The
Louisiana Engineering
Society

No. 5619 Case

Class 620.6 Shelf

PROCEEDINGS

OF THE

LOUISIANA

ENGINEERING SOCIETY

VOL. XVII, 1931

PUBLISHED BI-MONTHLY
BY THE
LOUISIANA ENGINEERING SOCIETY
NEW ORLEANS

PROCEEDINGS OF THE LOUISIANA ENGINEERING SOCIETY

CONTENTS

EDITORIAL NOTES AND COMMENT:

PAGE

Eads Memorial, The ... 87
Engineer and the Depression, The ... 229
Engineers and Employment ... 270
Engineering Mind, The ... 173
Flood Control ... 8
Dr. Freeman Honored in Providence ... 88
Hail and Farewell! ... 7
Imagination and the Engineer ... 143
Inquiry into the Causes of and the Remedies for Unemployment, An ... 231
November Meeting at Tulane University, The ... 271
New Story of Ancient Wrought Iron, The ... 87
"Numerically Speaking" ... 230
Old New Orleans Mint Building, The ... 269
Other Officers for 1931 ... 4
Our Engineering Golfers ... 174
Our New Members ... 9
Our Meeting Place ... 172
Our New President ... 3
Our Registration Problem ... 7
Outing, The ... 145
Professor Gregory Honored ... 87
Smoker, The ... 7
Some Phases of Law of Use to the Engineer in Louisiana ... 171
Southern Resourses and the Chemical Industry ... 9
Spring Meeting of the A. S. M. E., The.—April 20-23 ... 145
Stop, Look, Listen! ... 85
Wood—Its Practical Application in Engineering ... 144
Work of the United States Coast and Geodetic Survey, The ... 86

PAPERS AND DISCUSSIONS:

Flood Control. *By Major W. H. Holcombe* ... 14
Inquiry into the Causes of and Remedies for Unemployment, An. *By Carl Schneider* ... 232
Discussion ... 253
New Story of Ancient Wrought Iron, The. *By R. Carson Hamlett* ... 111
Discussion ... 123
"Numerically Speaking". *By Chester C. Jaeger* ... 259
Old New Orleans Mint Building, The. *By Allison Owen* ... 278
Discussion ... 292
Our Registration Problem. Address of the Retiring President. *By James M. Todd* ... 11
Report of the Committee on Relief from Unemployment of American Engineering Council ... 297
Some Notable European Laboratories. *By W. B. Gregory* ... 128

PAGE

Some Phases of Law of Use to the Engineer in Louisiana.
By Henry Bell Cooley.
Introduction 175
Chapter I—Surveying and Bounderies 177
Chapter II—Drainage 183
Chapter III—Buildings and Builders 187
Chapter IV—Walls in Common 193
Chapter V—Arbitration and Award 205
Chapter VI—Patents and Patent Rights 218
Chapter VII—The Engineers' License Law 224

Southern Resources and the Chemical Industry.
By Charles H. Herty 23

Wood Its Practical Application in Engineering.
By W. H. Scales 146
Discussion 165

Work of the United States Coast and Geodetic Survey, The.
By Ray L. Shoppe 89
Appendix—Geodetic Work Accomplished and Projected in Louisiana. *By R. S. Patton* 105
Discussion 109

OBITUARY:
James Wartelle Billingsley 274
Elbert G. Sandoz 276

MEMBERSHIP LIST FOR 1931 43

MINUTES OF MEETINGS AND BUSINESS OF THE SOCIETY:
Minutes of the Board of Direction:
December 8, 1930 59
January 12, 1931 60
February 9, 1931 140
March 9, 1931 140
April 13, 1931 141
May 11, 1931 170
June 8, 1931 227
July 17, 1931 267
October 12, 1931 304
November 9, 1931 305

Minutes of the Society:
December 8, 1930 60
January 17, 1931 61
February 9, 1931 140
March 9, 1931 141
April 13, 1931 142
May 11, 1931 170
June 8, 1931 228
September 14, 1931 268
October 12, 1931 305
November 9, 1931 306

ANNUAL REPORTS:
Report of the Board of Direction for 1930 63
Report of the Secretary for 1930 66
Report of the Treasurer for 1930 72
Report of the Employment Committee for 1930 77
Report of the Auditor 78

Vol 2
1931

The Proceedings of the Louisiana Engineering Society

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

JAMES M. ROBERT, 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
JAMES M. ROBERT, 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.

LOUISIANA ENGINEERING SOCIETY

OFFICERS FOR 1931

President, FRANK G. FROST, 317 Baronne Street.
Vice-President, FRED. N. BILLINGSLEY, 702 Interstate Bank Bldg.
Secretary, FRANK A. MUTH, 7705 Willow Street.
Treasurer, WALTER B. MOSES, 425 S. Peters Street.

DIRECTORS

J. H. O'NEILL, 637 Lowerline Street.
A. L. DUNLAP, 5524 Prytania Street.
E. S. BRES, 311 Maritime Building.
JAMES M. TODD, 818 Maritime Building.

STANDING COMMITTEES

On Technical Papers
C. C. Wiggins, Jr., Chairman
J. M. Robert
George P. Rice
R. J. Kuhn

Motivating Committee
James M. Robert, Chairman
W. B. Gregory
George R. Hammett
Charles M. Kerr
James M. Todd

On Library
Ralph Earl, Chairman
C. W. Ricker
A. J. Harris
P. F. Hoots

On Publications—Division "A"
James M. Robert, Chairman
Frank A. Muth

On Publications—Division "B"
John T. Eastwood, Chairman
D. W. Stewart, Vice Chairman
F. N. Billingsley

On Entertainments and Outings
Ole K. Olsen
Walter B. Moses

On Finance
F. N. Billingsley, Chairman
Walter B. Moses
James M. Todd

On Membership—Division "A"
D. W. Stewart, Chairman
A. L. Dunlap
E. S. Bres
H. B. Henderlite
J. L. Henning
O. O. Melancon
W. I. Neel
Ira W. Sylvester
Bryson Vallas
B. W. Pegues

On Membership—Divison "B"
J. S. Barelli, Chairman
E. S. Lanphier
C. J. Wyler

On Employment
R. H. Baumbach, Chairman
R. Bassich

On Civic and Industrial Affairs
A. M. Lockett, Chairman
D. Derickson
J. F. Coleman
James M. Todd
A. T. Dusenbury
John H. O'Neill
J. D. McNiven

The headquarters of the Society are in the State Museum Building, Jackson Square.

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

President Frank G. Frost

PROCEEDINGS
OF THE
LOUISIANA ENGINEERING SOCIETY

VOL. XVII. FEBRUARY, 1931 NO. 1

CONTENTS

EDITORIAL NOTES AND COMMENT: PAGE
Our New President ... 3
Other Officers for 1931 ... 4
Hail and Farewell! ... 7
The Smoker ... 7
Our Registration Problem ... 8
Flood Control ... 8
Southern Resources and the Chemical Industry ... 9
Our New Members ... 9

PAPERS AND DISCUSSIONS:
Our Registration Problem. Address of the Retiring President. *By James M. Todd* ... 11
Flood Control. *By Major W. H. Holcombe* ... 14
Southern Resources and the Chemical Industry. *By Dr. Charles H. Herty* ... 24

MEMBERSHIP LIST ... 43
MINUTES OF MEETINGS AND BUSINESS OF THE SOCIETY ... 59
ANNUAL REPORTS ... 63
REPORT OF AUDITOR ... 78

EDITORIAL NOTES AND COMMENT

Our New President. Frank G. Frost ("Jack" Frost) was born and grew to manhood in the vicinity of Mattoon, Illinois.

He is an alumnus of the University of Illinois, having graduated in the course of Mechanical Engineering there in 1901.

For the first six years after graduation he was employed in manufacturing plants in the vicinity of Chicago.

Since 1907 he has been connected with public utility companies, starting at Birmingham, Alabama. From there he went

to Little Rock, Arkansas, and then to Houston, Texas. From Houston he came to New Orleans in 1918 as Superintendent of Power for the old New Orleans Railway and Light Company. When the old company was reorganized and the New Orleans Public Service Company formed he was promoted to the position of Superintendent of the Electric Department, which position he now holds.

While in college he was a member of Sigma Alpha Epsilon and Tau Beta Pi. He is a member of the American Society of Mechanical Engineers, American Institute of Electrical Engineers, National Electric Light Association, Rotary Club, Association of Commerce and Metairie Golf Club.

It is with sincere pleasure that the Editor wishes Mr. Frost a happy and successful year as President of the Louisiana Engineering Society.

Other Officers for 1931. Mr. F. N. Billingsley was elected Vice-President for the ensuing year and Col. Edward S. Bres was elected to the Board of Direction to serve three years.

Mr. J. H. O'Neill and Professor A. L. Dunlap are the other elective members of the Board who hold over for one and two more years respectively. Mr. James M. Todd as retiring President automatically becomes a member of the Board, taking thereon the place of the preceding retiring President, Professor F. H. Fox.

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

DOUGLAS S. ANDERSON

Hail and Farewell! Under the above caption the last issue of the *Proceedings* carried an editorial from which is quoted as follows: "The next issue of the *Proceedings*, February, 1931, will find the publication in the hands of a new editor."

The situation spoken of in the quotation is now a fact, and "more's the pity."

For sixteen years Douglas S. Anderson, Dean of Engineering, Tulane University, has been the Editor and guiding spirit of this publication. Under his able direction we have seen the *Proceedings* grow from a doubtful venture to an accomplished institution of the highest order. He has a keen insight into general affairs, coupled with an uncanny judgment, both of men and things. As an inspiring teacher, a wise and just counsellor and a generous friend he may have an equal somewhere in the world, but he certainly has no superior. All these qualities have made him the ideal person to control the fortunes of this publication.

The new Editor is under no illusions whatever as to the task that is ahead. To edit a publication like this is a serious task in itself, but to do so in the footsteps of Dean Anderson is to carry an additional and discouraging sense of inadequacy.

And so, we can only say to Douglas Anderson, *former* Editor of the *Proceedings*, and *always* friend of the Society, "Well done, thou good and faithful servant."

The Smoker! Some Smoker!!! January 17, 1931, 9 P. M., Florentine Room, Jung Hotel. Whoopee!!! One hundred and forty-two members and guests present!

Walter out-Waltered Ole and Ole out-Oled Walter. Iced tea and decorum were joyously evident everywhere. Ole and Walter decided that previous smokers had been a little too interesting, so determined this one should be more sedate. Accordingly, they laid down the principle that the girls they employed to sing and dance for the members must all be old, ugly and fat. The principle was a success, but one young, lithe and beautiful creature evaded Walter and Ole and slipped in when they weren't looking. She nearly broke up the party with her loveliness and charm—we refer to the one dressed in a black lace costume.

And the Scotch!! Good old Dave Stewart, Scotch by birth, officiated as toastmaster and kept everyone in good humor with his delightful Scotch (burr). Many others were there who also were Scotch, but unlike Dave, they were Scotch by absorption and a good time was had by all.

One of the features of the evening was the presentation of a silver cup to Mr. Todd in recognition of his services as President during the past year, and the presentation of a handsome electric clock to the retiring Editor of the *Proceedings*, Dean Anderson, in recognition of his services as the directing force of this publication for the past sixteen years.

The invited guests present were Commander H. R. Keller, Assistant Commandant U. S. Naval Station; Dr. Robert Glenk, Curator, State Museum; Major W. H. Holcombe, District Engineer, Second New Orleans District, U. S. Engineer Office.

Our Registration Problem. Concerning this subject we print elsewhere a message to the membership from our retiring President, Mr. James M. Todd.

The discussion is timely indeed, because two phases of the situation are continually coming within our field of view.

First, the profession as a whole is becoming more and more conscious of its responsibility to the public. This is shown by the increasing number of states in which the profession has been able to secure the passage of registration laws. Secondly, the rapidly growing industrial development of Louisiana, with her great wealth of natural resources, will soon make us the Mecca for all of those of doubtful value to the public and to the profession.

Our protection and the protection of the citizens of this State, therefore, depends on the early passage of a comprehensive and fair registration law. The engineers of this state, however, must get behind the movement whole-heartedly and energetically or it will not become a law.

Flood Control. The admirable paper on the above subject by Major Holcombe is published herein.

Major Holcombe clearly outlines the many possibilities which were considered and investigated in the attempt to ar-

rive at a satisfactory, feasible and economical plan of flood control.

The paper indicates that the present plan appeared to be the one which most nearly fulfilled the above requirements.

An interesting sidelight on the paper is the fact that the engineers charged with flood control work are increasing their knowledge and the effectiveness of their work to such an extent that floods which years ago would have done considerable damage are now passing through the Mississippi Valley almost unnoticed.

Southern Resources and the Chemical Industry. The very educational and interesting address of Dr. Herty on this subject should be read by all who have the industrial development of the South at heart. Dr. Herty shows a keen insight into the great possibilities of wealth that should be ours by an intelligent and vigorous development of the wonderful and abundant natural resources of Louisiana.

One of the richest states in the Union in natural resources of all kinds, our intelligent development of these resources has lagged far behind their possibilities. There seems no logical reason why we should buy manufactured cotton goods, salt, newsprint and a host of other things from outside the State, when these things are all at our own door. And yet, we do. Why? Think it over.

New Members. The following new members have recently been elected and are welcomed to the ranks of the Society:

Resident Members

Charles H. Green, 4478 Lafaye Street, New Orleans. Assistant Resident Engineer, Louisiana Highway Commission.

Karl P. Kammer, 1452 Arabella Street, New Orleans. With New Orleans Public Service Company, Inc.

Leonard F. Kershaw, 2328 State Street, New Orleans. Superintendent, General Box Company.

W. T. McCay, 109 Tchoupitoulas Street, New Orleans.

Leroy A. Staples, 5101 Pitt Street, New Orleans.

Transfer from Student Member to Non-Resident Member

Harold H. Jaquet, P. O. Box 366, Sinton, Texas. With Shell Petroleum Corporation.

Associate Members

John P. Egan, 1127 Euterpe Street, New Orleans. With New Orleans Public Service, Inc.

John Reinhard, 3719 Camp Street, New Orleans. With Johns-Manville Corp.

William Wallace, 1403 Pere Marquette Bldg., New Orleans.

Resident Junior Members

Marcus J. Roux, 1610 Ursuline Street, New Orleans. With Federal Barge Line.

Resident Student Members

Robert L. Argus, 7725 Plum Street, New Orleans.

William P. Barrow, 5357 Magazine Street, New Orleans.

Aubrey G. Code, 7814 Green Street, New Orleans.

Marcel E. Crettet, Jr., 5580 Woodlawn Place, New Orleans.

William J. Drawe, Jr., 7918 S. Claiborne Ave., New Orleans.

Daniel D. Ewing, Jr., 3339 Richardson Court, New Orleans.

Joseph E. Leininger, 920 Music Street, New Orleans.

Claramon B. McEachern, 7103 Freret Street, New Orleans.

Charles R. Monteiro, 2103 Chestnut Street, New Orleans.

Irving S. Seligmann, 2803 Jefferson Avenue, New Orleans.

Herbert M. Shilstone, Jr., 7730 Jeannette Street, New Orleans.

Homer H. Stockmann, 5665 Ada Place, New Orleans.

Dalton H. Trepagnier, 2427 Calhoun Street, New Orleans.

Wilday Tudury, 2522 Palmer Ave., New Orleans.

Clarance M. Williams, 7103 Freret Street, New Orleans.

PAPERS AND DISCUSSIONS

"OUR REGISTRATION PROBLEM"

A Message to the Membership, by the Retiring President,
JAMES M. TODD.

With the failure of our efforts before the 1930 State Legislature, it seems only fitting to remind our membership that the question of Engineering Registration in Louisiana is still open. It will be necessary to keep the subject in mind, and be prepared next year, to present our case to the lawmakers of the State.

No matter what particular specialty we may profess, we should have the same aim—the furthering of the engineering profession and its standards in the State. Whether we believe in registration of Engineers or not, it is safe to say that the temper of the times appears to call for it, with the result that we may expect laws in practically all states that do not have them now, as well as possibly revision in the case of existing laws. Let us then assume that registration, properly enforced, will at least be one of the contributing factors to the growing recognition which the engineering profession is receiving, and rightly deserves.

When the original Act No. 308 requiring the Registration of Engineers in Louisiana was passed in 1908, it was made applicable only to the Civil Engineering branch of the profession, because at that time, Louisiana was not classed in any way as an industrial State. Civil Engineering was not only the most outstanding branch of the profession in Louisiana, but nationally as well. In Louisiana, in 1908, the membership of the Louisiana Engineering Society was less than 125, with a large majority of Civil Engineers. This membership is now over 500, with certainly as many members practicing Mining, Mechanical and Electrical Engineering, as there are practicing Civil Engineering. In 1910, the membership of the American Society of Civil Engineers was approximately 5,500, as compared to less than 4,000 in the American Society of Mechanical Engineers, and approximately 4,500 in the Amer-

ican Society of Mining and Metallurgical Engineers. In 1930, the membership in these same National Societies were: American Society of Civil Engineers, 18,313; American Society of Mechanical Engineers, 20,011; and the American Society of Mining and Metallurgical Engineers, 8,756. This gives you a fair idea of the growth and development of the other so-called branches of the profession.

It is apparent therefore the need of revision of the present state law. Further than that, the State Board of Engineering Examiners feel the need of stricter enforcement of the regulations for professional practice in the State. The Louisiana law was one of the first upon the statute books of any state, and whereas it has been revised slightly, it is lacking in the most fundamental principle, that of treating of engineering as a profession, undivided. Since 1908, twenty-four states have adopted laws; and in all cases, except one, these laws have been made to cover the "Profession of Engineering" rather than any one particular branch.

In the final working out of a compromise law, acceptable to all interests involved, which proposed law was approved by the society membership, the Local Sections of the Founder Societies and the State Board of Engineering Examiners, the foundation, at least, has been laid for proper revision of the present registration law. It is necessary now to erect on that foundation a proper and substantial structure. As in the case of any building enterprise, a great deal of work must be done after the completion of the foundation, before the final result is pleasing and acceptable to the builders. That work of erection is left to our successors in office, with the suggestion that they keep the interest and effort concentrated until the final structure is completed.

If our membership will continue actively to push the matter, when the next meeting of the State Legislature is held there is every reason to believe that we will be successful. After legislative enactment, we must continue our interest, and thereby assist in the proper administration of the act, because only through such procedure can it be a working success and benefit. Assist the State Board of Engineering Examiners in the performance of their duty, by placing in the hands

of the Attorney General the necessary data upon which the prosecution of a case against an offender can be handled. Do not consider the furnishing of such information underhanded; for if an offender is made to cease operations because of such data, no one can say that anything but a service to the profession has been accomplished. It will not require a very long period of strict enforcement to reach a point where "the actual issuance of a license to practice to the mature man will be of the nature of a formality."

