a button which would connect him with the operator, but the operator, not knowing who the subscriber was, it was necessary for the subscriber to give his number together with the number he wanted; for instance, he would say: "This is No. 71; connect me with 92", and the operator would then plug the two numbers together by means of a cord. As the demand for telephones increased very rapidly, it was only a year or two until there were too many subscribers in any one city to be served by one operator, and in 1880 the first multiple switchboard was installed in Chicago. The principle of the multiple switchboard, which is in effect to-day, is a very simple one, and consists merely in having each line terminate in two or more positions instead of only one. In other words, instead of having the pair of wires which connects with the subscriber appear in front of only one operator, it was multiplied so as to be accessible in as many positions as it was found necessary to install. While the methods of those days were crude as compared with the ones now in use, the same general idea holds good and is in use in the large manual offices of to-day.

Until about 1897 the only telephone exchanges in operation were of the magneto or local battery type, which merely means that the battery for each telephone was kept at the telephone, and that all signaling to the operator was done by hand by means of a magneto. This system, although much improved, is still in effect in some of our small towns and communities. About 1897, the common battery signaling and talking method was developed. This consists of having a large storage battery located in the central office which provides both talking and signaling current for

all subscribers and operators. This method is still in use in all common battery offices, and as you know, all that you have to do to signal an operator in our larger cities is to remove the receiver from the hook, which action causes a relay to operate and illuminate a light in front of the operator who serves your particular line. Many of the old magneto boards grew to large size, and, I believe, one of the largest was installed in Paris, France, but I am unable to tell you just how long this switchboard was.

The next development was that of connecting between two different offices, or, in other words, when enough telephones had been installed to justify a new office, some means of connecting the two had to be devised. This was known in the early days as the traffic or express system, while we know it now as the trunking system. Briefly, it consists of providing a number of common trunks between each office. Here in New Orleans we have trunks between Main and Uptown or Uptown to Main, from Jackson to Walnut or Walnut to Jackson, etc. The method of trunking a subscriber from one office to another is this: If you are in Main and are calling Uptown, the Main operator depresses a key which connects her with the trunking operator in the Uptown office. If you are calling Uptown 1000, she tells the operator that she wants 1000, whereupon the Uptown operator merely inserts her end of the trunk in the number 1000, telling the Main operator to use trunk No. 1. The Main operator then connects you to trunk No. 1, and the connection is established. The signaling is electrically controlled so that when you complete your conversation a light appears in front of the operator who first answered your call and she disconnects you, and this, in turn, gives a disconnect signal to the trunk operator in Uptown.

So far, we have only discussed manual types of switchboards, or, in other words, those operated manually. The so-called automatic system is not new, having been invented about thirty-three years ago. However, the Bell System has only been using it a few years because it had not been perfected to the point where they felt it would give the grade of service desired. Since it has been so perfected, the Bell System has entered into its use quite extensively. The first "official" name for the automatic telephone was machine switching, or, in other words, the switch-

ing of calls by machinery. As this term did not mean much to the general public, the later term of "dial" system has been adopted and no doubt will come into general use, as the dial is that part of the arrangement which is most familiar to the person using it. The dial system, as will be explained to you by the following speaker, consists of having a telephone equipped with a dial which sends a series of impulses into the central office, where they are translated into action by electrical equipment, which connects you with the number called. One of the most interesting phases of the dial system is the "call indicator", which serves to connect a dial subscriber with a manual subscriber. This, to my mind, is one of the prettiest forms of operating in the entire telephone business, and I suggest to you gentlemen that you pay particular attention to it when you are shown through our Main Office later on.

As I said in the beginning, my time is limited, and I will not be able to go further into detail on this subject. Mr. Weinstein, the next speaker, will explain to you some of the arrangements whereby dial service is given to you, and then you will be shown through both the Raymond dial office and the Main manual office. We extend to each of you a hearty invitation to come and visit any of our central offices at any time that you care to.

MR. WEINSTEIN'S REMARKS.

GENTLEMEN: I have been asked to say a few words to you on automatic telephony, but my time has been limited to ten minutes. When you know that it takes many months of study to really understand this system, you can see that I cannot tell you very much.