There is great need, in the interest of the public, for better and safer engineering. This need is a challenge to the entire profession, and to meet it we shall require most intelligent and whole-hearted co-operation on the part of the various branches. Our interests are, and rightly should be, common and closely interwoven. If our efforts are to count for genuine progress of the profession, it will be necessary for us to avoid conflicting representation to the Legislature.

To the end of having one general registration for professional engineers, any differentiation between engineers required to meet the needs of lawmakers and the affected public should be of the nature of special qualifications under the basic law, rather than by the further promotion of separate groups under special legislation.

If each member of our profession will but assume his part in assisting to put the matter through, we may rest assured that the lawmakers will hear our plea, and grant our request. The existing law will then be improved by numerous provisions in the proposed law, resulting in added prestige to the profession, this by requiring higher qualifications to practice the profession of engineering in this State.

FLOOD CONTROL

By Major W. H. Holcombe.
Corps of Engineers, U. S. A.

Read before a Joint Meeting of the American Institute of Chemical Engineers and of the Louisiana Engineering Society, December 8, 1930.

I have been invited to talk to you tonight with a view to explaining, as best I may, the plan of flood control of the Mississippi River in its alluvial valley. This plan was adopted by Congress in May, 1928, following the disastrous flood of 1927 with which the people of the Valley and, I imagine, the people of the country at large, are familiar.

The purpose of the flood control plan is to limit the flood heights of the river to safe gage heights. In other words, to prevent the river from rising above the gage heights which have been determined to be safe, and against which flood protection can safely and economically be provided.

In studying the problem, the first thing to be determined was the size of the flood against which protection was to be provided. Both the Mississippi River Commission a body of Federal engineers, composed partly of civilian engineers and partly of military engineers, which has been in existence for fifty years and has made exhaustive studies of floods on the Mississippi River, and also the officials of the Weather Bureau, who, of course, are experts on meteorology, rainfall and general conditions contributing to the occurrence of floods, were called upon to determine the maximum flood which was probable or even possible in the alluvial valley. From studies of all available data, including consideration of possible combinations of maximum floods of record in the past, both in the main river and in the principal tributaries, both of these agencies determined that a flood discharging approximately 3,000,000 cubic feet of water per second past the latitude of Old River, where the Red and Atchafalaya River system connects with the Mississippi, would be the maximum flood which could be expected to occur.

With this amount of water to be provided for, the Chief of Engineers and his assistants formulated the plan of flood con-

trol which was later adopted by Congress, and is the basis of the law under which we are working today.

Various methods of providing flood protection were considered, among which might be mentioned the dredging of lateral channels, and extensive dredging in the channel of the river itself with a view to providing adequate capacity to take care of the flood waters. Both of these methods, however, were discarded as being too costly and too uncertain in their results. Another method which was considered was setting back of the main levees as they exist today, that is, moving the levee locations back from the river bank and locating the levees a number of miles from the river in order to provide additional flood capacity. This plan was found to be unsuitable, however, for several reasons. First, it would be too costly; secondly, it would wipe out most of the communities along the river, for the reason that the lands immediately on the river bank are, generally speaking, the highest and best lands in the Valley. That may sound paradoxical to people who think of a river as following the lowest part of its valley. As a matter of fact, however, the banks of the Mississippi River are the highest lands in the Valley. As you leave the river the land slopes off to either side, the reason being that in past ages the Gulf of Mexico is presumed to have extended to the head of the Valley and the allivial lands in the Valley have been deposited by the river spilling over its banks. Each flood brought additional material which was deposited along the river banks, building up the banks and leaving the land further removed from the river relatively lower. An extensive system of setback levees was found to be unsuitable for the purpose of flood control.

Other methods were considered, such as straightening the river channel, which winds back and forth covering over a thousand miles from the mouth of the Ohio to the Gulf of Mexico, whereas it is only half that distance by air line. This method was also discarded since the river requires this distance in which to make its way to the Gulf. There is a certain equilibrium established between the ability of the flowing water to cut its banks and the ability of the banks to resist the erosion of the current. If shortening the natural channel is attempted,

the slope of the river and the velocity of flow are increased, and as a result the river immediately starts to cave the banks at other points. If the river is permitted to cut through a bend, thereby shortening the channel, it will be found that elsewhere, above or below, the river will create another bend to restore this condition of equilibrium. So that method was discarded.

Clearing and reforestation were also considered, but the benefits were too remote, too distant and too inadequate, and these methods were also discarded.

The so-called "levees only" plan was also considered. Until the adoption of the present plan, the method of flood control had been to attempt to confine the flood flow between levees without recourse to other methods of either holding back the flood waters or disposing of them as they came down. It was found, however, that to confine between levees the superflood for which provision was deemed necessary would require raising of the levees as much as five or six feet at Cairo, Illinois, the junction of the Ohio and Mississippi Rivers; as much as eighteen or nineteen feet at Arkansas City, where the Arkansas River flows into the Mississippi; and as much as six feet at New Orleans. Those of you who have seen the waterfront of New Orleans can perhaps appreciate the cost that would be involved in raising all of the docks which are built upon the levees, but more important than the cost is the danger of raising flood heights in front of the City of New Orleans six feet.

The last method that was considered but not adopted was flood control by means of reservoirs. There is a great deal of interest at the present time in the subject of reservoirs. Many people believe that by holding back the flood waters in the tributary streams the need of providing material additional flood protection in the lower Valley can be avoided, and that if such a method were adopted the floodways that are part of the present scheme of flood control could either be done away with entirely or at least could be very much narrowed. Many people of the Valley are therefore very much interested in the possibility of reservoirs today. I do not want to enter into discussion of this subject very much because it is something

that is still being studied, and we should not form opinions about matters which are still being investigated and which may have possibilities of which we do not know today. However, considerable study of the subject was given when the adopted flood control plan was formulated, and it was found that any reservoirs which could be utilized to hold back sufficient water to affect in any appreciable degree the floods of the Mississippi River would be so costly as to make their use entirely impracticable for present purposes. Obviously any engineering plan, whether it be flood control or any other form of engineering, must be justified economically, or else it will fall of its own weight, and it is my impression that investigations to date have not shown that the reservoir method of flood control is practicable from an economic point of view.

The plan adopted provides for three floodways. The upper floodway is located near the point where the Ohio River flows into the Mississippi. Obviously the points of greatest strain from floods are the places where two streams come together and the flood waters are concentrated. Therefore the first important places where relief is required is the territory at the junction of the Ohio and Upper Mississippi, where the town of Cairo, Illinois, is located.

The plan provides for setting back the main river levee about five miles, and for cutting down the existing main river levee approximately five feet at the upper and lower ends of the floodway, in order that when the floods reach a gage height five feet lower than the top of the present levee they will be permitted to spill into this river-bank floodway, the lands in the rear being protected by the new levee now under construction. The river-bank floodway thus provided will give additional flood capacity to the river, and will give ample protection by preventing the floods from rising above a safe piont on the levees protecting the adjacent territory.

Between New Madrid and Arkansas City, where the next great tributary flows into the main river, it is found to be practicable to raise and strengthen the existing levees sufficiently to carry the flood flow within the main channel, and the plan therefor provides for raising and strengthening the levees along this section of the river.

At the point where the Arkansas River joins the Mississippi, however, additional capacity must be provided, because, as I mentioned before, it would require raising the levees at this point as much as eighteen or nineteen feet to contain the maximum flood that is predicted as possible. Rather than do that, it was decided to provide for a lateral floodway known as the Boeuf Floodway.

The 1929 flood was a major flood, which, had it occurred a few years previously, would undoubtedly have caused crevasses and have gained publicity similar to that of other floods which have caused damage in years past. In 1922, there was a flood very similar in volume and characteristics to the flood of 1929. The 1922 flood did cause several crevasses and received a good deal of publicity throughout the country. The 1929 flood, however, due to the work accomplished in the seven years that had intervened, passed through the valley with no publicity and very little note by any except the river engineers who were nevertheless carefully watching its progress.

The Boeuf Floodway discharges into what is called the Red River backwater area, which is the area near the mouth of Red River that is subject to overflow in all flood years. Operation of the floodway is dependent altogether on the volume of water which Divine Providence may send into the Valley above the mouth of the Arkansas. The levee at the head of the Boeuf Basin is to remain at its present grade and section, that is, it is not to be raised or strenthened, while the levees above and below the head of the basin are to be raised and strengthened —raised about three feet and quite materially strengthened. The plan provides also for the construction of lateral floodway levees, so-called guide or protection levees, which would confine the water passing through the floodway.

The next feature of the plan is what is known as the Atchafalaya Floodway, which extends from the mouth of the Red to the mouth of the Atchafalaya River. Similar to conditions affecting the Boeuf Floodway, the levees at the head of the Atchafalaya Basin are to remain as they are; neither raised nor strengthened. The levees on the Atchafalaya River, extending about fifty miles south from Simmesport, are to be strengthened somewhat but are not to be raised. The levee

extending west from Hamburg to the high land, and the levee along the south bank of the Red River are to be raised and strengthened, and similarly the levee extending down the Mississippi River from Red River Landing is to be increased in size and height.

Lateral or protection levees are also provided for the Atchafalaya Basin. These levees will be amply large to confine any flood which might break through the levees at the head of the basin, thereby protecting the more or less thickly settled and well developed territory adjacent to the Mississippi River and also the more highly developed territory to the west of the Atchafalaya Basin, part of which is known as the Teche Ridge—Bayou Teche being the stream made famous by the settlement of the Acadians—the Evangeline country.

Let me repeat: The levees at the heads of the Boeuf and Atchafalaya Basins will remain as they are. The levees above and below will be raised and strengthened. A major flood which would rise above the tops of these existing levees, a flood which would overflow the country today, would then overtop the levees at the heads of these basins, but would not be permitted to overtop or breach the levees above or below.

In every great flood of the past these two basins have been overflowed, and in every great flood of the future these basins presumably will continue to be overflowed. Adoption of the present flood control plan has not changed this condition, but when the adopted project is completed the remainder of the Valley, which heretofore has been subject to flood damage, the jeopardy having heretofore been general, will be given complete protection.

Now I want to refer very briefly to a feature of the plan which has been provided for the special protection of New Orleans. That is the Bonnet Carre Spillway, approximately 25 miles above the city. Side levees connect the two ends of the mile-and-a-half-long spillway with Lake Pontchartrain. The purpose of the spillway is to keep the river at New Orleans from exceeding twenty feet on the New Orleans gage, or the Carrollton gage, as we know it.

In several past floods the river has risen above twenty feet on the gage. In the flood of 1927 it rose to twenty-one feet, and

in the flood of 1922 it rose to slightly above twenty-one feet without any danger to the city. In almost every recent major flood the gage has risen to twenty feet. It rose to approximately twenty feet in the flood of 1929, and yet I don't suppose that a tenth of the population of the city knew that there was a flood in 1929.

The spillway consists of a low concrete dam paralleling the river bank, less than a thousand feet in rear of the present levee. Flow over the spillway may be controlled by a device known as a needle dam. The abutments of this dam will be connected to the main river levee and also to the levees extending back to the lake, so that when the spillway is completed and ready for operation, all that will be necessary will be to remove the section of the main river levee which is now in front of the spillway. The spillway is practically completed at this time. The contractor is expecting to finish the structure early next month.

I may say that of the 30,000 square miles which would be subject to flood if no protection works were provided, 20,550 will receive complete protection under the plan at all times, and further, that those 20,550 square miles, or over two-thirds of the total, are the most highly developed and most valuable parts of the Valley. Of the remainder, constituting less than one-third of the total, it is worthy of note that two-thirds, or over 6,000 square miles, are swamp and timber lands which are not damaged by flood, being largely represented by the backwater areas.

There are remaining then only approximately ten per cent of the total lands of the alluvial valley, or a little over 3,000 square miles of cleared land which will not be completely protected. Those lands are largely represented by the cleared portions of the floodways. These areas, constituting approximately ten per cent of the total, will, however, be protected to exactly the same extent as they are protected today. The protection afforded by the levees at the heads of the basins will be effective from approximately eleven years in twelve to fourteen years in fifteen. In other words, it is expected that the levees at the heads of the Boeuf and Atchafalaya floodways will not be overtopped oftener than one in twelve or

fifteen years. Consequently the lands can be used for agriculture, stock raising and similar purposes, just exactly as they are today. They can be occupied with exactly the same degree of safety as at present, and while they would have to be evacuated occasionally, such a condition is no different from that which has prevailed for years and years. As I have said, in every large flood of the past those areas have been overflowed. In every large flood of the future those areas will continue to be overflowed.

I don't know whether flood control matters get the same publicity throughout the country at large as they do down here in Louisiana, and I see only the local papers as a rule—but one might gain the impression from reading the local papers, and possibly from the press at large, that the adopted plan of flood control is in some respects faulty, that it may not be adequate, that it requires some kind of revision or modification.

I would like to say that I have yet to hear a valid objection to this plan based on its engineering features, nor is it hard to understand why the plan could not be reasonably attacked on any sound engineering basis, for it is simply nature's own plan, and any time that man seeks to go contrary to nature in the Valley of the Mississippi River, he is attempting an impossible task.

In this connection let me quote from the message of the Secretary of War to the President, in submitting the plan for the consideration of Congress. Former Secretary of War Davis said:

"Dear Mr. President: I have the honor to forward herewith the report of Major General Edgar Jadwin, Chief of Engineers, giving the plan of the Army Engineers for flood control of the Mississippi River in its alluvial valley. The plan appears to be simple but comprehensive and is designed to take care of the maximum flood estimated by experts to be possible. The plan conforms to the natural tendencies of the river when in flood. The river is led rather than driven or forced."

The whole object of the adopted plan of flood control is to conform to the natural tendencies of the river and provide the means whereby the flood levels of the river shall not be permitted to rise above safe heights, and it is found therefore that

such attack or criticism as the plan may have been subjected to resolves down to objection to some of its economic aspects. It is the position of the United States Government for example that the United States is not in any way liable for flood damages which may occur to lands within the Boeuf and Atchafalaya floodways. The Government is not doing anything to remove existing protection in these floodways. The Government simply admits in the adopted plan that these floodways are subject to flood at times, always have been, and probably always will be.

These economic features of the plan which appear to be distasteful to some people of the Valley were well realized, and being foreseen, were provided for in advance so far as any obligation of the United States is concerned. This is indicated by the message of the President to Congress at the time the plan was submitted. Mr. Coolidge said:

"In determining the distribution of the costs, there must be considered not only the people of the Valley itself, who receive the major portion of the benefits, but also the great mass of taxpayers who suffer less directly from Mississippi floods and upon whom most of the burden of Federal taxation falls. It is axiomatic that States and other local authorities should supply all land and assume all pecuniary responsibility for damages that may result from the execution of the project. It would be revolutionary for the Federal Government to establish the precedent of buying part of the land upon which to build protective works to increase the value of the remainder. Similarly it would be very unwise for the United States, in generously helping a section of the country, to render itself liable for consequential damages. The Federal Treasury should bear the portion of the cost of engineering structures for flood control that is justified by the national aspects of the problem and the national benefits. It may even bear eighty per cent of such costs, but substantial local co-operation is essential to avoid waste. * * * * It would seem that the States should share with the Federal Government the burden of assisting the levee districts and individual property owners, especially in view of the fact that the States benefit directly by the in-

creased taxes from land made more valuable by reason of its protection."

I think it is evident to all who are reasonably familiar with the flood control plan that it is entirely adequate in its engineering features; that it will accomplish what it is intended to do; that it will give the Valley complete protection in those areas where it is economically practicable to provide complete protection; and that certain remaining areas will continue to enjoy the same protection that they have always had.

The disastrous Mississippi flood of 1927 may after all have been a blessing in disguise for the Valley, since it had the effect of enlisting the sympathy and help of the entire nation. It removed Mississippi flood control from the haphazard and uncertain status which, due to inadequate funds, had always characterized it in the past. It paved the way for the adoption of a project which will accomplish complete flood protection in all parts of the Valley where it is justified, and which will deprive no part of the Valley of any existing protection without due compensation.

The people of the Valley should indeed be grateful for the flood control project, the greatest gift of a nation to part of its people, the cost—$325,000,000.

SOUTHERN RESOURCES AND THE CHEMICAL INDUSTRY

By Doctor Charles H. Herty.

Delivered before a Joint Meeting of the American Institute of Chemical Engineers and of the Louisiana Engineering Society, Dec. 8, 1930.

I always knew that my friend, Doctor Williamson, was a very tactful man, a very diplomatic man, but I did not know the extent to which it reached until I received a letter from him telling me that there would be another speaker on the program besides myself this evening, but he did not tell me the subject, and I know Williamson is perfectly familiar with my tendency to garrulity, so when I found on the program that the subject of the preceding speaker was to be flood control, I knew what Williamson was trying to hint—mildly and delicately to me that I must control my desire to talk all evening. (Laughter.) So I will tell Major Holcombe that that engineering problem is solved as far as I am concerned. (Laughter.)

I want to congratulate the members of the American Institute of Chemical Engineers. You have a lot of reasons to be happy. Just see what happened to the engineers in Russia. They are in prison, and all you are condemned to is three days imprisonment in the most delightful city of the South and the social hospitality of this beautiful place.

I had a story I was going to tell you of a meeting in 1915, but I have to modify that story. A funny thing happened. I happened to be President of the American Chemical Society at the time, and we gave a public lecture to which all the New Orleans public was invited. Doctor Hesse of New York was the speaker on the dyestuff industry. It was in another hotel. They rigged up a temporary platform across the ballroom floor. The past Presidents of the Society sat on the platform, six of us altogether. Doctor Little of Boston sat next to me, and he said, "Herty, this is the height of Southern hospitality." By each chair was a great big white spittoon. I was going to talk about the progress New Orleans hoteldom has made, but here they are again, but smaller, showing that we are considered

better marksmen than they used to think we were; and maybe the next time we meet here we will find cracks along the wall to give us a chance to hit the mark accurately. (Hearty laughter.)

I am conscious of the fact tonight that I am talking to two audiences, one of technical experts and one of the general public, so if I talk of some things that may seem commonplace to you men of the Institute, some of the general public are not so familiar with these things. On the other hand, I want to tell you men of the Institute something of the problems in which you, those you teach and those like you can be of tremendous assistance in our development of the South. I want to say at the very outset that I do not feel that the South needs the discovery of new substances, new products, new inventions. What the South needs today is the application of sound principles of chemical engineering and sound engineering, through well-known methods, to the development of its great masses of raw material, its native wealth.

I say also to the people of the South that in their plans for the development of these resources, keep in mind that in this latter day of the development of the United States those sections are most prosperous, those lines of industry are most successful, where there is complete chemical control and where sound chemical engineering practice prevails.

Now, too often that principle has been overlooked. I remember a plant in the South, a chemical plant, which was actually put in charge of two civil engineers. That is hard to believe, but it is true.

My mind goes back to a long string of plants for the destructive distillation of pine wood—in 1902 and 1903 when Mr. Bellfinger went through the South and raised local capital in each neighborhood and told them of the ease of construction and operation of pine wood distillation plants. And what happened? They were put in charge of men who had never been in a plant in their lives, and built without any knowledge of chemical engineering. I make no reflection on Mr. Bellfinger, but what was the result? Every one of those plants burned or failed. They had products on their hands they didn't know how to purify, couldn't market the products, and local

capital was lost in those plants, thousands of dollars. But now see what happened. There was another stage in development, but again men who knew nothing about chemistry or chemical engineering stepped in the front of the picture. My good friend, Thomas Dixon, the author of "The Clansman," a preacher, a good preacher but a poor chemist, got busy, and Tom put up a plant to be a model plant, to which all these Crackers could come, you know, and see the wonders of what chemistry can do, and of all the bum engineering and bum chemical engineering principles I ever saw in a plant! He hoped to put up 200 such plants all over the South. He put up one and it never made a success at all. But mark the contrast—when two companies like the Hercules Powder Company and the Newport Chemical Company came South, with real research corps, a real staff of chemists and chemical engineers, and put up beautiful plants at Pensacola and Brunswick, Georgia, to utilize the resinous wood of the South, you see a successful industry, collecting the stumps economically through the pine woods, covering thousands and thousands of acres of land, good mechanical devices, and in the extraction plants applying the best of chemical engineering knowledge, and making a place for themselves in the market against the gum spirits and the gum rosin men, and through intensive research each plant has learned to bring up the grade of rosin from dark to pale, which makes a tremendous addition to their income annually today. No better proof could be given of the very principle I enunciated at the outset than the history of that industry of the utilization of pine stumps.

But now see another thing—the question of lime manufacture is a tremendously important question. The South is a wonderful place for great stores of limestone, but see what we are doing. Visit any lime kiln in the South. In the first place, you find no chemical control. In the next place, you find a lot of kilns that to a good chemical engineer appear ridiculous. Inefficiency in manufacture, we pay the price for that, and yet there are plenty of good lime kilns in this country, especially connected with the soda industry, making lime at one-half the cost. They don't sell it, but use it in their own processes. We have to take heed of that matter.

What is limestone made of? Calcium oxide, and lime is one of the greatest chemical reagents. Don't forget that, because over forty-five per cent of the lime manufactured in the United States today is chemical lime used for chemical purposes, in connection with sugar, paper mills, glass factories, and so on. But that is only about half of the weight of the limestone, the other half is carbon dioxide. What happens to the other half? It goes into the air as flue gases, and yet that very material that escapes, that CO_2, if gotten into solid form, is being used today in salvaging the peach crop of the South, particularly in Georgia, or the fig crop in Texas, and should apply to the fishing industry all along this Gulf Coast from one end to the other, where the great proportion of the fish for the United States comes from. Crop after crop can be preserved by the quick freezing processes so rapidly coming to the fore. The waste material is now going into the air.

But let's see, now. Let's talk about the resources of this great section. I don't want to spend too much time on this, because it has been so admirably covered in a publication gotten out by the Chamber of Commerce in New Orleans, "Industrial Chemical Opportunities of New Orleans," and then there is another publication—I don't know whether these have been distributed at the meeting. I haven't it here. No, here it is, "Survey of the New Orleans Industrial Zone." If those of you who are members of the Institute haven't obtained copies of these two publications, call on Mr. Schneider at the Chamber of Commerce, and rope him, throw him down and take them away from him, because if you want to know something of the remarkable possibilities of this country, there is one of the most complete surveys I have ever seen.

And among those things, we come naturally as chemical engineers to think first of fuel. I don't need to dwell here upon the fact that this section, as you already know, is blessed with the two ideal fuels for industrial purposes, oil and natural gas.

I don't think anyone will dispute the point that such fuels as oil and natural gas, with their ease of control and certainty of maximum heat, make a wonderful foundation stone for the chemical industry.

capital was lost in those plants, thousands of dollars. But now see what happened. There was another stage in development, but again men who knew nothing about chemistry or chemical engineering stepped in the front of the picture. My good friend, Thomas Dixon, the author of "The Clansman," a preacher, a good preacher but a poor chemist, got busy, and Tom put up a plant to be a model plant, to which all these Crackers could come, you know, and see the wonders of what chemistry can do, and of all the bum engineering and bum chemical engineering principles I ever saw in a plant! He hoped to put up 200 such plants all over the South. He put up one and it never made a success at all. But mark the contrast—when two companies like the Hercules Powder Company and the Newport Chemical Company came South, with real research corps, a real staff of chemists and chemical engineers, and put up beautiful plants at Pensacola and Brunswick, Georgia, to utilize the resinous wood of the South, you see a successful industry, collecting the stumps economically through the pine woods, covering thousands and thousands of acres of land, good mechanical devices, and in the extraction plants applying the best of chemical engineering knowledge, and making a place for themselves in the market against the gum spirits and the gum rosin men, and through intensive research each plant has learned to bring up the grade of rosin from dark to pale, which makes a tremendous addition to their income annually today. No better proof could be given of the very principle I enunciated at the outset than the history of that industry of the utilization of pine stumps.

But now see another thing—the question of lime manufacture is a tremendously important question. The South is a wonderful place for great stores of limestone, but see what we are doing. Visit any lime kiln in the South. In the first place, you find no chemical control. In the next place, you find a lot of kilns that to a good chemical engineer appear ridiculous. Inefficiency in manufacture, we pay the price for that, and yet there are plenty of good lime kilns in this country, especially connected with the soda industry, making lime at one-half the cost. They don't sell it, but use it in their own processes. We have to take heed of that matter.

What is limestone made of? Calcium oxide, and lime is one of the greatest chemical reagents. Don't forget that, because over forty-five per cent of the lime manufactured in the United States today is chemical lime used for chemical purposes, in connection with sugar, paper mills, glass factories, and so on. But that is only about half of the weight of the limestone, the other half is carbon dioxide. What happens to the other half? It goes into the air as flue gases, and yet that very material that escapes, that CO_2, if gotten into solid form, is being used today in salvaging the peach crop of the South, particularly in Georgia, or the fig crop in Texas, and should apply to the fishing industry all along this Gulf Coast from one end to the other, where the great proportion of the fish for the United States comes from. Crop after crop can be preserved by the quick freezing processes so rapidly coming to the fore. The waste material is now going into the air.

But let's see, now. Let's talk about the resources of this great section. I don't want to spend too much time on this, because it has been so admirably covered in a publication gotten out by the Chamber of Commerce in New Orleans, "Industrial Chemical Opportunities of New Orleans," and then there is another publication—I don't know whether these have been distributed at the meeting. I haven't it here. No, here it is, "Survey of the New Orleans Industrial Zone." If those of you who are members of the Institute haven't obtained copies of these two publications, call on Mr. Schneider at the Chamber of Commerce, and rope him, throw him down and take them away from him, because if you want to know something of the remarkable possibilities of this country, there is one of the most complete surveys I have ever seen.

And among those things, we come naturally as chemical engineers to think first of fuel. I don't need to dwell here upon the fact that this section, as you already know, is blessed with the two ideal fuels for industrial purposes, oil and natural gas.

I don't think anyone will dispute the point that such fuels as oil and natural gas, with their ease of control and certainty of maximum heat, make a wonderful foundation stone for the chemical industry.

Doctor Williamson has just mentioned sulphur. We all know the story of Doctor Herman Frasch and his wonderful development at Union of the sulphur mines. You can see his picture in the Chemists Club in New York. He was rewarded for his infinite persistence that would not brook failure until he got from the bowels of the earth that which had lain there for centuries. I think we can get inspiration in a brief period of thought on the character of Herman Frasch and his work in Louisiana. He almost completely wound up the Standard Oil Company with its money to help him out. He got another fortune and spent that, and spent his own. Difficulty after difficulty was encountered and finally success came, and after all it seemed so easy. And so with us, with many of our problems, if we can put into our work of overcoming the difficulties which are going to arise in any line of development, the same spirit that Frasch put into it, success is sure.

Now, there are two other chemical products which play a somewhat important role in the chemical industry, caustic soda and chlorine from salt, or sodium itself, metallic sodium. You are going to see, those who take the trip Doctor Williamson has announced, the most remarkable salt deposit I have ever witnessed, and I have been through all those in Germany and other sections of this country, but I will never forget my visit in 1915 to the Myles salt mine, to see how nature has blessed this State with salt that runs 99.84 per cent sodium chloride. As I understand it, the rest of it is practically anhydrite. Now, you chemists and chemical engineers know what that means. You have salt there that is not delinquescent. The thing that makes ordinary table salt deliquescent is a salt of magnesium, and this is practically pure salt, just a trace of magnesium salt, just like the sulphur in its purity—a remarkable thing to me about this country down here. I don't know what the Lord was thinking about when he gave you people such pure stuff and gave you time to loaf while the rest of us are working.

Let me tell you a story about that salt. Listen, you people of Louisiana. I am talking to you now. The chemists can go to sleep. I was in Baton Rouge last spring a year ago and stayed

at a very lovely hotel. In the morning we went to breakfast, everything was very nice, served beautifully. We had nice scrambled eggs served, and picked up the salt cellar, but nothing came out. Unscrewed the top, poured out some of it, and there was a lot of rice in it, a sticky, gluey mass. I went back to the chef and said, "Where did you get this salt" He said, "It came from Michigan." And right here under your nose you have the most beautiful salt in the world.

And, by the way, this afternoon when we came back from the Celotex plant, what did I see on the fences over there but the advertisement of a salt from without the State of Louisiana. Good gracious alive, my niece brought me the other day a carton of well-known table salt—I am not advertising any particular salt—and she said: "Listen to that hard lump of salt in there." It had so much magnesium salts—almost like running opposition to the Pluto Water industry. And here these Louisiana people sit right here with the most beautiful salt in the world. In 1915 I took some Louisiana salt to the laboratory in Chapel Hill, N. C., and spread it out on some crystallizing dishes and left it for a year, and I picked it up on the muggiest, wettest day in the year and it had never changed.

So I say to the people of Louisiana, look out about your own home products. See that they are advertised and the rest of the country can get advantage of them.

Now, of course from the standpoint of the chemical industry you have an abundance of limestone, and in Winn Parish, at Winnfield, there is a great deposit of limestone to make that great base of the chemical industry, calcium oxide, quick lime, or hydrated lime—so that is present.

Another thing, especially for the man connected with the organic chemical industry, the greatest chemical reagent that chemists have to work with next to water is alcohol. I know there are a lot of people who put alcohol before water, just a little water and much alcohol, but alcohol, the consumption of industrial alcohol in this country in the last few years, has gone forward by leaps and bounds, and yet right here in New Orleans twenty-five per cent of the industrial alcohol of the nation is manufactured, either from molasses from the local

sugar refineries or imported molasses, and right here anyone who wants to enter the chemical industry will find an abundance of industrial alcohol—twenty-five per cent of the nation's supply made right here.

There is another thing I notice, looking at Mr. Schneider's paper, he rather boasts of the fact that with natural gas we have an abundant supply of carbon black which is used in the chemical industry, and yet I don't know whether that is worth bragging over. It looks to me like that is the greatest sacrifice of good stuff that ever was. I had rather point out to the people of Louisiana the example of West Virginia. West Virginia practically forbade it, and today, instead of burning natural gas to make carbon black there on the banks of the river at Charleston, West Virginia, they make glycol, in tank car lots, and six or eight million gallons of ethylene alcohol. That is the way to make use of natural gas. You have got to have fuel. That is all right, but don't let's stop at the half-way station. Let's take it on to real chemical development through the medium of research.

Then, of course, here we have this great industry of sugar and syrup. I don't know whether you men coming down here have been eating maple syrup or gotten familiar with Southern syrup. If not try some on your waffles tomorrow morning.

And the Celotex plant. I don't know, but there was something about that plant this afternoon that just made me feel happy, to live to see an old nuisance such as bagasse that was all over every cane field in the South, to see that stuff coming out from that plant over there and going throughout the nation to make people's homes comfortable, improve the acoustics of buildings—that is progress. It is the same kind of progress that we once had in Tennessee when everybody was filing suits against the copper companies, and Georgia was suing Tennessee for damages from the fumes of the smelters; but no more. Now tank cars of sulphuric acid are going out to make phosphate and to improve the crops of the South. That is progress. That is the part of the chemical engineer in specialization, and that is why I say to you people in Louisiana, there are two conventions going on today, one of the Superintendents of Dining

Cars—well, they are necessary when you are hungry—but the presence of these men, you people of Louisiana, and especially you people of New Orleans, the presence of the American Institute of Chemical Engineers has more significance for the people of the State than any convention held here in years, in the possibilities that may materialize through their brains working out the problems that you have got to have worked out.

Wood distillation. Here is a whole raft of hardwood such as was pointed out to us up in these swamps, but you say that since the advent of synthetic methyl alcohol there is no future for wood alcohol, but the hardwood distillation people are not closing their doors. It is all needed in the chemical development of lacquers and so on.

Of course, in the question of water, a good supply of water is necessary in any great chemical development. These rivers down South look awfully muddy to you, maybe disgusting after some of the clear waters of the North, but that mud is not in solution, and if allowed to settle out and you clarify it, you get one of the purest, finest industrial waters known.

Then there is the naval stores industry. Spirits of turpentine and rosin, this industry is not so great in this State as it was, but it is capable of coming back strong, and that brings me to the next subject.

If I were asked my opinion of what is the greatest asset in the way of chemical resources the South has today, that is, this section right here, but it applies to the whole South, I would say the one substance is cellulose. Here in the South, through the solar energy acting through the leaves of plants and trees under favorable temperature conditions, not too hot and not too cold, throughout most of the year, there goes on a constant elaboration of cellulose by the plants, and so you have a continuing source of wealth, not like mineral wealth from the ground, which is dug up and is gone, but nature continuing in its own chemical factory through tiny cells in the leaves this constant manufacture of what is going to be the great raw material for untold industries in this country. There is no doubt about the fact that in America today we are right

in the middle of the cellulose age. I would not dare to predict for one moment what the consumption of wood pulp for paper, for artificial leather, etc.—I am speaking about wood pulp. Cotton has its place. But first let me discuss the question of cotton or cotton seed. Last January I fed a protein compound made from coton seed meal to 800 people in the Chamber of Commerce at Savannah, and they smacked their lips over the sandwiches. People used to think cotton seed wasn't any good. Then they found it good to put back in the land as fertilizer, and they found it good for hogs and cattle, but Dave Wesson has gone a step further and showed it is good for people—fed a whole editor's association in Atlanta, and talk about luscious caviar and things of that kind, you can't touch it. It is good. And don't forget this fact, that there is enough cotton seed protein produced every year in the South to give a full protein ration for a whole year to 55,000,000 people. That is an industry that has considerable future to it.

But coming back to cellulose, we all know that cotton is the purest form of cellulose, and cotton linters we used to throw away are now eagerly sought by manufacturers for nitration, but along with it is coming the opposition of the wood pulp people, and that is where the big future is to come. Cellulose by only two reactions, nitration and acetylation, can be converted into such things as the inside furnishings of automobiles, lacquers for outside body paint, varnish, artificial leather, celluloid and non-shatterable glass to prevent accidents. I think the day will come when no one will be allowed to build an automobile or a railroad car without non-shatterable glass, because the great bulk of accidents by automobile, train or bus comes from cuts by glass.

But what I am telling you particularly about now is the use of cellulose for paper and for cartons. Do you realize what a tremendous change has come in the wrapping of any kind of packages today, as compared to a few years ago, how the carton has completely supplanted the old wooden box,—the white pine box Go to any store and see what you find. You will see a mass of cartons. When they came to move my office a while ago they brought cartons for packing the books. There are a thousand and one uses for cartons. We are just beginning

to realize the advantages in weight and shipment, but let us get to a higher use than that, and that is for paper.

What does paper mean to us in the South? Already the development of the Kraft paper industry, that is, brown wrapping paper for groceries, bags, etc., has developed on an enormous scale in the South, in Arkansas, Louisiana, Mississippi, Alabama and West Florida. And what is the reason for it? Why, it is just the simplest economic factor in the world. I talked last night with a man coming down on the train, and although he was guarded and careful in his statements, he knows as much about paper as any man in the world. He told me the cost of wood for making Kraft paper in the North was about $20.00 a cord, and you can get it anywhere down here for $4.50 to $6.00. When I made that statement in Georgia the other day, they said, "Good gracious, if you will pay $6.00 we would all stop working and go to cutting wood. We are glad to get $3.00." It takes two cords of wood to make a ton of pulp. That is $40.00, and at $6.00, say, giving the highest figure, that is $12.00. Look at the difference. Look at the advantage the South has in that respect. And yet this same man told me with equal frankness, and I value his opinion, that the paper mills of the South are being conducted too much without chemical control and chemical research to bring them up to the highest quality. I think that point is well worth passing on to the paper manufacturers in the South, because the paper industry is practically a chemical industry, and a chemical industry without a chemical engineer is in danger.

But what about white paper? Well, that is a funny story. To me that is one of the most remarkable stories I ever ran across in my life. I am talking now to both the chemical engineers and to the public. Two gross misconceptions about the pines of the South have been primarily responsible for the lack of development of the white paper industry in the South, and by white paper I mean any kind of paper using a white bleached pulp, and especially news print.

When the newspapers talk to our people about patronizing home industry and buying the farmers' products, I see that the very issue on which they print that story is on paper imported from some other part of this country or from abroad.

They have slipped up on the greatest possibility before the South.

Here are the two misconceptions: The first is—and you will find it all through the literature on the subject—that we have spoken about the pine in the South and have made no distinction between the heart wood of the pine and the sap wood. The average man has thought of the pine of the South in the terms of the great and wonderful old forests of pines cut off in this country during the past twenty or thirty years. Louisiana had the most magnificant of all timber. There never was such timber anywhere in the South as in Louisiana, and I learned last year that on one railroad that had at one time forty-seven sawmills, now only seven are left, and they have only a few years left to cut. But this timber made wonderful structural timber for house building, and trestles, and wherever strength and elasticity are needed. That old heart pine, the yellow pine of the South, was considered a great thing, and people have always thought of pine in those terms, and that sort of wood is full of resin. In sawing that kind of stuff we always threw away the sap wood and burned it up in the slab pits. There is a difference in the weight of the heart wood and the sap wood, but even the International Critical Tables give the specific gravity of pine ,and no man can tell whether they are talking about heart wood or sap wood.