First, I shall tell you about the thing with which the subscriber is most familiar, the dial. The dial is merely an instrument for interrupting the electrical circuit established by you when you remove your receiver from its hook. When you move the dial to call a number, you do nothing but when you allow it to return to normal it does so under the control of a governor. This governor, which is very small, is in the dial and regulates its speed so that the electrical circuit will be interrupted 1/20 of a second and closed for 1/20 of a second, as many times as

the digit you dial. For instance, if you were to dial a four, this circuit would be opened and closed for periods of 1/20 of a second four times. If it were an eight you dialed, this would happen eight times. I might say at this time, that to the equipment in the office the letters are the same as numbers. That is, the "F" is a three, the "R" is a seven, "M" is six and "W" is nine, and so on. It may seem to you that when I say 1/20 of a second I am exaggerating, but, actually, the equipment in the office is tested to function on interruptions the duration of which are 1/30 of a second.

This interruption of the current by the dial brings about the operation of certain pieces of apparatus in the telephone office which we call relays. These are actually electro-magnets which are about as long as your finger and as great in cross section as your thumb. An office the size of the Raymond will have about 100,000 of these electro-magnets, which have soft iron cores and are wound with copper wire of different sizes. We have relays whose resistance is as low as a fraction of an ohm and as high as twelve thousand ohms, and they are adjusted to operate on currents whose intensities are just a few ten thousandths of an ampere. We adjust some of these to operate on a specified current, and they must not operate on another current which differs from this by over a very small fraction. For instance, we have one relay that is adjusted to operate on .0148 ampere and not to operate on .0144 ampere. It is these relays that are affected by the operation of your dial, and through their action and the action of other relays operate mechanical devices which route your call through the office.

You can best understand this routing when taken backwards. First, you must imagine a rheostat, semi-circular in shape, whose arm can be connected to ten separate posts. Now imagine a telephone connected to each post and your telephone connected to the arm. Give your telephone instrument, by means of the dial and electro-magnets, the power to move this arm step by step in a rotary motion to the desired connection and you have a system of ten telephones.

Take ten such semi-circular groups, place them one above the other, give each group beginning at the bottom a number

from one to zero, give the mechanism the power to move in a vertical direction under the control of the dial, and then ask the subscriber to dial first the digit to correspond to the level on which the desired telephone is connected, followed by a digit that will rotate the switch to the actual terminal, and you have a system of 100 telephones.

To increase this system, take ten of these groups, make them subject to selection by a new set of equipment which we will now place in service, give each of these groups a number from one to zero and place them on the correspondingly numbered levels of this new set of switches, and we have in this manner reached the point where we can serve 1000 telephones by having the subscriber dial three digits.

The increase to 10,000 and 100,000, and then to 1,000,000, are but successive steps backwards requiring the subscriber to dial additional digits.

Because of the fact that the places on the dial that are allotted to 1 and 0 have no letters on them, it is obvious that the number of offices that can be reached by dialing two letters is limited to 64. It is also a fact that by dialing only four numerals, only 10,000 numbers can be reached. Therefore, in this system as installed in New Orleans, and with the subscriber dialing but six times (except in the case of party lines) 640,000 is a maximum capacity. However, this can be increased by eight times by having the subscriber dial the first three letters of the office name instead of the first two.

We now come to the power plant. This consists principally of two sets of large storage batteries and the equipment with which to charge them. These batteries have plates in them whose capacity is forty amperes. In each set of batteries there are 24 tanks giving us 48 volts current. To charge these batteries, we have several generators that are run by motors which get their energy from current from the Power Company. We also make use of several Mercury Arc Rectifiers, each giving 50 amperes. We also have a motor driven generator to give us ringing current which is 60 cycle, 100 volt alternating current. This machine has in addition several sets of interrupters which are used to in-

terrupt battery at various rates of speed to give different sounding tones, such as busy and dial tones.

My time is about up, gentlemen, and I am sorry I cannot tell you more. If any of you are interested after you are shown through the building to-night and wish to spend some time with us, you are welcome to come to any of our offices and spend as much time as you like. You may be assured that we will be more than glad to have you come. The Chief Switchmen we have with us to-night, Mr. Holbrook, of the Franklin Office, Mr. Evans, of the Raymond Office, and myself, of the Galvez Office, all extend to you a cordial invitation.

Discussion:

MR. PORTER: I am sure that we have enjoyed very much the talks on the development of the telephone, and about the present dial system. Are there any questions?

MR. LAWES: With reference to the stepping-up process; do they run wires from dial to next step up?

MR. COPELAND: Yes; they are connected together with trunks, just as described in the manual system.

MR. BILLINGSLEY: About howmany subscribers are there to an exchange, and how many trunk lines run through the various exchanges?

MR. GREEN: About 1,000 trunk lines to an exchange; an exchange normally takes care of about 10,000 subscribers. In a manual office, we have J & W ,which, naturally, enables us to take care of a great many more individual subscribers. There are about 10,000 numbers to the average office.