Well, you say, what does that mean? The paper men have said that this material is too rich in resin to consider trying to digest it by the sulphite process by which white paper is made, too rich in resin. There is not just one pine of the South —here we have four: the long leaf or pinus palustris, with needles 14 inches in length; slash pine, there is more in Georgia but some here, too, pinus heterophylla, or Cuban pine; both of them great producers of naval stores; and loblolly pine, it does not make turpentine, but there are great tracts of it in Arkansas and through there; and the shortleaf pine, that also does not make turpentine. Those are the four chief pines of the South.

All the great original forests of these species, chiefly heart wood, have practically been cut away. There are small tracts here and there, but they are limited. However, there

has been reproduction in spite of all the carelessness of our people in allowing fires to sweep this country through every winter—I don't mean forest fires as in the West, but ground fires. This whole country is covered with wire grass. It makes a beautiful coat in the spring and summer in the pine forests. It dies out in winter, and they burn it off for all sorts of reasons, some to protect against fire, another to keep the cattle out, and another to keep the rattlesnakes out, but they burn up all the young pine. Wherever you keep the fire out of the ground, you don't need to plant the seed—the trees that are left bring up an abundant supply. And so through the South today, through accidental protection, where a road has been built through, or where wagon tracks have made a road—put it that way—where a creek runs along, where a log has fallen down, or anything to stop fire—there has been so much reproduction even under adverse circumstances, that while people predicted to me twenty years ago that the naval stores industry—it was twenty-eight years ago, in 1902—would be extinct in twenty years, now the great hue and cry is overproduction of naval stores.

Think what this country can do in the way of production of that material when we stop burning the woods in the winter. The movement is getting headway. It is being done. It has been proved effective. It can be stopped, and wherever it is stopped you have wonderful growth, and right here in Louisiana I want to pay my tribute to Mr. Henry Hardtner, the pioneer in this movement. He lives at Urania, and he started this movement twenty-five years ago. His example has spread, and in Georgia and elsewhere other people are keeping the fires off. The Forest Service is co-operating in every way possible. Today I had a delightful talk with the head of the Forest Service here in New Orleans.

But they say it comes up so thick, what are we going to do with the thinnings? That is the pretty part of the story, and that brings up the next thing. If you will take, for instance, the slash pine—if any of you have ever traveled through Georgia on the way to Florida, you will see all along the railroads wonderful stands of slash pine. It is the greatest of all pro-

ducers of naval stores, so much so that the representative of the Forest Service who made a study of the suitability of American wood for pulp, in a bulletin issued in 1927, made this statement, that the slash pine, after studying all the woods, by the sulphite, sulphate, soda, and mechanical processes, the slash pine was probably too rich in resin for consideration for pulping by the sulphite process, and under the head of mechanical process, "probably too rich in resin for consideration."

Mr. Rue, who published this statement, was in my office about two weeks ago and stayed two hours, and he said his eyes were opened. Here is where he went wrong, like so many other people. I tried to get someone to tell me how much resin there was in slash pine, because that being the richest producer of resin that was the best point of attack, and I got estimates of from 10 to 33 per cent. Then I said to Mr. Alex Sessones, let's get the facts, and get away from hunches and opinions. We had thirty trees cut down and sawed, young trees, no heart, all sap. The sawdust was sent in sealed cans to the Hercules Powder Company to be analyzed, and there was just a shade more in that pine wood than in the Canadian spruce, which contains three-fourths of one per cent, and this is about 1.3 per cent, practically the same as the Canadian spruce. Now here is where the second error came in, and that is where the naval stores people suffered a long time. In a pine tree as it stands there is a certain amount, a small amount, of physiological resin, a perfectly normal constituent of a pine tree. And yet, if you cut that pine which runs so low in resin, and as you continue to chip it from week to week during the year, you find more and more resin formed, and so the great bulk of the naval stores crop of the world, you might say practically the entire naval stores crop of the world, is produced only as a result of wounding the pine. It is a pathological product.

Some of you will say—the general public—that is pretty theoretical. No, it is not. That means everything. I will show you what it means. An experienced professor worked that out a long time ago. I talked with him in 1903, but nobody paid any attention to him. It has kept the South from having a white

paper industry more than any other thing in the world. It has kept back millions and millions of dollars of invested capital from the South, and has destroyed the chance for the farmers and the men owning abundant acres.

I will show you how you can make it. I had an awful hard time finding a place to have the experiment made after we found the low resin content and looked at the wood and saw how different it is from the heart wood. It is a beautiful wood. Here is a disk of one young pine, only an eleven-year-old tree. It takes sixty years to grow one like that in Canada. The wood is nice and white and has not any of the appearances of the ordinary pine wood we are so familiar with from the heart of the tree. Through the courtesy of a friend I was introduced to a man, one of the best known paper chemists in the country, at a well-known plant, whose paper many of you have handled. We shipped some slash pine wood. You can see from that there is practically no resin in the wood. And here is the point, as you season that wood, when the water content in that wood drops down below some point—I haven't determined it yet—that resin formation stops. So if you cut down the tree and leave it lying on the ground for three or four weeks, with the top of the tree to aid the evaporation of the water, you have a tree as free from resin as any Canadian spruce.

We took some of that wood and the paper chemist made a basket out of a metal not affected by sulphurous acid, and hung it right down in the digester with a regular cook of Canadian spruce, and there was nothing new about it except in the pine wood we used, which was free from heart wood. And here is the pulp. That is the unbleached pulp made from a piece of slash pine. This is the tree right here—cooked in the same digester with the spruce pine of Canada, the same length of time, the same pressure, the same temperature. It broke up easily and gave a nice pulp, and that chemist told me that when he started the experiment he didn't have the slightest belief that anything would develop.

Then came the question of bleaching, and I stood watching with anxiety. Then I saw his hand tremble. He was so excited when he saw the color of that beautiful material, as white as snow, from the slash pine of the South.

Some of that was taken to make a mat, and I show you two samples of the paper that came out. There is a sample of spruce, a little thicker sample, and there is a sample of slash. The spruce took thirteen and a half pounds of bleach to one hundred pounds of bleach, and the slash took thirteen, a little less, and everybody that sees it says it is prettier. In other words, it is just as easy to bleach as the spruce of Canada.

If you will take pine without heart wood in it,—and that is the young pine that comes up in reforestation—and thinning, say, a thousand trees to the acre, and it is too thick, and you have to take out, say, 800 and leave a final stand of 200 for naval stores and lumber, you have 800 trees as a waste product. These trees grow fast, and can be the foundation of a white paper industry.

The next question came, "What about newsprint?" Because that is made up of from fifteen to twenty-five per cent sulphite pulp, and the rest is mechanical pulp, which is nothing in the world but ground-up wood. We had that experiment made in South Carolina, and that wasn't purified in any way, just took it right out from under the grindstone. I have shown that sample to Doctor Kellogg, Director of the Newsprint Service Bureau. That was about two weeks ago, and I was a little afraid of the color, thought it might be too much of a cream color, and he said it was beautiful, and the chief chemist of one of the largest publishers said the same thing. Moreover, I asked the man who ground that wood, Mr. Coker, who has been grinding wood for twenty-five years and making paper, to look at it, and I said, "Give me your expert opinion and tell me honestly what you think about that as a possibility for newspapers." He examined it and studied it a long time, and said, "You have some very, very good material for newsprint." When people say that I exhibited specimens of newsprint in Atlanta about a month ago, that is not correct. I did not, but I exhibited the two things from which newsprint is made.

Just think what that means—think what that means to the farmers of the South. I have seen two articles in a paper since I have been here that worried me. One of them was an

article—a man in Savannah sent it to me—an article in the Times-Picayune of December 1st, in which the writer says that Louisiana is changing from a farm-timber basis to farm-chemical economy. I am sorry that he wrote that article, because that article had big headlines, and a great many people read only the headlines.

Tell me, as a matter of commonsense, you people of Louisiana, how much acreage do you need for a mine—to make a hole in the ground? Two or three, maybe ten for your plant. Suppose you have got a hundred mines, 10,000 acres. It will, of course, be natural to go ahead with your mineral development, but what about the rest of the 1,000,000 acres of this State on which nothing is being done today? That is something to think over. Talk about turning away from timber considerations! Here is the hard part of the story. That article had big headlines, and probably many people read those headlines and got the idea the timber business was all over, and didn't see the very beautiful contribution from Doctor Ziegler of the Southern Forest Experiment Station, who answered it in the issue of December 4. Probably none of you read it. It was put under the "Letters from Readers" column, and some people probably thought it was like Dorothy Dix's answers to lovelorn maids, but it should have had big headlines. This comes from a man who knows your State and is living in New Orleans, "Louisiana's 17,000,000 acres of forest land are capable of growing five billion feet of timber each year in perpetuity, a quantity larger than the four and one-tenth billion feet cut in 1918," and yet Mr. Trufant says in his article as to Louisiana that "it seems apparent the State is passing from a timber and farm economy to a mineral and farm economy. Hardly anyone says that reforestation for wood pulp will ever replace the lumber industry in Louisiana in the position it occupied in the decade between 1903 and 1913. That day is gone forever."

He does not know about the wonderful production of cellulose each year, and he needs only to take a trip by automobile and see what I saw last year, the great tracts of abandoned land, cut-over land, on which nothing is being done today, and

yet here is New York State appropriating $60,000,000.00 for reforestation, and down here we can grow it faster than anyone, and there is the proof that we can utilize it to build up in the South an industry far more natural to the South than ever the textile industry was.

Put your $40.00 timber against your $12.00 timber as a start-off advantage to the South. It doesn't require any more bleach, and is as good a mechanical pulp as the other. Take the year-round operations in a mild climate. Take the amount of capital that many mills have to tie up in loge, and the storage and interest charges on the investment, and down here you can reap it as you want it. But I wish the South would get away from the idea of cheap labor. Any man who tries to keep labor down is working against the best interests of the South, because in that way you get nearer to China and India, but there is good negro labor in the Southern country today that gladly would work for $2.00, and you will pay $4.00 in the North for that same class of roustabout labor.

But look at another thing. I saw in a mill 'way up in the northern part of the United States last summer a carload of clay from near Augusta, Georgia. I calculated with the owner of that mill when he gave me the freight charges what an advantage it would have been to him if he could have gotten that without the freight, and saved $1.00 a ton on the pulp, and that's a pretty good thing, and yet the clay that the paper industry is using is right down South in the midst of the pine lands. And there in another room in the same mill I saw rosin shipped from the South and out of the very same tree from which you make pulp you can make rosin.

Sum it all up, is there any answer but one to that argument? There are a lot of questions that cannot be answered yet. I have been asked many questions many times in the last month about pines other than the slash pine. Is that also true of young longleaf pine? Young loblolly and young shortleaf, which likewise have no heart wood until they reach the age of about twenty-five years? I can only answer that I don't know from experiment; but the slash I know, that is the laboratory method, that is what the chemist relies upon. As to the others,

that is simply a matter of opinion, but I believe confidently from my knowledge of the wood that if the same experiments were carried out you would get the same results as in the case of the slash pine. But we have no facilities in the South to make that test and to make paper from it, which would do more than anything else to convince the paper manufacturers as to the most economical locations for their plants. I hope some day these facilities will be available.

Think what that would mean. Talk about changing to a mineral economy! Develop the minerals to the fullest extent, but your perpetual source of wealth is that constant crop of cellulose, of wood fiber, which this country can grow in such quantities, as Mr. Ziegler pointed out in that article in the Times-Picayune; and that is true of the whole South. In this morning's paper I noticed that twelve of the literary men of the South are publishing a book—I think one is a New Orleans man. They want the South to turn back from the idea of industrial development and keep the old cultural spirit of the South. Well, believe me, first of all, every one of these gentlemen who wrote that book—I hope they will succeed in keeping up the fine old culture of the South, and I think they can do it without sacrificing to the industrial spirit—but they are nice professors in universities with nice homes in the city, and they are not thinking about the old fellow on the farm, wondering from where he is to get his meat and bread. Too long we have been thinking about the farmer as a man who has to raise cotton, corn and a little oats, and a few scrub cattle, but he has a wood lot. I don't know what the figures are for the entire South, but in Georgia he has got altogether some 3,000,000 acres of abandoned farm land, not cultivated, but they are waking up over there, and you ought to wake up over here. One of the important things for the farmer to raise is pine trees, and reap every year judiciously, under good forest management, through the aid of an extension course, and take out those he can market to let the rest grow better. They grow best on abandoned fields, which raise nothing but broomstraw. They can plant in the winter, and realize the stumpage value, and haul it to the mill and get the truck

hire. In other words, while we are talking about hard times, let's open our eyes and see if there is not a good source of wealth right beneath us, under our feet. Don't you see, therefore, you people of Louisiana, you people of the whole South, don't you see the importance of a paper industry, not simply to manufacture paper and give employment to the people in the paper mill, but to take up the output of your abandoned farm land and to stimulate the very agriculture these professors are asking for? I make this prediction—I don't like to boast, but if this vision I have of a reforested South, with paper mills scattered all through it buying up the products from the reforested areas and the farms, if that doesn't do more to help agriculture than all they say here, I will take a back seat, because the people have got to come out of the depths of despondency in which agriculture is today in the South. Don't look to the Federal Government for relief all the time: let's help ourselves. That is why I say that the most important problem before the South today is through every legitimate means at our command to see more and more paper mills come down here, and through their presence stimulate the cultivation of that most important chemical resource, cellulose.

MEMBERSHIP LIST

HONORARY MEMBERS

J. F. COLEMAN, (C. M. and H. M.), of J. F. Coleman Engineering Co., 501 Hibernia Bldg., New Orleans.

WALTER H. HOFFMAN, (C. M. and H. M.), Civil Engineer, 1518 State St., New Orleans.

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

GERVAIS LOMBARD, (C. M. and H. M.), Board of State Engineers, 207 N. O. Court Bldg., New Orleans.

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

LIFE MEMBERS

JOHN KLORER, (1898), Chief Engineer, Orleans Levee Board, 600 Common St., New Orleans.

G. W. LAWES, (1898), Civil Engineer, 510 American Bank Bldg., 918 Broadway, New Orleans.

HENRY J. MALOCHEE, (1898), Buckmaster, Buck and Malochee, Inc., 617 Common St., New Orleans.

THOS. H. TUTWILER, (1898), Retired, 1488 Vinton Ave., Memphis, Tenn.

FRANK H. WADDILL, (1898), Consulting Civil Engineer, 407 Tulane-Newcomb Bldg., New Orleans.

HENRY L. ZANDER, (1898), Civil Engineer, 821 N. Rampart St., 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., 1224 Lowerline St., New Orleans.

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

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

WALTER J. AMOSS, (1924), c/o United Dredging Co., Woolworth Bldg., New York City.

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

PAUL ANDRY, JR., (1930), Engineering Department, Shell Petroleum Corporation, 1527 Fourth St., New Orleans.

SAM VERNON APPLEWHITE, (1927), with J. W. Billingsley, Interstate Bank Bldg., 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, Orleans.

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

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

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

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

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

BEN H. BELL, (1920), Operating and Electrical Engineer, New Orleans Public Service Inc., 4215 Freret St., New Orleans.

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

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

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.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

HENRY BELL COOLEY, (1924), Civil Engineer and Attorney at Law, Napoleonville, La.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

GEORGE G. EARL, (1900), General Superintendent, Sewerage and Water Board of New Orleans, Room 402, Sewerage and Water Board Bldg., New Orleans.

RALPH EARL, (1913), Assistant Director of Water Purification Department, 2142 Eagle St., New Orleans.

JOHN T. EASTWOOD, (1901), Principal Assistant Engineer, Sewerage and Water Board, Sewerage and Water Board Bldg., New Orleans.

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

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

MARION J. EPLEY, (1920), President, Automobile Security Corp., 1706-08 Masonic Temple, New Orleans.

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

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

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

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

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

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

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

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

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

HAROLD L. GAIDRY, (1930), Gas Dept., New Orleans Public Service Inc., 317 Baronne St., New Orleans.

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

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

WILL J. GIBBENS, SR., (1900), President, Gibbens & Gordon, 532-534 Canal St., New Orleans.

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

DAVID W. GODAT, (1924), Assistant Engineer in Charge of Bridges, City Engineer's Office, 7826 Zimple St., New Orleans.

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

JOSEPH McCORMICK GONDRAN, (1924), Structural Engineer with Luckens Steel Co., Box 320, New Orleans.

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

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

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

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

EUGENE C. GRAVELY, (1918), Civil Engineer in Private Practice, 908 Masonic Temple, New Orleans.

CHARLES HENRY GREEN, (1931), Assistant Resident Engineer, Louisiana Highway Commission, 4478 Lafaye St., New Orleans.

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

E. H. GREHAN, (1914), Engineer with Geo. J. Glover Co., Inc., 1670 Soniat St., New Orleans.

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

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

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

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

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

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

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

WILLIAM WALLACE HAY, (1928), Engineer, Inland Waterways Corp., 500 Lowerline St., New Orleans.

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

W. S. HENNING, (1919), Locating Engineer, Louisiana Highway Commission, 316 Camp St., New Orleans.

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

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

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

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

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

EDWARD C. HYATT, (1925), Civil Engineer, 3802 Prytania St., New Orleans.

LYALL GIBSON IRELAND, (1929), Assistant to Vice-President, New Orleans Public Service Inc., 1634 Robert St., New Orleans.

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

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

ERNEST LEE JAHNCKE, (1900), Assistant Secretary of the Navy, Washington, D. C.

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

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

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

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

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

KARL P. KAMMER, (1931), with New Orleans Public Service Inc., 1453 Arabella St., New Orleans.

ERROL E. KELLY, (1920), American Bank Bldg., New Orleans.

JAMES P. KEMPER, (1909), Civil Engineer in Private Practice, 530 Whitney Bldg., New Orleans.

CHARLES MACDONALD KERR, (1914), Sales Engineer, American Tar Products Co., 5831 S. Robertson St., New Orleans.

LEONARD FRANK KERSHAW, (1931), Superintendent, General Box Company, 2328 State St., New Orleans.

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

LEONARD R. KIRST, (1928), Engineer, Roadway Dept., New Orleans Public Service Inc., 2113 Tulane Ave., New Orleans.

R. B. KOHNKE, (1911), Engineer, 934 Picheloup Place, New Orleans.

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

HERRICK J. LANE, (1922), Auditor, W. Horace Williams Co., Inc., 1465 State St., New Orleans.

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

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

LEON LASSEN, (1926), Assistant Engineer, Water Purification Plant, 4019 Eagle St., New Orleans.

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

RANDALL FRANK LEGEAL, (1923), Engineer, New Orleans Public Service Inc., 5800 Fontainebleau Drive, New Orleans.

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

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

J. H. LEWIS, (1908), 502 St. Peter St., New Orleans.

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

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

A. M. LOCKETT, (1900), President, A. M. Lockett & Co., Queen and Crescent Bldg., New Orleans.

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

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

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

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

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

H. L. McLEAN, (1930), Engineer, 823 Maritime Bldg., New Orleans.

CHARLES S. McFARLAND, (1903), 2215 Joseph St., New Orleans.

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

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

RALPH G. MALONE, (1924), Chief Engineer, Louisiana Fire Prevention Bureau, 2831 Calhoun St., New Orleans.

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

JOHN W. MONTGOMERY, (1924), Engineer with Lukens Steel Co., 407 Balter Blag., New Orleans.

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

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

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

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

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

ROBERT K MULNIX, (1922), General Manager, North Rampart Lumber Supply Co., 525-41 N. Rampart St., New Orleans.

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

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

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

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

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

LAWRENCE KITCHENER NELSON, (1927), Engineer, 1026 N. Claiborne St., New Orleans.

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

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

WILLIAM F. OAKES, (1918), 344 Camp St., New Orleans.

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

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

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

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

OLE K. OLSEN, (1905), Contracting Engineer, 325 N. Cortez St., New Orleans.

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

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

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

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

JOHN L. PORTER, (1924), Director, Water Purification Station, Sewerage and Water Board, 8407 Panola St., New Orleans.

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

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

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

CHARLES FREDERICK RANTZ, (1924), Proprietor, Rantz Ice Factory, 425 Vallette St., New Orleans.

LESTER H. RAYNER, (1920), Chemical Engineer, 2116 Canal St., New Orleans.

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

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

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

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

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

GEORGE P. RICE, (1924), Consulting Engineer, 1301 Hibernia Bldg., New Orleans.

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

GEORGE P. ROBBINS, JR., (1928), Member, firm Robbins & Robbins, 4119 Perrier St., New Orleans.

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

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

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

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

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

ELBERT GILBERT SANDOZ, (1927), Civil Engineer and Surveyor, Slidell, La.

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

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

CARL SCHNEIDER, (1926), Mechanical Engineer, 7711 Plum St., New Orleans.

ARTHUR M. SCOTT, (1915), with Ole K. Olsen, Concrete Engineer, 325 Cortez St., New Orleans.

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

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

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

B. E. M. SKERRETT, JR., (1928), Personnel Director, Standard Coffee Company, 5594 Rosemary Place, New Orleans.

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

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

LEROY AUGUSTUS STAPLES, (1931), with George P. Rice, 5101 Pitt St., New Orleans.

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

REINHARD A. STEINMAYER, (1925), Assistant Professor of Geology, Tulane University, 1217 Calhoun St., New Orleans.

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

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

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

JAMES M. TODD, (1923), Consulting Engineer, 818 Maritime Bldg., 7421 Maple St., New Orleans.

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

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

GEORGE E. VINNEDGE, (1927), Superintendent, City Park, 6624 Louis XIV St., Lakeview, New Orleans.

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

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

GEORGE D. WADDILL, (1911), Assistant Engineer, U. S. Engineering Offices, 911 Cherokee St., New Orleans.

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

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

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

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

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

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

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

BEN WILLARD, (1900), Local Manager, General Electric Co., 1004 Union Indemnity Bldg., 7111 Freret St., New Orleans.

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

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

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

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

VICTOR L. WILLOZ, (1900), Distribution Engineer, New Orleans Public Service Inc., 317 Baronne St., New Orleans.

RUSS FAULKNER WILLS, (1926), Assistant Engineer and Terminal Engineer, Southern Pacific R. R., 2633 Napoleon Ave., New Orleans.

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

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

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

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

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

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

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

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

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

NON-RESIDENT MEMBERS.

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

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

ORLANDO P. ADAMS, (1920), National Tube Co., Nat'l. Works, McKeesport, Penn.

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

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

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

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

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

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

JOS. M. BING, (1917), Consulting Engineer, 152 West 42nd St., New York City.

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

PAUL BONHAM, (1926), Civil Engineer and Surveyor, Box 1024, Gulfport, Miss.

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

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

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

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

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

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

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

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

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

PETER J. DROMGOOL, (1925), 5218 St. Charles Ave., New Orleans.

WILLIAM F. EBLEN, (1916), Secretary-Treasurer, Engineering Service Corp., 923 Post Dispatch Bldg., Houston, Tex.

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

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

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

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

A. A. FRASER, (1922), Sales Manager, The General Fire Proofing Building Products Company, 305 Merchants Bank Bldg., Indianapolis, Ind.

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

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

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

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

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

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

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

FARRAR PETRIE HAMILTON, (1915), Texas Creosoting Co., Orange, Tex., 408 Walnut St., New Orleans, La.

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

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

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

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

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

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

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

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

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

HAROLD H. JAQUET, (1930), Geophysical Surveyor and Engineer, Shell Petroleum Corporation, P. O. Box 366, Sinton, Tex.

CHARLES L. JACOB, (1911), 1506 Boulevard, N. E., Atlanta, Ga.

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

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

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

SAMUEL P. LANDRY, (1929), Field Engineer, Box 334 Thibodeaux, La.

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

A. J. McCORKLE, (1930), Contracting Engineer, Picayune, Miss.

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

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

RALPH H. MANN, (1921), Field Engineer, Am. Wood Preservers Ass'n, 111 West Washington St., Chicago, Ill., Field Hdqrs., 645 Graybar Bldg., New York City.

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

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

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

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

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

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

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

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

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

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

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

LEON MYERS REINACH, (1928), Engineer, Phillips Pipe Line, Bartlesville, Okla.

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

J. B. REYMOND, (1922), 709 Main St., 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, Box 1002, Baton Rouge, La.

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

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

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

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

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

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

ARTHUR M. SHAW, (1910), Consulting Engineer to the Chinese National Construction Commission, Hangchow-Kiangshan Railroad, Hangchow, China.

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

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

JOHN A. SILSBEE, (1915), Vice-Pres., Director and Chief Department of Petroleum Engineering and Geology, Producers Royalty Corp., 9th Floor, Palace Bldg., Tulsa, Okla., 1702 So. Detroit, Tulsa, Okla.

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

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

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

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

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

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

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

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

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

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

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

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

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

ASSOCIATE MEMBERS

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

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

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

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

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

MICHAEL A. COOPER, (1927), Heating Engineer, 816 Howard Ave., New Orleans.

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

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

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

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

WALTER J. FOLSE, (1930), Machinery Sales, 8121 Freret St., New Orleans.

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

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

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

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

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

JULES GODCHAUX, (1899), Vice-President and Engineer of Operations, Godchaux Sugars, Inc., 1007 Masonic Temple, New Orleans.

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

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

OTTO S. JESSEN, (1929), Draftsman, 4956 Music St., c/o Dubuque Boat Co., Dubuque, Iowa.

GUS C. KRAUS, (1929), Assistant to Superintendent Rolling Stock and Shops Department, New Orleans Public Service Inc., 3233 Magazine St., New Orleans.

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

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

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

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

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

EDGAR CARUTH WALTHALL, (1929), Sales Engineer, Combustion Engineering Corporation, New Orleans District Manager, 588 Walnut St., New Orleans.

NON-RESIDENT ASSOCIATE MEMBERS.

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

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

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

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), Market Street Power House, New Orleans.

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

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

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

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

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

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

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

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

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

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

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

FRANK E. HOIGHT, (1926), Draftsman, La. Highway Commission, 452 Convention 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 Port Commissioners, 1729 N. Rampart St., New Orleans.

ALFRED LIPPMAN, JR., (1929), Chemical Engineer, 2508 Nashville Ave., 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, 4131 Elba St., New Orleans.

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

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

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

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

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

WILLIAM P. OSTER, (1928), 3436 Gentilly Blvd., New Orleans.

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

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

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

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

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

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

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

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

NON-RESIDENT JUNIOR MEMBERS.

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

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

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

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

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

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

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

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

FRED HADLEY PENN, (1930), Electrical Engineering, 204 Church St., Baton Rouge, La.

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

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

STUDENT MEMBERS.

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

JEROME C. BAEHR, 908 Webster St., New Orleans.

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

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

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

PERCY L. BERNSTEIN, East Beach, Gulfport, Miss.

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

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

CHARLES E. CASSAGNE, JR., 1012 Verret St., New Orleans.

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

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

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

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

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

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

CHARLES D. DAVID, Mandeville, La.

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

LUCIEN DEVALL, 2124 Milan St., New Orleans.

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

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

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

THEODORE LAWRENCE ESTORGE, 570 63rd St., West Allis, Wis.

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

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

CHARLES J. FRITCHIE, Slidell, La.

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

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

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

JOHN J. GIDIERE, 1015 Eleonore St., New Orleans.

JOSEPH E. GUIDRY, JR., 1101 Henry Clay Ave., New Orleans.

JOHN M. GUILLORY, 5201 Magazine St., New Orleans.

ERIC J. HANNEMAN, 1126 Dumaine St., New Orleans.

W. T. HESS, 202 Rosewood Drive, Metairie, New Orleans.

ALVIN E. HOTARD, 829 Lafayette Ave., Gretna, La.

EDMOND F. HUGHES, 4502 S. Miro St., New Orleans.

F. LAWES KLEINPETER, 2210 Nashville Ave., New Orleans.

CARL V. LAZARONE, Kenner, La.

STANLEY M. LECOURT, 213 N. Solomon St., New Orleans.

JOSEPH EDWARD LEININGER, 920 Music St., New Orleans.

CHARLES LOB, 3309 St. Charles Ave., New Orleans.

CLARAMON B. McEACHERN, 7103 Freret St., New Orleans.

FRANK M. McDONALD, 2820 Gen. Pershing St., New Orleans.

ALGERNON A. MABSON, 4020 Prytania St., New Orleans.

E. P. MADDEN, 1228 N. Rendon St., New Orleans.

EVAN W. MAHONEY, 806 Belleville St., New Orleans.

GEORGE ELMER MAY, 1533 Broadway, New Orleans.

LEAL C. McLEAN, 1544 Henry Clay Ave., New Orleans.

JOHN K. MAYER, 1738 Carrollton Ave., New Orleans.

PAUL G. MERRITT, JR., 1931 Gen. Pershing St., New Orleans.

JOHN J. METZGER, JR., 3126 Dauphine St., New Orleans.

ALBERT J. MEYERS, 5517 Prytania St., New Orleans.

EUGENE H. MIAZZA, 3424 Prytania St., New Orleans.

CHARLES R. MONTEIRO, 2103 Chestnut St., New Orleans.

HERMANN D. MYSING, 2115 Palmer Ave., New Orleans.

MYRTIS M. NORTON, 908 Lwerline St., New Orleans.

J. F. NUNEMACHER, 4915 Baccich St., New Orleans.

PASCAL PERETI, JR., 619 Bourbon St., New Orleans.

PHILIP FRANK PHILLIPS, 4424 S. Claiborne Ave., New Orleans.

CARROLL J. PEIRCE, JR., 8217 Nelson St., New Orleans.

WALTER H. PRICE, 3001 Ursuline Ave., New Orleans.

RAYMOND C. PROUET, 5110 Freret St., New Orleans.

RENE H. REIXACH, Interstate Commerce Commissioner, 1803 19th St., N. W., Washington, D. C.

JAMES M. ROBERT, JR., 2141 State St., New Orleans.

ASHLEY H. ROBINSON, 1735 Palmer Ave., New Orleans.

HENRY B. SARGANT, c/o Mississippi Power & Light Co., Jackson, Miss.

JOSEPH H. SAUCIER, 2616 Ursuline Ave., New Orleans.

BEN ZION SEGALL, Tester, New Orleans Public Service Inc., 520 Magazine St., New Orleans.

GEORGE JACOB SEGEL, 3022 Baronne St., New Orleans.

IRVING SIDNEY SELIGMANN, 2803 Jefferson Ave., New Orleans.

LEWIS M. SHELTON, 4915 Baccich St., New Orleans.

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

WALTER SUMNER SIMPSON, 19 Audubon Place, New Orleans.

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

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

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

BRUNO STOLLEY, 630 Napoleon Ave., New Orleans.

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

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

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

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

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

WILDAY TUDURY, 2522 Palmer Ave., New Orleans.

RICHARD E. WAGNER, 1818 S. Gayoso St., New Orleans.
STEPHEN J. WALLBILLICH, 4027 Delgado Ave., New Orleans.
JOHN MORT WALKER, JR., 6039 Prytania St., New Orleans.
O. P. WALKER, 5918 Chestnut St., New Orleans.
PHILIP ANTOINE WEBER, 3118 Magazine St., New Orleans.
CLARANCE MOHR WILLIAMS, 7103 Freret St., New Orleans.
JOHN W. WILSON, 7916 Oak St., New Orleans.
CARROLL LEE WOOD, JR., 819 Calhoun St., New Orleans.
CHARLES LAFAYETTE WRIGHT, JR., Romeville, La.

SUMMARY

Honorary Members	5
Life Members	6
Resident Members	235
Non-Resident Members	95
Associate Members	27
Non-Resident Associate Members	3
Junior Members	38
Non-Resident Junior Members	11
Student Members	91
Total	511

MINUTES OF THE MEETINGS AND BUSINESS OF THE SOCIETY

Minutes of the Board of Direction, December 8th, 1930.

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

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

A letter was read from Professor Douglas Anderson, Editor of the "Proceedings," submitting his resignation after sixteen years of service in conducting the Proceedings of the Society. The resignation was accepted with regret and the Board wished to express its thanks for the splendid work of Professor Anderson in carrying on these Proceedings. On motion, duly seconded, Professor James M. Robert was appointed Editor of the "Proceedings."

The President brought up the matter of the forthcoming visit of the President of the American Society of Mechanical Engineers the latter part of January during his tour of the local sections of the A. S. M. E. The Board voted that it would be fitting to have the Louisiana Engineering Society co-operate in some way with the New Orleans Chapter of the A. S. M. E., and on motion, duly seconded, the President was authorized to appoint a committee of three members to co-operate with the local Chapter of the A. S. M. E. as necessary in making arrangements for the entertainment of the national President.

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

Resident Members.

Charles Henry Green — Leonard Frank Kershaw
Karl P. Kammer — W. T. McCay
Leroy Augustus Staples

Transfer From Student Member to Non-Resident Member.

Harold H. Jaquet

Associate Members.

John P. Egan — John Reinhard
William Wallace

For Resident Junior.

Marcus J. Roux

Resident Student Members.

Robert Lang Argus — Claramon B. McEachern
Marcel Emile Crettet, Jr. — Herbert M. Shilstone, Jr.
Joseph Edward Leininger — Wilday Tudury
Irving Sidney Seligmann — Aubrey George Code
Dalton H. Trepagnier — Daniel D. Ewing, Jr.
William Pfaff Barrow — Charles R. Monteiro
William Joseph Drawe, Jr. — Homer H. Stockmann
Clarance Mohr Williams

There being no further business the meeting adjourned.

F. A. MUTH, Secretary.

Minutes of the Society, December 8th, 1930.

The meeting was called to order about 7:30 p. m. in the Arch Room of the Tip Top Inn, Roosevelt Hotel, James M. Todd, President, F. A. Muth, Secretary, and forty-one members and guests present. As previously announced, this meeting was an unusual one, in that it met in a different place from the regular meeting room, at an earlier hour, for the transaction of business, and then the Society was the guest at the winter meeting of the American Institute of Chemical Engineers.

On motion, duly seconded, it was voted to dispense with the reading of the minutes and the Society proceeded with the nomination of officers for the ensuing year.

The following members were appointed as tellers: Messrs. Moses, Billingsley and Dunlap.

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

For President.....Frank G. Frost
For Vice-President.....Fred N. Billingsley
For Secretary.....Frank A. Muth
For Treasurer.....Walter B. Moses
For Director (to serve 3 years).....Edward S. Bres

There being no further business the meeting adjourned to the adjoining room as the guest of the American Institute of Chemical Engineers, Professor C. S. Williamson presiding. A most interesting address was delivered by Major W. H. Holcombe on "Flood Control," and another on "Industrial Possibilities of the South," by Dr. Charles H. Herty.

F. A. MUTH, Secretary.

Minutes of the Annual Meeting of the Board of Direction, January 17th, 1931.

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

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

The resignation of Mr. Joseph M. Bing was accepted with regret.

The following names were removed from the roll: Messrs. M. J. Eppley, R. C. Bailey and R. F. Wils.

Communications from Mr. M. F. Canning, addressed to Mr. James M. Todd and Mr. F. G. Frost, relative to the School of Lighting Practice, were brought before the Board for consideration.

On motion, duly seconded, it was voted that the Society would cooperate in every practicable way with the School of Lighting to be held

in February, although it would not be practicable to arrange a meeting of the Society on that occasion. The Board instructed the Secretary to write Mr. Canning, explaining the situation, and offer the list of addresses, etc.

The annual report of the Committee on Employment, also the annual reports of the Secretary and the Treasurer and the Auditor were read and received. The Secretary was instructed to read them to the Society at the annual meeting.

There being no further business the meeting adjourned.

F. A. MUTH, Secretary.

Minutes of the Annual Meeting of the Society, January 17th, 1931.

The meeting was called to order about 8 p. m., Mr. James M. Todd, President, F. A. Muth, Secretary, and twenty-two members and guests present.

The minutes of the previous meeting were read and approved. The annual reports of the Board of Direction, Secretary, and the Treasurer, also report of the Committee on Employment, were read and, on motion, duly seconded, were received with instructions to have them printed in the "Proceedings." The President appointed Mr. John H. O'Neill and Mr. A. Lee Dunlap as tellers to canvass the ballots for officers and new members.

The committee announced 82 formal ballots for officers and 3 informal ballots, and 81 formal ballots for members, with 3 informal ballots. The following officers were therefore declared elected:

President.....Mr. Frank G. Frost
Vice-President.....Mr. Fred N. Billingsley
Treasurer.....Mr. Walter B. Moses
Secretary.....Mr. Frank A. Muth

Member of Board (to serve 3 years).....Edward S. Bres

As a result of the canvass of ballots for new members the following were declared elected:

Resident Members.

Charles Henry Green — Leonard Frank Kershaw
Karl P. Kammer — W. T. McCay
Leroy Augustus Staples

Transfer From Student Member to Non-Resident Member

Harold H. Jaquet

Associate Members.

John P. Egan — John Reinhard
William Wallace

For Resident Junior.

Marcus J. Roux

Resident Student Members.