MR. MOSES: How do they know whether or not you have given last letters?

MR. COPELAND: That comes in on call indicator equipment. Suppose you have dialed 1294 and it should have been 1294 J or W. In the multiple of the manual office, the operator has a jack in which she has to insert a plug. She looks up and sees it must be 1294 J or W. She then connects you to an intercept operator, who asks you "what number are you calling, please?"

A MEMBER: What if a mistake is made? How is that recorded to the operator?

MR. COPELAND: If you make a mistake and call 1234 instead of 1235, as you intended, if 1234 is a working number, you will get it. If it is not a working number, you are connected to intercept operator, who will inform you that the number you dialed is a "dead number" and ask you what number you were calling. In other words, all "dead lines" are connected to an intercept operator.

A MEMBER: You speak of using a tone alternating current, and you say a tone is used in signaling. What are these tones used for in particular?

MR. COPELAND: The tone most familiar to you is the "busy" tone; in other words, when you call a busy line, you get an interrupted or popping sound in your ear which notifies you that the line is busy.

A MEMBER: How do you keep the points from corroding?

MR. COPELAND: We use platinum points, and this, incidentally, makes the relays very costly.

A MEMBER: Are the currents used small?

MR. COPELAND: Very small. It varies, of course, for different uses, but as an example, you heard Mr. Weinstein say that on one operation we use only from 140 to 148 mills, and we have others which use less current. The total amount, however, runs to a large figure, and in the Main Office we will go as high as 600 amperes during the busy hour.

A MEMBER: These electro-magnets described; do they work by having different amounts of current? How are interruptions transformed into current?

MR. COPELAND: The current is on your line at all times, and the dial merely serves to interrupt the circuit, which starts flowing when you take your receiver off the hook. If you dial 4, this interrupts the circuit four times, and causes a magnet to operate and release four times in the central office, stepping a switch around four points.

A MEMBER: How does it determine which electro-magnet is going to work?

MR. COPELAND: These are controlled by a series of contacts and connections between the different pieces of apparatus. In other words, the dial only directly operates one magnet, but this,

in turn, operates others which are connected to it, and which respond in different ways, due to the number of times the original magnet is operated.

A MEMBER: Why is it still necessary to use storage batteries?

MR. COPELAND: For two reasons; one is that the storage battery serves as a "choke" to eliminate noises which would occur in the talking circuit if we use the current direct from the brushes. The second reason is to insure no interruption to service. For instance, if the power went off for one moment, all conversation in that office would be interrupted, were it not for the fact that they can be supplied now from the storage battery.

At the conclusion of these addresses, and after some brief discussion, the visitors were divided up into groups of ten, and each group was assigned to one of the technical staff of the Telephone Company to be shown through the plant.

This took in all departments, the Raymond machine switching exchange, the power plant, and the Main manual exchange with its different departments of connection between dial and manual equipment, long distance calls, toll service, information, etc.

At the conclusion of the inspection trip through the different departments, the whole party was taken to the dining room, where a very delicious supper was served. A very pleasing feature of this supper was that, in addition to one of the members of the technical staff being assigned to each table, one of the young lady supervisors was also so assigned, thus rounding out a technical evening with a very pleasant social function.

The sincere thanks of the officers and members of the Louisiana Engineering Society are extended to the Southern Bell Telephone and Telegraph Company as a whole, and to the following members of its staff, individually, who contributed so much to making the evening both instructive and entertaining:

C. A. Stair.....Louisiana Manager.
H. N. Rufo.....Louisiana Traffic Superintendent.
F. N. Green.....District Traffic Manager.
B. B. Copeland.....District Plant Chief.
E. A. Becker.....Wire Chief.
P. E. Bordes.....Supervisor of Central Office Repairmen.
J. H. Schroeder.....Supervisor of Switchmen.
J. S. Evans.....Chief Switchman.
F. Holbrook.....Chief Switchman.
Sam Weinstein.....Chief Switchman.
M. Scheurman.....Switchman.
E. A. Graziani.....Switchman.
H. F. Landry.....Switchman.
E. J. Goode.....Switchman.
W. J. Freche.....Switchman.
A. F. Bear.....Traffic Manager.
H. R. Evans.....Toll Traffic Manager.
F. W. Petty.....Force Adjusting Engineer.
E. W. Kirkpatrick.....Force Engineer.
J. D. Schneidau.....Chief Clerk—Louisiana Traffic Superintendent.
Miss J. Arnoult.....Main Chief Operator.
Mrs. M. Adams.....Main Supervisor.
Miss M. Hosea.....Main Supervisor.
Miss A. Roig.....Main Supervisor.
Mrs. E. Shannon.....Toll Chief Operator.
Miss E. Taylor.....Toll Instructor.
Miss R. Brown.....Toll Supervisor.
Miss E. Reeves.....Toll Instructor.
Mrs. G. Allnet.....Toll Supervisor.
Mrs. G. Simmons.....Auxiliary Service Chief Operator.
Miss A. Hemmerling.....Auxiliary Service Supervisor.
Miss G. Williams.....Dial "A" Operator.
Miss E. Friedman.....Dial "A" Operator.
Mrs. I. Ritter.....Supervising Matron.