Robert Lang Argus	Claramon B. McEachern
Marcel Emile Crettet, Jr.	Herbert M. Shilstone, Jr.
Joseph Edward Leininger	Wilday Tudury
Irving Sidney Seligmann	Aubrey George Code
Dalton H. Trepagnier	Daniel D. Ewing, Jr.
William Pfaff Barrow	Charles R. Monteiro
William Joseph Drawe, Jr.	Homer H. Stockmann

Clarance Mohr Williams

Mr. James M. Todd, retiring President, made a few brief remarks, thanking the officers, members and various committees of the Society for their co-operation and assistance during the year, and he requested the same support for the incoming President.

Mr. Frank G. Frost was then conducted to the chair, where he made a short talk to the members.

The meeting then adjourned to the Annual Smoker, held at the Jung Hotel.

F. A. MUTH, Secretary.

ANNUAL REPORTS

ANNUAL REPORT OF THE BOARD OF DIRECTION

Year 1930

January 2nd, 1931.

To the Members of the Louisiana Engineering Society:

Gentlemen—Your Board of Direction begs to report that during 1930 there were held 9 regular and 2 special meetings, or a total of 11 meetings of the Board for the transaction of the business of the Society.

The Technical Papers Committee has given us an excellent program of very high grade papers. These parts are recorded in the "Proceedings."

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

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

The Membership Committee has done good work this year. The increase in membership has been gratifying in that 36 members were admitted. Of course, as usual, there have been a number of resignations and adjustments, with three deaths, the net increase resulting in 11 new members.

The Publication Committee has given us six very excellent issues of the Proceedings during 1930. Professor Douglas Anderson, Editor of the Journal, deserves the highest praise for the quality and tone of this magazine, and the Board as well as the members of the Society recognize the fact that the Proceedings is a powerful factor in the interest and usefulness of our Society.

For sixteen years Professor Douglas Anderson has been the Editor of the Proceedings. The Board was requested by him to accept his resignation, which was done with regret, thanking him for his splendid services as Editor during all these years. Professor James M. Robert was appointed by the Board to succeed Professor Anderson as Editor.

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

Attention is invited to the financial condition of the Society. The financial statement shows that the Proceedings Fund has increased $149.04. Our investments are well placed and amount to $9,296.69. The Reserve Fund shows a balance of $12,401.47, having increased $1,140.29

during the year. The Treasurer's report shows a cash balance on January 1, 1931, of $1,472.96.

Some special committees were appointed during the year to submit reports on certain features of special interest to the Society. The committees which have completed their reports have covered the following important investigations: Committee on Airport Drainage and Surfacing; Committee on Registration of Engineers; also Committee on Investigation of Stream Pollution. These committees have the sincere thanks of the Board for their painstaking efforts in making the necessary study in the preparation of their reports.

The Committee on Motivation was authorized and appointed as a standing committee to serve each meeting in introducing new members or in creating a spirit of fellowship at the meetings. The work of this committee must necessarily be spontaneous and is meeting a long-felt need.

In addition to the Annual Smoker, which is one type of entertainment the Society provides for its members, the Society has arranged details for or sponsored two dinners. A Testimonial Dinner was given on January 30th by personal friends acting with a committee of this Society at the Roosevelt Hotel for Mr. John F. Coleman, who was elected President of the American Society of Civil Engineers.

In appreciation of the untiring efforts of Senator Joseph E. Ransdell over a number of years in securing the passage of the bill creating a National Hydraulic Laboratory, the Louisiana Engineering Society tendered a Testimonial Dinner to Senator Ransdell on July 21st, at the Jung Hotel.

Many guests of honor and distinction attended both of these dinners and the place that the Louisiana Engineering Society occupies in the affairs and interests of the community and the country was brought to the attention of the public.

Scholarships—Scholarships were awarded to L. Blumer, Jr., of Louisiana State University and Joseph E. Guidry of Tulane University.

Junior Memberships—The Society has also continued to award two Junior memberships, which are awarded to outstanding students. This year the awards were made to F. Robert Mendow of Tulane University and Fred Hadley Penn of Louisiana State University.

Registration of Professional Engineers—No doubt the greatest achievement of the year for the Society was the work accomplished in the direction of preparation of definite data for amending the present law for registration of civil engineers and surveyors. The committees appointed to study the needs of professional engineers and report a suitable bill carried on their activities under the leadership of Mr. James M. Todd, President, resulting in a bill so drafted that it had the official endorsement of the Louisiana Engineering Society, the Local Section of the American Society of Civil Engineers, the New Orleans Chapter of the American Society of Mechanical Engineers, and the Louisiana State Board of Engineering Examiners. The bill was passed by the House of

Representatives of the State Legislature of 1930 and was favorably reported out of the Committee of the Senate, but before the matter came to a vote in the Senate, the Legislature adjourned. The whole-hearted support given the proposed law from all engineers and all sources speaks well for the unanimity of feeling and desire for a more comprehensive law to replace the law for registration of Civil Engineers and Surveyors. A complete record of the reports of committees, draft of the bill and other pertinent data are published for permanent record in the April, June and August issues of the Proceedings.

Recapitulation—Every organization must justify its existence year by year by its fruits. What has the Society offered its members during the year? For the technical needs there have been some nine technical addresses delivered before the Society and subsequently printed with the discussions for record in the "Proceedings." Each meeting was followed by a social gathering of the members and guests while partaking of refreshments. Then there was the annual smoker, attended by some 135 members and guests. Two dinners of a public character were also provided for the members.

Two scholarships were awarded to assist worthy students in carrying on their engineering education.

Two junior memberships were awarded.

Numerous assignments on committees enabled various members to actually carry on the work of the Society.

Many positions were filled by the Employment Committee without cost to employer or employee.

The matter of registration of professional engineers, which has been considered for years, reached a stage this year when all interests involved were agreed upon a definite draft of a bill.

The Society laid away some funds in careful investments with the hope some day of owning their own building.

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

Respectfully submitted,

JAMES M. TODD, President.
FRANK G. FROST, Vice-President.
FRANK A. MUTH, Secretary.
W. B. MOSES, Treasurer.
JOHN H. O'NEILL,
A. LEE DUNLAP,
F. N. BILLINGSLEY,
Board of Direction.

ANNUAL REPORT OF THE SECRETARY

Year 1930

January 2nd, 1931.

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 1930:

During the past year, the Board of Direction has held 9 regular and 2 special meetings, a total of 11 meetings; the Society has held 9 regular meetings, one special meeting and two dinner meetings, also two meetings as guests of other societies, with an average attendance of 60 at regular meetings, maximum 88, minimum 41.

The membership shows a steady increase from year to year. This year there has been a net increase of 11 members, although there was a total of 36 members elected and reinstated.

The Society was guest of the Electrical League at a dinner meeting in September and in December the Society was the guest of the American Institute of Chemical Engineers at their winter meeting. The two dinner meetings were testimonial dinners to Mr. J. F. Coleman, on January 30th, and to Senator Joseph E. Ransdell, July 21st.

GRADE	On Roll Jan. 1, 1930	Elected	Reinstated	Transferred to	Transferred from	Dropped	Resigned	Failed to Qualify	Died	On Roll Jan. 1, 1931
Honorary Members..	6	....	....	....	....	....	....	....	1	5
Life Members.....	0	....	....	6	....	....	....	....	....	6
Resident Members....	244	7	2	1	9	2	6	1	1	235
Non-Res. Members....	93	2	....	7	1	2	3	....	1	95
Associate Members..	24	5	....	....	....	2	....	....	....	27
Non-Res. As. Mem...	2	1	....	....	....	....	....	....	....	3
Junior Members.....	37	2	1	....	1	1	....	....	....	38
Non-Res. Jun. Mem.	10	1	....	1	....	....	1	....	....	11
Student Members	84	15	....	....	4	1	3	....	....	91
	500	33	3	15	15	8	13	1	3	511

It is with regret that the death of Messrs. A. L. Black, Samuel M. Young, and S. A. Eggleston are recorded.

The Treasurer's report is submitted separately, and shows a cash balance of $1,472.96.

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

Total Receipts	$6,771.33	
Total Disbursements	5,298.37	
		$ 1,472.96
Checking account in New Orleans Bank and Trust Co.		$ 1,472.96
1—Union Title Guarantee Gold Note	$1,000.00	
1—New Orleans Securities Gold Note	1,000.00	
1—Farmer and Ochs Gold Bond	1,000.00	
2—$100.00 First Liberty Loan	200.00	
1— 50.00 First Liberty Loan	50.00	
5— 50.00 (1917) Liberty Loan	250.00	
Greater New Orleans Homestead	1,100.08	
Union Homestead	500.00	
Standard Homestead	500.00	
Italian Homestead	500.00	
Security Homestead	500.00	
Columbia Homestead	500.00	
N. O. Bank & Trust Co. (Savings Account)	1,617.20	
Canal Bank & Trust Co.	579.41	
		9,296.69
		$10,769.65

It is noted from the above that during the year $1,000.00 was set aside and a Farmer & Ochs Gold Bond was purchased for that sum.

The following technical exercises were held:

Feb. 10—"Arc Welding," by Dr. Frank P. McKibbon.

Mar. 10—"Acousti—Celotex and Accoustical Correction," by Wallace Waterfall.

Apr. 14—"A Discussion of Street Traffic Control Lights," by A. J. Naquin, Jr.

May 12—"New Developments in Smokeless Fuels," by Dr. Robert Glenk.

June 9—"Wolmanized Timber," by Dr. John G. Kreer.

Oct. 13—"Oxwelding of Overland Transmission Lines for Oil and Gas," by Mr. C. D. Jax.

Nov. 10—"Dredge Electrification," by Mr. C. T. Pearce.

Dec. 8—"Flood Control," by Major W. H. Holcombe, and "Industrial Possibilities of the South," by Dr. Charles Herty, at the winter meeting of American Institute of Chemical Engineers.

The Constitution was amended to remove the restriction to a membership of 500 members, also to provide for life members, who would be exempt from dues after dues have been paid for thirty years.

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

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

Respectfully submitted,

FRANK A. MUTH, Secretary.

FINANCIAL CONDITION OF THE SOCIETY

January 1, 1931.

Assets:

Cash on hand in bank	$1,472.96	
Accounts Receivable (Members)	3,452.00	
Accounts Receivable (Advertisers)	45.86	
Entrance Fees Receivable	236.50	
Smoker Memberships	219.50	
Investments	9,296.69	
		$14,723.51

Liabilities:

Proceedings Reserve Fund	$ 896.65	
Building Fund	151.65	
Library Fund	886.14	
Accounts Payable	359.60	
1931 Dues in Advance	28.00	
		2,322.04
		$12,401.47

General Reserve Funds

Balance from 1914	$ 165.00	
Balance from 1915	189.75	
Balance from 1916	377.45	
Balance from 1917	299.49	
Balance from 1918	27.47	
	$1,059.16	
Deficit from 1919	62.93	
	$ 996.23	
Balance from 1920	198.09	
Balance from 1921	90.94	
Balance from 1922	1,186.58	
Balance from 1923	309.84	
Balance from 1924	586.43	
Balance from 1925	975.61	
Balance from 1926	1,128.05	
Balance from 1927	1,363.40	
Transferred from Proceedings Reserve in 1927	700.00	
Transferred from Library Fund Reserve in 1927	300.00	
Balance from 1928	1,374.79	
Transferred from Proceedings Reserve Fund in 1929	700.00	
Transferred from Library Reserve Fund in 1929	200.00	
Balance from 1929	1,151.22	
Balance from 1930	1,140.29	
		12,401.47

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	41.58	
	$1,855.07	
Deficit in 1920	221.98	
	$1,633.09	
Balance from 1921	26.25	
	$1,659.34	
Deficit in 1922	301.02	
	$1,358.32	
Deficit in 1923	110.65	
	$1,247.67	
Deficit in 1924	120.26	
	$1,127.41	
Balance from 1925	184.56	
Balance from 1926	353.57	
	$1,665.54	
Balance from 1927	148.11	
	$1,813.65	
Less amount transferred to General Fund	700.00	
	$1,113.65	
Balance from 1928	164.48	
	$1,278.13	
Less amount transferred to General Fund—1929	700.00	
	$ 578.13	
Balance from 1929	169.48	
	$ 747.61	
Balance from 1930	149.04	
		$ 896.65

Cash Account—Year 1930

Receipts:

1926 Dues Collected	$ 6.00	
1927 Dues Collected	17.50	
1928 Dues Collected	114.00	
1929 Dues Collected	432.50	
1930 Dues Collected	2,471.00	
1931 Dues Collected	24.00	
Smoker Memberships Collected	257.50	
Smoker Balances	166.50	
Entrance Fees	217.00	
Advertisers in Proceedings	1,022.40	
Proceedings Sales	.45	
Interest	312.28	
Total Receipts		$ 5,041.13
Deduct Exchange		4.55
		$ 5,036.58
Add Balance of January 1, 1930		1,712.75
		$ 6,749.33
Total Warrants paid during year		5,276.37
Balance on hand, Checking Account		$ 1,472.96

Library Fund, January 2nd, 1931

Revenues:

Balance, January 1, 1930	$ 695.25	
Allotted from General Fund	480.00	
Total Revenues		$ 1,175.25

Expenditures:

Owen-Gernon, Inc.	$ 36.00	
Payments to Carrie Freret during year	180.00	
Subscriptions to Magazine, Journals	34.70	
Paid to Siler's, Inc., for books	7.75	
John Wiley & Son	6.46	
American Society for Testing Materials	11.20	
McGraw-Hill Book Co.	13.00	
		289.11
Balance on hand December 31st, 1930		$ 886.14

Proceedings Fund for Year 1930

Revenues:

Advertising Revenues	$1,041.23	
Members Subscriptions	990.00	
Sales of Proceedings	.45	
		$ 2,031.68

Expenses:

Salary of Editor and Secretary	$ 360.00	
Printing and Mailing	1,280.14	
Stenographer	40.00	
Proceedings Miscellaneous Expenses	180.00	
Advertisements Cancelled	22.50	
		$ 1,882.64
		$ 149.04

General Fund, Year 1930

Revenues:

Membership dues for 1930	$4,142.00	
Smoker Account	332.50	
Entrance Fees	245.00	
Interest on Investments	457.92	
		$ 5,177.42

Expenses:

Subscriptions to Proceedings	$ 990.00	
Allotment to Library Fund	480.00	
Secretary Dues	12.00	
Printing and Postage	431.46	
Secretary Salary	540.00	
Refreshments	119.50	
General Expense	334.72	
Exchange	4.55	
Auditor	50.00	
Smoker Expense	550.90	
Scholarships	165.00	
Loss on Memberships	359.00	
		4,037.13
Net Revenue for Year 1930		$ 1,140.29

ANNUAL REPORT OF THE TREASURER

January 1st, 1931.

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

Dear Sir—As per requirements of Article No. 4 of the Constitution, I have the honor to submit the following report covering receipts and disbursements for the period of Jan. 1st, 1930, up to Jan. 1st, 1931:

Received from Secretary—	Deposited in New Orleans Bk. & Tr. Co.	Exchange Charged
Feb. 8th, 1930—Memo 1 to 10 incl.	$1,739.17	$ 1.65
Mar. 8th, 1930—Memo 11 to 14 incl.	576.80	.30
Apr. 12th, 1930—Memo 15 to 16 incl.	157.42	.20
May 12th, 1930—Memo 17 to 19 incl.	553.84	.50
June 9th, 1930—Memo 20 to 22 incl.	381.91	.40
July 11th, 1930—Memo 23 to 24 incl.	241.45	.35
Aug. 15th, 1930—Memo 25 to 28 incl.	520.37	.35
Sept. 23rd, 1930—Memo 29 to 30 incl.	136.47	.15
Oct. 13th, 1930—Memo 31 to 32 incl.	125.92	.25
Nov. 8th, 1930—Memo 33 to 34 incl.	119.17	.15
Dec. 8th, 1930—Memo 35 to 36 incl.	225.11	.15
Dec. 26th, 1930—Memo 37 to 38 incl.	96.12	.10
	$4,923.75	$ 4.55
Coupons Deposited (Liberty Bonds)	19.38	
Coupons Deposited (N. O. Securities)	60.00	
Coupons Deposited (Farmer & Ochs)	60.00	
		$5,063.13
Less Exchange		4.55
		$5,058.58
Balance on hand as per Treasurer's Report Jan. 1, 1930		1,712.75
		$6,771.33

Disbursements from January 1st, 1930, to January 1st, 1931

No.	Name—	Amount
January 18th—		
1	Carrie Freret	$ 15.00
2	Railway Engineering and Maintenance	3.00
3	Concrete Pub. Co.	6.00
4	Edna Doll	15.00
5	F. A. Muth	53.50
6	Tulane Press	194.89
7	Col. E. S. Bres	7.75
8	N. O. Bank & Trust	6.00
9	Addressograph Co.	2.23
10	Miss Y. Drouet	30.00
11	Siler's, Inc.	7.75
12	Jung Hotel	226.00
13	Walter B. Moses	249.90
14	Leo Loubere	50.00
15	Owen Gernon Co.	36.00
16	C. P. Powell	5.00
February 10th—		
17	Amer. Society for Testing Materials	10.40
18	Edna Doll	15.00
19	Carrie Freret	15.00
20	F. A. Muth	57.40
21	B. Augustin	6.98
22	Boyland's Detective Agency	3.00
23	Tulane Press	125.00
24	A. Serremon	18.50
25	Ry. Engineering & Maintenance	3.00
26	Farish Art Store	1.80
March 10th—		
27	Edna Doll	15.00
28	Carrie Freret	15.00
29	W. C. Rondeau	5.00
30	Addressograph Co.	1.10
31	Railway Age	6.00
32	O. Van Nortrand Co.	4.00
33	Boyland's Detective Agency	3.00
34	B. Augustine	5.10
35	F. A. Muth	54.50
36	Eugene Dietzgen Co.	3.60
37	A. Serremon	15.00
38	Ferd Marks Ins. Agcy.	17.50
39	N. O. Securities, Inc.	1,022.00
40	P. Kaul	10.00

No.	Name—	Amount
April 14th—		
41	Edna Doll	15.00
42	Carrie Freret	15.00
43	F. A. Muth	55.50
44	Tulane Press	131.86
45	Boylan's Detective Agency	3.00
46	W. C. Rondeau	5.00
47	A. Serremon	15.00
48	B. Augustin	15.00
49	Williams and Wilkins	4.50
May 12th—		
50	Tulane Press	348.05
51	F. A. Muth	56.00
52	Edna Doll	15.00
53	Carrie Freret	15.00
54	W. C. Rondeau	5.00
55	Boylan's Detective Agency	3.00
56	Victory Printing Co.	3.00
57	A. Serremon	15.00
June 2nd—		
58	Tulane Press	9.50
59	Carrie Freret	15.00
60	Edna Doll	15.00
61	Douglas Anderson	150.00
62	F. A. Muth	54.50
63	B. Augustin	6.50
64	Boylan's Detective Agency	3.00
65	W. C. Rondeau	5.00
66	A. Serremon	15.00
67	Jas. M. Todd	29.82
June 23rd—		
68	Jas. M. Todd	25.76
69	F. N. Billingsley	7.66
70	F. A. Muth	7.26
June 24th—		
71	Boudeau	4.65
72	E. S. Bres	19.86

No.	Name—	Amount
July 11th—		
73	Tulane Press	403.82
74	W. C. Rondeau	5.00
75	Carrie Freret	30.00
76	Edna Doll	30.00
77	F. A. Muth	108.10
78	James M. Todd	8.45
Sept. 16th—		
79	Tulane Press	304.50
80	Boylan's Detective Agency	3.00
81	Edna Doll	15.00
82	Carrie Freret	15.00
83	F. A. Muth	54.50
84	A. Serremon	11.00
85	Tulane University of La.	125.00
86	La. State University	40.00
Oct. 8th—		
87	Tulane Press	7.75
88	Edna Doll	15.00
89	Carrie Freret	15.00
90	Boylan's Detective Agency	3.00
91	A. Serremon	15.00
92	Harcol Film Co.	15.00
93	F. A. Muth	55.50
94	John Wiley and Sons	6.46
Nov. 10th—		
95	P. Kaul	10.00
96	Ed. Christenberry	7.50
97	Tulane Press	50.00
98	Carrie Freret	15.00
99	Edna Doll	15.00
100	F. A. Muth	56.00
101	Boylan's Detective Agency	3.00
102	A. Serremon	15.00
Dec. 8th—		
103	Douglas Anderson	150.00
104	Tulane Press	129.47
105	Carrie Freret	15.00
106	Edna Doll	15.00
107	F. A. Muth	54.50
108	E. J. Christenberry	7.50
109	E. M. S. LeBlanc	40.00
		$5,298.37

RECAPITULATION

Total Receipts	$6,771.33	
Total Disbursements	5,298.37	
		$ 1,472.96
Checking Account in New Orleans Bank & Trust Co		1,472.96
1—Union Title Guarantee Gold Note	$1,000.00	
1—New Orleans Securities Gold Note	1,000.00	
1—Farmer and Ochs Gold Bond	1,000.00	
2—$100.00 First Liberty Loan	200.00	
1— 50.00 First Liberty Loan	50.00	
5— 50.00 (1917) Liberty Loan	250.00	
Greater N. O. Homestead	1,100.08	
Union Homestead	500.00	
Standard Homestead	500.00	
Italian Homestead	500.00	
Security Homestead	500.00	
Columbia Homestead	500.00	
N. O. Bank & Trust Co. (Savings Account)	1,617.20	
Canal Bank & Trust Co. (Savings Account)	579.41	
		9,296.69
		$10,769.65

Respectfully submitted,

LOUISIANA ENGINEERING SOCIETY,
Walter B. Moses, Treasurer.

REPORT OF THE EMPLOYMENT COMMITTEE

January 8th, 1931.

To the President and Members of the Louisiana Engineering Society:

Gentlemen—It gives me pleasure, as Chairman of the Employment Committee of the Louisiana Engineering Society, to hand you herewith my report covering the year's activities of this committee, which is composed of the writer and Mr. R. Bassich.

As Mr. Bassich has just sent me a report, I am combining his record with my own and take pleasure in reporting activities during the year 1930 as follows:

Number of applicants	215
Number of vacancies	83
Number of vacancies filled	61

Permit me to mention that in many cases applicants who have secured positions do not notify us to that effect and it is entirely probable that many more positions have been filled by applications filed with your committee than are shown by this report.

Both Mr. Bassich and myself feel that your committee is doing good work for the members of the Society, and we trust that they will continue to file their applications with either of us.

I hope this report is satisfactory.

Yours very truly,

R. H. BAUMBACH, Chairman.

AUDITOR'S REPORT

January 9, 1931.

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

Gentlemen—Acting in accordance with instructions from Mr. F. A. Muth, Secretary of the Louisiana Engineering Society, I have audited the books and records of your Association covering operations for the calendar year 1930, and during the course of my audit verified all cash records as well as the Assets and Liabilities of the Society as of December 31, 1930. The attached General Balance Sheet truly reflects the financial condition of the Louisiana Engineering Society at December 31, 1930. I certify that all books and records were found in order and the receipts and disbursements properly accounted for.

You will take note that the balance of unpaid membership dues from 1926 to 1930 amount to approximately $628.00 more unpaid dues than existed at the same time last year and showing the unpaid dues for 1926 to 1929. The unpaid membership dues at December 31, 1929, amounted to $2,820.00 and the unpaid dues at December 31, 1930, amount to $3,452.00.

Appended hereto you will find the following exhibits in substantiation of this report:

EXHIBIT "A"—General Balance Sheet December 31, 1930.

EXHIBIT "B"—Statement showing results of General Fund and changes during 1930 as well as the net revenues for the year.

EXHIBIT "C"—Statement showing results of Proceedings Fund, also changes during 1930 as well as balance Dec. 31, 1930. The net profits for 1930 showed very little change as against 1929.

EXHIBIT "D"—Statement of Library Fund for the year 1930.

EXHIBIT "E"—Statement of Cash Receipts and Disbursements for the year 1930.

Unpaid Membership Dues $3,452.00—

1926 Dues Unpaid	$ 136.00	
1927 Dues Unpaid	367.25	
1928 Dues Unpaid	568.25	
1929 Dues Unpaid	871.00	
1930 Dues Unpaid	1,509.50	
Total		$ 3,452.00

Increase in Assets—

The total Assets at December 31, 1930, amount to	$14,335.91
The total Assets at December 31, 1929, amount to	12,855.69
Total increase during 1930	$ 1,480.22

My audit discloses the fact that your surplus funds have been invested in the following securities, all of which my investigation prompts me in saying are all good and of sound value.

Bank Savings Accounts:		
N. O. Bank & Trust Company	$1,617.20	
Canal Bank & Trust Company	579.41	
		$ 2,196.61
Homestead Stock:		
Greater N. O. Homestead	$1,100.08	
Union Homestead Association	500.00	
Standard Homestead Association	500.00	
Italian Homestead Association	500.00	
Security Homestead	500.00	
Columbia Homestead	500.00	
		3,600.08
Liberty Bonds:		
2—$100.00 First Liberty Loan	200.00	
1— 50.00 First Liberty Loan	50.00	
5— 50.00 1917 Liberty Loan	250.00	
		500.00
Other Bonds:		
Farmer & Ochs Gold Bond	1,000.00	
Union Title Guarantee Gold Note	1,000.00	
N. O. Securities Collateral Trust Gold Note	1,000.00	
		3,000.00
Total Stocks, Bonds, Savings Accounts, etc., at December 31, 1930		$ 9,296.69

Due to the fact that I wish to have this report to you on time for your annual meeting I have not held it up pending my checking over the above securities. However, I will greatly appreciate it if you will call your Finance Committee together as soon as possible and make an appointment with me so that I may go to the bank and check over the above securities to satisfy myself that all the above are in order.

The balance in the checking account was verified with bank and found correct.

Hereafter I will greatly appreciate it if your committee will make an appointment with me some time in the latter part of the year so that the securities could be checked immediately before the beginning of my annual check of the records.

I found the books and records very well kept, and the Secretary and Treasurer have kept their books in such manner that I found no difficulty whatever in securing all the information desired. I take this occasion to thank Mr. Muth and Mr. Moses for the valuable assistance and information rendered.

I wish to extend sincere greetings to the officers and members of the Society and to wish all of you a Happy and Prosperous New Year.

Respectfully,

LEO A. LOUBERE,
Public Accountant—Auditor.

LOUISIANA ENGINEERING SOCIETY
GENERAL BALANCE SHEET

December 31, 1930

Assets

Current Cash:		
Checking Account, N. O. Bank & Trust Co.		$ 1,472.96
Accounts Receivable:		
Membership dues unpaid (1926 to 1930)	$3,452.00	
Due by advertisers in "Proceedings"	45.86	
Entrance Fees uncollected	236.50	
Smoker Memberships uncollected	219.50	
		3,953.86
Reserve Investments:		
BONDS—		
U. S. Liberty Bonds	$ 500.00	
Other Bonds, Gold Notes, etc.	3,000.00	
	3,500.00	
STOCKS—		
Homestead Stock plus accrued dividends	3,600.08	
SAVINGS ACCOUNTS—		
N. O. Bank & Tr. Co. Savings Account	1,617.20	
Canal Bank & Tr. Co.	579.41	
	2,196.61	
		9,296.69
TOTAL ASSETS		$14,723.51

Liabilities and Reserves

Accounts Payable (December Salary and Bills Unpaid)		$ 359.60
1931 Dues Paid in Advance		28.00
Reserve Funds:		
Proceedings Reserve Funds (Exhibit "C")	$ 896.65	
Building Fund	151.65	
Library Fund (Exhibit "D")	886.14	
		1,934.44
TOTAL LIABILITIES AND RESERVE FUNDS		$ 2,322.04
GENERAL FUND BALANCE AT DECEMBER 31, 1030 (Exhibit "B")		12,401.47
TOTAL		$14,723.51

EXHIBIT "A"

THE LOUISIANA ENGINEERING SOCIETY
GENERAL RESERVE FUND

At Dcember 31, 1930

BALANCE FROM LAST REPORT JANUARY 1st, 1930	$11,261.18
Profit for 1930 as detailed below added to Fund	1,140.29
BALANCE GENERAL RESERVE FUND AT DECEMBER 31, 1930	$12,401.47

ANALYSIS OF GENERAL FUND FOR CALENDAR YEAR 1930

Revenues:

Membership dues for 1930	$4,142.00	
Smoker account	332.50	
Entrance Fees	245.00	
Interest earned on Investments	457.92	
		$ 5,177.42

Expenses:

Allow Dues of Secretary	$ 12.00	
Subscription to Proceedings	990.00	
Appropriation to Library Fund	480.00	
Salary of Secretary	540.00	
Printing and Postage	431.46	
Refreshments	119.50	
General Expense	334.72	
Exchange on out-of-town checks	4.55	
Auditor	50.00	
Smoker Expense	550.90	
Loss on members dropped for non-payment of back dues, N. S. F. checks, etc	359.00	
Scholarships—Tulane Uni. and L. S. U.	165.00	
		4,037.13
NET REVENUES OVER EXPENSES—added to General Reserve Fund		1,140.29

EXHIBIT "B"

THE LOUISIANA ENGINEERING SOCIETY
PROCEEDINGS RESERVE FUND

At December 31, 1930

Balance at January 1st, 1930, as per last report		$ 747.61
Net gain for 1930 detailed below		149.04
TOTAL BALANCE DECEMBER 31, 1930		$ 896.65

ANALYSIS OF PROCEEDINGS FUND FOR CALENDAR YEAR 1930

Revenues:

Advertising Revenues	$1,041.23	
Members subscriptions	990.00	
Sales of "Proceedings"	.45	
		2,031.68

Expenses:

Salary of Editor and Secretary	$ 360.00	
Printing and Mailing	1,280.14	
Stenographer	40.00	
Miscellaneous Expense	180.00	
Loss from Cancelled Ads	22.50	
		1,882.64
NET REVENUES OVER EXPENSES (Transferred to Credit of Proceedings Reserve Fund)		$ 149.04

EXHIBIT "C"

THE LOUISIANA ENGINEERING SOCIETY
ANNUAL STATEMENT OF THE LIBRARY FUND COVERING THE TWELVE MONTHS ENDING DEC. 31, 1930

Revenues:

Balance January 1st, 1930		$ 695.25	
Appropriation from General Fund		480.00	
			$ 1,175.25

Expenses:

January—			
Owen-Gernon, Inc.	$36.00		
C. P. Powell	5.00		
Siler's, Inc.	7.75		
		48.75	
February—			
Farish Art Store	1.80		
Carrie Freret	15.00		
Subscription to Journals, etc.	13.40		
		30.20	
March—			
Subscription to Journals, etc.	10.00		
Carrie Freret	15.00		
		25.00	
April—			
Carrie Freret	15.00		
Subscription to Journals, etc.	4.50		
		19.50	
May—			
Carrie Freret	15.00		
		15.00	
June—			
Carrie Freret		15.00	
July—			
Carrie Freret		30.00	
September—			
Carrie Freret		15.00	
October—			
Carrie Freret	15.00		
John Wiley & Son	6.46		
		21.46	
November—			
Carrie Freret		15.00	
December—			
Carrie Freret		15.00	
Dec. 31—Unpaid Invoices:			
Carrie Freret	15.00		
Hill Pub. Co.	13.00		
Amer. Soc. for Testing Materials	11.20		
		39.20	
			289.11
BALANCE DECEMBER 31, 1930			$ 886.14

EXHIBIT "D"

THE LOUISIANA ENGINEERING SOCIETY
STATEMENT OF CASH RECEIPTS AND DISBURSEMENTS FOR PERIOD JANUARY 1st TO DECEMBER 31st, 1930

Balance in Checking Account, N. O. Bk. & Tr. Co., 1-1-30		$ 1,712.75
Receipts		
Dues Collected—		
1926 dues	$ 6.00	
1927 dues	17.50	
1928 dues	114.00	
1929 dues	432.50	
1930 dues	2,471.00	
1931 dues	24.00	
		3,065.00
Smoker Memberships Collected		257.50
1930 Smoker		166.50
Entrance Fees		217.00
Proceedings Advertising		1,022.40
Proceedings Sales		.45
Interest on Investments		312.28
TOTAL RECEIPTS		$5,041.13
Less Exchange		4.55
		5,036.58
TOTAL CURRENT CASH ACCOUNTABLE		$ 6,749.33
Deduct Disbursements		
Scholarship	$ 165.00	
General Expense, Watchman, etc	322.97	
Smoker Expense	505.90	
1929 Accounts Paid	295.14	
Refreshments	119.50	
Printing and Mailing	1,113.89	
Stenographer	40.00	
Auditor	50.00	
Proceedings Miscellaneous Expense	165.00	
Library Fund Expense and Salary	249.91	
Salary—Secretary and Editor	355.00	
Salary—Secretary	495.00	
Printing and Postage	399.06	
Bond Purchases	1,000.00	
TOTAL PAID OUT		$ 5,276.37
DECEMBER 31, 1930, BALANCE N. O. BK. CHECKING ACCOUNT		$ 1,472.96

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.

JAMES M. ROBERT, 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
JAMES M. ROBERT, 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.

LOUISIANA ENGINEERING SOCIETY

OFFICERS FOR 1931

President, FRANK G. FROST, 317 Baronne Street.
Vice-President, FRED. N. BILLINGSLEY, 702 Interstate Bank Bldg.
Secretary, FRANK A. MUTH, 7705 Willow Street.
Treasurer, WALTER B. MOSES, 425 S. Peters Street.

DIRECTORS

J. H. O'NEILL, 637 Lowerline Street.
A. L. DUNLAP, 5524 Prytania Street.
E. S. BRES, 311 Maritime Building.
JAMES M. TODD, 818 Maritime Building.

STANDING COMMITTEES

On Technical Papers
C. C. Wiggins, Jr., Chairman
J. M. Robert
George P. Rice
R. J. Kuhn

Motivating Committee
James M. Robert, Chairman
W. B. Gregory
George R. Hammett
Charles M. Kerr
James M. Todd

On Library
Ralph Earl, Chairman
C. W. Ricker
A. J. Harris
P. F. Hoots

On Publications—Division "A"
James M. Robert, Chairman
Frank A. Muth

On Publications—Division "B"
John T. Eastwood, Chairman
D. W. Stewart, Vice Chairman
F. N. Billingsley

On Entertainments and Outings
Ole K. Olsen
Walter B. Moses

On Finance
F. N. Billingsley, Chairman
Walter B. Moses
James M. Todd

On Membership—Division "A"
D. W. Stewart, Chairman
A. L. Dunlap
E. S. Bres
H. B. Henderlite
J. L. Henning
O. O. Melancon
W. I. Neel
Ira W. Sylvester
Bryson Vallas
B. W. Pegues

On Membership—Divison "B"
J. S. Barelli, Chairman
E. S. Lanphier
C. J. Wyler

On Employment
R. H. Baumbach, Chairman
R. Bassich

On Civic and Industrial Affairs
A. M. Lockett, Chairman
D. Derickson
J. F. Coleman
James M. Todd
A. T. Dusenbury
John H. O'Neill
J. D. McNiven

The headquarters of the Society are in the State Museum Building, Jackson Square.

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

PROCEEDINGS
OF THE
LOUISIANA ENGINEERING SOCIETY

VOL. XVII. APRIL, 1931 NO. 2

CONTENTS

EDITORIAL NOTES AND COMMENT: PAGE
Stop, Look, Listen! ... 85
The Work of the United States Coast and Geodetic Survey ... 86
The New Story of Ancient Wrought Iron ... 87
Professor Gregory Honored ... 87
The Eads Memorial ... 87
Dr. Freeman Honored in Providence ... 88

PAPERS AND DISCUSSIONS:
The Work of the United States Coast and Geodetic Survey. *By Ray L. Schoppe* ... 89
Appendix—Geodetic Work Accomplished and Projected in Louisiana. *By R. S. Patton* ... 105
Discussion ... 109
The New Story of Ancient Wrought Iron. *By R. Carson Hamlett* ... 111
Discussion ... 123
Some Notable European Laboratories. *By W. B. Gregory* ... 128
MINUTES OF MEETINGS AND BUSINESS OF THE SOCIETY ... 140

EDITORIAL NOTES AND COMMENT

Stop, Look, Listen! Thirty-five papers have been presented before our Society in the last four years. Of these thirty-five papers only thirteen or 37.5 per cent have been presented by members of the Society. The remaining 62.5 per cent were presented by non-members. While these discussions by non-members have usually been interesting, and occasionally very instructive, we cannot overlook the fact that a large number of them have been presented by representatives of commercial concerns. Frequently these speakers have not even been engineers, but sales representatives.

It is only fair to say that in practically all cases, these papers have been kept on a high plane with a minimum of

direct advertising as such, and, as noted above, are frequently instructive.

If we survey the situation for the last two years, instead of the last four, we find matters even worse. Out of a total of fifteen papers during this time only two or 13 per cent have been presented by members. These figures are taken from the annual reports of the Secretary. Think of it! Only two papers in the last two years by members!

Not by the wildest stretch of the imagination can this be construed as a criticism of the Technical Papers Committee. They are a hard working committee and their policy has *always* been to get papers from members, but when the members will not "come across", naturally they have to go afield.