A TELEPHONIC INCIDENT

In May, 1877, Alexander Graham Bell gave a demonstration at Chickering Hall, in New York City, of the telephone invented by him just the year before. This was the first time the new device had been shown in New York.

He was assisted in this demonstration by a young man named Brown Ayres, then a student at Stevens Institute in Hoboken.

This young man was destined in later years to play a most important part in the educational life of New Orleans and of the whole South, for he afterwards became Professor of Physics in Tulane University, where he organized and founded the College of Technology, now the College of Engineering, and where he was responsible for many of the most important developments in the early history of Tulane, laying a foundation of high standards, high ideals and fine traditions, upon which has been reared the superstructure of the splendid institution as it exists to-day. Afterwards called by Tennessee to become President of its State Unversity at Knoxville, he did for that institution much the same kind of work he had done for Tulane.

As a considerable portion of this issue of the *Proceedings* is concerned with the telephone and similar apparatus, it was thought the little incident set forth in the two following letters might be of interest.

18 May, 1916.

Professor Alexander Graham Bell,

Washingon, D. C.

Dear Professor Bell:

I had the pleasure of being present on Tuesday night. in Atlanta, on the occasion of the National Meeting of the American Institute of Electrical Engineers, and of hearing your address to the meeting through the telephone. I need not say that it gave me great pleasure to hear your voice again, and when you expressed the statement that you "were glad to be alive to be present at the wonderful demonstration made on that occasion," there arose in my mind, in a flash, the memory of the wonderful time, just thirty-nine years ago

to-day, at which you demonstrated for the first time in New York City the practical operation of your great invention. It has been a source of life-long pleasure to me to remember that I had the privilege of assisting you on that occasion, and with a vivid memory of the marvel that your demonstration at that time seemed to me and to all those present, I am almost overcome with the thought of what transpired on Tuesday night and of what I have read of the recent achievements of the wireless telephone. Out of the fullness of my heart I am writing to-day, therefore, to offer my sincere appreciation and humble congratulations that you have been spared to see this child of your brain reach full and mature manhood. History will always write down the telephone as one of the greatest inventions of all time, and I cannot conceive a greater pleasure than that which you must feel in the thought of having been its inventor.

In your busy life you may not have remembered the full circumstances of that day, May 18, 1877. My dear friend and teacher, Professor Alfred Marshall Mayer, of Stevens Institute at Hoboken, where I was a student, took me to call on you on account of the fact that I had been making a number of experiments in telephony over a period of years. I then had the pleasure of being introduced not only to you but to the lady who after became your wife. After a short visit you took Professor Mayer and myself to Chickering Hall, where you had arranged your apparatus for the nights' demonstration. The whole picture is as vivid to me as though it were yesterday, and its memory has been one of the pleasantest of all my experience.

I hope that you are in excellent health and that you may be spared for many years to come to see even greater developments in the telephone.

With kind regards, I am,

BROWN AYRES,
President.

1331 Connecticut Avenue,
Washington, D. C.
May 31, 1916.

President Brown Ayres,
University of Tennessee,
Knoxville, Tenn.

Dear President Ayres:—

I have been very much touched by your kind note of May 18, and wish to thank you for it.

I recall very vividly that demonstration of the telephone in Chickering Hall,—which for me too was a memorable occasion. I wonder whether you were present when an insane man came up to me and claimed that he had confided to me while on a sick-bed the very invention which I was then "claiming" to be my own? Seeing at once that he was not quite right in his mind I listened carefully and then suggested that it might be my father to whom he had made this confidence. My father was at that time in Canada, and I knew out of reach of his annoyance,—so I felt safe in thus diverting his mind. The idea worked perfectly, and the man thanked me very courteously and quietly took his departure.

The incident has remained in my mind all these years, and your recollections of the occasion bring it back very clearly.

Thanking you for your kind comments and congratulations,

I am,

yours sincerely,
ALEXANDER GRAHAM BELL,

The Editor is indebted to Mrs. Brown Ayres of Knoxville, Tennessee, for the privilege of publishing this correspondence.

MINUTES OF MEETING AND BUSINESS OF THE SOCIETY.

Minutes of the Board of Direction, November 12, 1928.

The meeting was called to order by President Porter, and the following members were present: Messrs. Lanphier, Fox, Todd, Moses and Muth. Professor W. B. Gregory was also present by request, to submit report of his Special Committee. The meeting was held in the Assembly Room of the Southern Bell Telephone Company.

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

Prof. W. B. Gregory, Chairman of the Special Committee appointed to investigate and report on the proposed ordinance relative to inspection requirements for gas fittings, etc., submitted the report for his committee. On motion, duly seconded, report of the committee was accepted with thanks, and was approved. The Secretary was instructed to furnish a copy of the report to the Commissioner of Public Utilities.

Professor Gregory, who is Chairman of the Special Committee on Resolutions, submitted the report of his committee on the resolution relative to the death of Mr. George S. Schoenberger. On motion, duly seconded, this report was accepted, and the Secretary was instructed to furnish a copy to the family of the deceased, also a copy to the Editor of the Proceedings and to spread a copy upon the minutes.

Mr. W. B. Moses, member of the Entertainment Committee, submitted a report as to the result of the postal card suggestions invited from all resident members. He reported that 34 members indicated their approval of smokers similar to those in recent years, whereas 17 members indicated their desire for a change to a more sedate type of smoker. In view of the sentiment of the 17 members indicating their desire for a change, on motion, duly seconded, it was voted that the Entertainment Committee look into the matter of securing something of a change in the program for the next smoker.

There being no further business, the meeting adjourned.

F. A. MUTH, Secretary.

Minutes of the Society, November 12, 1928.

The meeting was called to order about 8:15 P. M., John L. Porter, President, in the chair, F. A. Muth, Secretary, and 92 members and guests present.

This meeting was held in the Assembly Room of the Southern Bell Telephone Company, and on motion, duly seconded, it was voted to dispense with the reading of the minutes.

An address of welcome was made by Mr. Charles A. Stair on behalf of the Southern Bell Telephone Company, then followed addresses by Mr. B. B. Copeland and Mr. Sam Weinstein, on "The Evolution of the Telephone." It was announced by the speakers that our members would be conducted by groups through the Raymond Exchange and the Main Exchange, and that we would then be taken to the cafeteria for luncheon.

A rising vote of thanks was then tendered to the officers and the employees of the Southern Bell Telephone Company, and the meeting adjourned as such for the trip through the plant, which was enjoyed by all.

F. A. MUTH, Secretary.

November 12, 1928.

The President and Board of Direction,
Louisiana Engineering Society,
New Orleans.
Gentlemen:

Your committee has considered the ordinance proposed by Commissioner William T. Hall to regulate the installation of gas pipe, gas stoves and heaters and to provide inspection and proposing suitable fees for all such work.

In our opinion such regulation is desirable and for the work of inspection fees should be collected, but the amount of the fees should be carefully considered to be sure they are just and fair to all parties.

It is our opinion that it is unnecessary and undesirable to create a new organization to handle this work. We wish to suggest that the Plumbing Inspection Department of the Sewerage and Water Board be given this gas inspection work in addition to their other duties.

Respectfully submitted,

(Signed) JOHN RIESS,
(Signed) JOHN H. O'NEILL,
(Signed) W. B. GREGORY,
Chairman.

Postponement of Annual Smoker.

At the meeting of the Society held December 10, it was voted to postpone the Annual Smoker to Saturday, January 19, 1929. More information will be furnished later. The Secretary suggests that you members keep on the lookout for postal notices.

Postponement of February Meeting.

At the meeting of the Society held December 10, it was voted to postpone the February meeting from the second Monday to the fourth Monday, February 25, owing to the fact that the regular meeting would fall on the night before Mardi Gras, and furthermore because the Technical Papers Committee has arranged for an address: "Electric Welding of Steel Buildings and Bridges," by Mr. Frank P. McKibben, Consulting Engineer for the General Electric Company.

Arrangements have been made for this meeting to be held in the Assembly Room of Gibson Hall, Tulane University, at 8:00 P. M., February 25. The local chapters of the A. I. of A., A. S. C. E., and A. S. M. E., also the members of the Louisiana Architectural Association have been invited to attend this meeting.

F. A. MUTH, Secretary.