A society such as ours derives its progress from the character of its meetings. If we are candid we must admit that an organization will not get very far when it depends on outsiders for its upbuilding. This should come from the inside and be founded upon the solid worth of its own members.

Let us then have more papers by members. Do not say you are too busy. The busiest men in the world always seem able to find time to do the worthwhile things. If you wait until you have time to write a paper, you'll never do it. Squeeze it in when you think you can't possibly spare the time and both you and the Society will profit.

The Work of the United States Coast and Geodetic Survey. The admirable paper by Commander Schoppe, and having the above title, is printed elsewhere in this issue. The paper and appendix give one the notion that the members of this service must not only be "jacks of all trades" but men of high scientific accomplishment as well.

The tradition of the service for extreme accuracy is well exemplified in the discussion. The original placement of the monument in Lafayette Square was made many years ago. Yet a recent check of its position, made with the latest and most approved instruments, shows that the original placement was made with but little, if any, error.

The New Story of Ancient Wrought Iron. An interesting exposition of a new development in the production of wrought iron. Up to the development of this process the size of the "production unit", or plastic ball, has been limited to the strength of a man, because puddling had to be done by hand. This process, apparently, removes that limitation. It will be interesting to see what effect the reduced cost of production will have in expanding the market. It will then be interesting to see what effect this expanded market will have in further reducing prices.

Professor Gregory Honored. At the Spring Meeting of the American Society of Mechanical Engineers held in Birmingham, April 20-23, 1931, Professor Gregory was nominated for the Vice-Presidency of that body. Professor Gregory's nomination is tantamount to election. This is the second time this honor has come to him, he having already served a term as Vice-President. Before his first term as Vice-President, he served as one of the Managers of the Society.

We congratulate Professor Gregory on this new and conspicuous honor.

The very interesting account of Professor Gregory's visit to the great hydraulic laboratories of Europe last summer is published in this issue.

The Eads Memorial. Has a vision material consequences? Sometimes it has, indeed. One man's vision, backed by great spiritual courage, had the very material consequence of changing New Orleans from an inland town to a seaport.

The memorial to James B. Eads, which it is proposed to erect on the river-front at Canal Street, is a fitting tribute to the courage, persistence and keen minded public spirit of a man who dared all to make a dream come true. That dream *has* come true. New Orleans is the second seaport of this country. And this city can well be proud to honor itself in honoring

James B. Eads. The present New Orleans is the realization of a great engineer's vision.

Dr. Freeman Honored in Providence. Dr. John R. Freeman, noted engineer, was honored by a testimonial dinner in his home city of Providence, R. I., on April 21. Over three hundred associates and friends gathered to honor him for his life of constant achievement and public service.

Dr. Freeman's visit to this Society on several occasions will be remembered.

PAPERS AND DISCUSSIONS

THE WORK OF THE UNITED STATES COAST AND GEODETIC SURVEY

By Ray L. Schoppe.

Read before the Society, February 9, 1931.

It is a pleasure to come here tonight and to try to tell you something of the work of the bureau with which I am connected. When Government funds have been expended in the collection and the compilation of valuable scientific and engineering information, it is highly desirable that widespread and prompt distribution of this information be effected. It is of little value or little interest to the engineer or to the general public, if the archives in our Washington Office are filled with valuable field records and maps and drawings, or if our trained mathematicians and other experts are constantly producing new and valuable additions to scientific knowledge, unless this information be brought to the attention of citizens who are in a position to use it. If I can acquaint you with some of the details of the work of our bureau, I shall feel that I have rendered a service not only to you but to the organization which makes it possible for me to live for a short time in your city.

The U. S. Coast and Geodetic Survey is a Government Bureau operating under the jurisdiction of the Department of Commerce. It is an engineering bureau in which surveying duties on shore and on shipboard form a curious mixture. Many of the activities ashore differ but little from the usual practice of civil engineers and surveyors. Such differences as do occur are caused by the requirement that great precision is demanded if an unusually high order of accuracy is to be obtained. The activities of this bureau *afloat* differ entirely from the usual civil engineering practice, and take on a decidedly maritime nature. If I should start in by giving you a recital of the various details into which the work of the Bureau is separated you might have difficulty in seeing, readily, the inter-relation between the different parts. A few years ago, one of the distinguished Secretaries of Commerce stated, in an article that

was widely distributed, that in order to be successful, the field officers of the Coast and Geodetic Survey should be web-footed. This web footed simile would be appropriate in the costal area of Louisiana or around Chesapeake Bay, but it would hardly be applicable to the deserts of Arizona or the mountanous regions of Alaska.

It is possible that some of my listeners may have as vague an idea about the Coast and Geodetic Survey as I had when I qualified by Civil Service Examination for appointment about 17 years ago. I took the job and reported in Washington for duty and was decidedly surprised and somewhat disturbed to find that about 80% of the field work of the Bureau is done from ships or from parties working afloat.

The Coast and Geodetic Survey is one of the oldest engineering organizations connected with the Government. The need for a systematic government survey of the American coast was brought to the attention of President Thomas Jefferson by Dr. Robert Patterson of Philadelphia. In 1806 the President made a recommendation for a coast survey to Congress and Congress acted favorably on the suggestion. On February 10, 1807, an act was approved authorizing the President to cause such a survey to be made. Acting under orders from the President, the Secretary of the Treasury issued a circular setting forth the project of a survey, inviting the attention of scientists to it and requesting plans for carrying it into effect. As set forth in this project, three points were stressed: "(1) The ascertainment, by "a series of astronomical observations, of the true positions of "a few remarkable points on the coast; (2) a trigonometrical "survey of the coast between these points; and (3) a nautical "survey of the shoals and soundings of the coast, of which the "trigonometrical survey was to supply the basis." At this time there was an instructor in mathematics at West Point named Ferdinand R. Hassler, a Swiss engineer who had previously had experience in triangulation. Mr. Hassler submitted a plan which was adopted and he was appointed the first Superintendent of the Survey of the Coast. Owing to lack of funds and of instruments, and to the interference caused by the War of 1812, it was some time before field work was started.

In 1816, Hassler received a definite appointment as Superintendent of the Survey of the Coast, to date from June 18 of that year. This is regarded as the date of founding of this Bureau. The first work was done in the vicinity of New York Harbor. The affairs of the new bureau did not always progress smoothly. Funds were not always provided by Congress and there was serious discussion as to the desirability of furnishing personnel from the military or from civilian sources. In the meantime the Superintendent of the Survey participated in the making of boundary surveys required by the treaty of Ghent, along the northern boundaries of New York, Vermont, New Hampshire and Maine. In 1832 the attention of Congress was again directed to the needs of this Bureau and an Act of Congress was passed reviving the original Act and increasing the scope of its activities.

At this time Hassler was engaged in the Treasury Department, comparing the weights and measures to be used at the custom houses of the United States and ascertaining by experiment the proper hydrometer proofs of liquor. The work connected with standard weights and measures was continued under his charge and it remained under the Coast Survey until 1901 when it formed a beginning for that vast organization now known as the Bureau of Standards.

Up to 1843, surveys had been confined to a limited portion of the Atlantic Coast but with the annexation of Texas and the West Coast of Alaska, these coasts were included in the field of operation. In 1871, a great transcontinental arc of triangulation was authorized. It followed closely, the 39th parallel of latitude and in 1898, its completion, connecting previous surveys on the Atlantic and Pacific coasts is regarded as an event of great importance in the history of geodesy. Due to the growing importance of geodetic operations, the name of the bureau was changed to "Coast and Geodetic Survey" in 1878.

The records of the Civil War, the Spanish War and the World War are filled with eloquent testimony of the support which this bureau has rendered to armed forces of the Government in war time. It is a matter of local interest to note that when Commodore Porter, with his Union gunboats, bombarded Forts Jackson and St. Philip, his movements were guided by a map of the river that was hurriedly made under fire for him by

three civilian field officers of this service. On May 16th, 1862, Commodore Porter wrote to the Superintendent of the Coast Survey as follows:

> "I forward to you by the Baltic, a plan of Fort "Jackson (or the remains of it) faithfully drawn, "under the direction of Mr. Gerdes, by Messrs. Harris "and Oltmanns, Assistants of the Coast Survey. It is a "striking specimen of the effects of mortar-practice, "showing what can be done when distances are accur- "ately determined, as they were in this case by the "gentlemen belonging to the Coast Survey."

These same surveyors rendered valuable service to the Federal forces at Mobile and on the Atchafalaya River.

Since 1861 no officers of the Army have been assigned to duty on the Survey and since 1898, when naval officers were relieved of survey duties on account of the War with Spain, no military forces of either branch have served in this bureau. The service was re-organized on purely civilian lines in 1900.

It is beyond the scope of this paper to recount in detail the history of the Coast and Geodetic Survey. It is however, a matter of great importance to recognize the fact that an unbroken series of records extending back to 1816, has been collected and preserved in the archives of our bureau. This will be recognized as of even greater value when your attention is called to the unfortunate destruction by fire of valuable old records of other engineering bureaus in Washington.

Under the present organization the personnel of the Coast and Geodetic Survey may be grouped in three definite classes:—

1. Field Officers.
2. Civil Service employees.
3. Unclassified group, (listed as temporary employees).

The Field Officers of the Bureau are in charge of all field work and fill the administrative positions in the Washington Offices. These officers, 164 in number, are Civil Engineers who hold commissions from the President. They hold the same relative rank with and the same pay and allowances (including retirement) as officers in the U. S. Navy. For several years past, no applicant has been eligible for a commission unless he holds a degree in Civil Engineering from a reputable college nor unless he has maintained high grades throughout his college course.

This insures a corps of officers whose technical training is unquestioned. A period of probationary service on board ship in which such training courses as navigation, seamanship, ship routine and government accounting methods are stressed, serves to acquaint the candidate with his future duties and it also enables the service to weed out those who fail to show aptitude for ship work.

The group of civil service employees numbering about 300, covers a wide range of skilled technical experts as well as those serving in certain non-technical supervisory positions. Among these are mathematicians, cartographers, copper plate engravers, lithographic experts, magnetic experts, marine mechanical engineers, ships doctors, etc. In the Washington Office, this group includes a number of men known and recognized internationally for their accomplishments in their chosen lines.

The non-classified group is made up of crews of vessels and all classes of workers below the grade of instrumentman for field parties ashore. The crews of vessels are drawn mainly from marine workers. They serve in a sort of dual capacity. In addition to the operation of the vesseles and launches, they furnish the entire crews of surveying parties operating afloat. This group numbers about 700 to 800 men.

In order to operate the entire Bureau, an appropriation of approximately $2,500,000.00 yearly is now required. Special surveys for other Government Bureaus are frequently made, using funds from their own appropriations, which are made available to this bureau by transfer. This amounted last year to over $210,000.00.

Our Director has defined the present functions of the Bureau, in terms of the products given to the public for its use, as follows:

(1) The nautical chart.
(2) Related nautical publications.
(3) Control surveys of the interior.
(4) Tidal current surveys and data.
(5) Terrestrial magnetism, investigations and data.
(6) Seismology investigations and data.
(7) Airway maps.
(8) Technical work for other Federal agencies.

Each of these projects is an important one and most of them will continue indefinitely. In other words, due to continued development in each of these lines, it is not possible to visualize at present the full requirements of a completed project. The various interests served by this bureau are in the field of maritime commerce, aviation, engineering (including surveying), applied science as devoted to certain practical fields of industry and commerce.

The engineer is probably more concerned with the processes by which the above material is produced. The field work of the Coast and Geodetic Survey is divided into four main groups:—

(1) Geodetic work.
(2) Hydrographic work.
(3) Tide and current observations.

Geodetic operations are divided into Triangulation, Traverse, Precise Leveling, Gravity Measurements, Determining the Figure of the Earth. Standards of accuracy for geodetic work have been established by the International Geodetic and Geophysical Union and a national scheme of control surveys has been laid out by the Federal Board of Surveys and Maps. The work of this bureau conforms to these standards in all respects. It is claimed that the geodetic work of the Coast and Geodetic Survey, by the magnitude of the operations, by the instruments employed, and by the economy and speed and cost is without equal in the geodetic world. In this group, triangulation occupies the most important part of our work and it probably offers results of the greatest local interest. On account of the amount of triangulation now in progress in this locality, I wish to call your attention to some of the recent developments.

The tall timber and the flat terraine in Louisiana formerly proved a serious obstacle to first order work and very little high grade control was done here in the early years. This was on account of the lack of good road facilities and the expense of building tall towers to elevate the instrument and observed above the tree tops. In 1926 a new type of steel observing tower (known as the Bilby Tower) was designed and tested, and it bids fair to revolutionize this class of work in heavily wooded flat country. Light weight, rigidity, and ease of erection are the important features of its design. As constructed at present, a 90-foot tower

weighs 5000 pounds and a 103-foot tower weighs 6400 pounds. The addition of extra sections makes it possible to elevate the instrument to a height of 146 feet. This makes it possible to observe lines over any but the tallest timber in this section of the country. One of these towers can be erected by 6 men in 5 or 6 hours. You have doubtless seen some of them recently in the vicinity of New Orleans. The cost of each tower is about $600.00 and depreciation is undetermined but it appears to be very slow.

The problem of vertical collimation has been troublesome, because of the requirement that the station mark, the instrument, and the signal lamp for night observation be placed accurately in respect to a vertical line. This has made it necessary to develop a new vertical collimator for the quick and accurate determination of such a line. By the use of this instrument, the probable error of a line projected upward to a 100-foot tower is not more than 0.1 inch.

This preliminary work is so arranged that the actual herizontal angles may be obtained with speed and accuracy. Accuracy beyond certain limits is not necessary and for first order triangulation, these limits are, an average triangle closure of not over one second of arc with a maximum allowed error of closure of any one triangle of not to exceed three seconds. It is found that with suitably chosen base lines, the discrepancy between the measured length of a base line and its length as computed through the scheme from the next preceeding base, shall not, after the side and angle equations have been satisfied, be greater than 1 part in 25,000. A complete table of these requirements is as follows:—

REQUIREMENTS FOR HORIZONTAL CONTROL

TRIANGULATION

	First Order	Second Order	Third Order
Strength of figures:			
Desirable limit, ΣR_1 between bases	80	100	125
Maximum limit, ΣR_1 between bases	110	130	175
Desirable limit, R_1, single figure	15	25	25
Maximum limit, R_1, single figure	25	40	50
Discrepancy between computed length and measured length of base or adjusted length of check line, not to exceed	1 in 25,000	1 in 10,000	1 in 5,000
Triangle closure:			
Average, not to exceed	1 sec.	3 sec.	6 sec.
Maximum, not to exceed	3 sec.	8 sec.	12 sec.
Usual number of observations:			
Positions with 1-second direction theodolite	16	4	2
Positions with 2-second direction theodolite	20 to 24	4 to 8	2 to 4
Sets with 10-second repeating theodolite	5 to 6	2 to 3	1 to 2
Base measurement:			
Actual error of base not to exceed	1 in 300,000	1 in 150,000	1 in 75,000
Probable error of base not to exceed	1 in 1,000,000	1 in 500,000	1 in 250,000
Discrepancy between 2 measures of a section, not to exceed	10 mm. $\sqrt{k}$	20 mm. $\sqrt{k}$	25 mm. $\sqrt{k}$
Astronomic azimuth probable error of result	0.5 sec.	2.0 sec.	5.0 sec.

TRAVERSE

Closing error in position, not to exceed	1 in 25,000	1 in 10,000	1 in 5,000
Probable error of main scheme angles	1.5 sec.	3.0 sec.	6.0 sec.
Number of stations between astronomical azimuths	10 to 15	15 to 25	20 to 35
Astronomic azimuth, discrepancy per main angle station, not to exceed	1.0 sec.	2.0 sec.	5.0 sec.
Astronomic azimuth, probable error of result	0.5 sec.	2.0 sec.	5.0 sec.

These limits are practically the same as have been required for a great many years and latest developments have served to increase the speed of operation and at the same time cut down the cost. A new type of theodolite has been recently put into service and it is a decided improvement over the older, more cumbersome styles. This new instrument, designed and constructed in our Washington Office and called the Parkhurst theodolite, is unusually rigid, compact and simple in operation. A 9-inch circle is read by two micrometer verniers, each graduated to 1 second of arc. Under ordinary conditions, 5 lights are to be observed at each occupied station. With this new instrument it is possible to make 16 pointings direct, and 16 reverse, on each of these 5 lights in less than an hour and it has been done in 40 minutes. Short periods of favorable atmospheric conditions are sufficient to complete a set of operations. This has been a big factor in cost reduction.

In recent work in this state, where tall towers are required at practically every station, the cost per station has been approximately $270.00. Or, if stated in terms of miles of progress along the axis of the triangulation scheme, the amount is approximately $90.00 per mile. This includes the measurement of base lines and the astronomic work.

The measurement of base lines is a process where modern methods give accuracy and speed that was previously unheard of. All measurements are made with a tape of invar metal, carefully supported on stakes and subjected to constant tension. Each tape length is carefully transferred to copper strips nailed on top of the stakes. The accuracy is represented by a probable error of not to exceed 1 part in 1,000,000. Such measurements are made by a party of 6 persons, only one of whom needs to be skilled in that type of work. The cost runs from $50.00 to $75.00 per kilometer. As an example, the Kenner Base Line, about 5 miles long and located just east of Kenner, La., was measured last summer by such a party in about ten days. This included all the operations necessary to complete the base measurement. The frequency of bases is illustrated by work in this vicinity where 7 base lines are located on the arc from New Orleans to Cairo, Ill., and on the arc from New Orleans to Mobile,

one base line is at Bay St. Louis and one (an old one) at Dauphine Island, near Mobile Bay.

The necessary astronomic work consists of the measurement of Azimuth, Latitude and Longiture. The azimuth measurements, on the star Polaris, are made by the party observing horizontal angles. Such observations are included in the regular routine of observations and no extra time or expense is involved unless cloudy nights make it necessary to wait a day or two, until the star is visible. The probable error of a first order azimuth is not over one-half second of arc. Latitude and Longitude are observed by a special party. In recent years, accurate time determination for these observations is obtained by special short wave radio signal from the Naval Observatory and is recorded in the field on a portable apparatus by the radio chronograph method. By the present method a complete determination of latitude and longitude may be made in approximately ten hours of observing, and if conditions are favorable, this may be completed in one night. During January, 1931, a party of two officers and 1 helper completed these observations at nine stations in Louisiana. This is a speed record for this type of very exacting astronomic work.

A certain amount of traverse of first order accuracy has been done in flat areas, formerly considered difficult for triangulation, but the present satisfactory results in triangulation obtained by the use of steel "Bilby Towers" has practically done away with the need for traverse of this accuracy. First order traverse may be described as a series of base lines placed end to end. It is still necessary however, for accurate control in city surveys. Traverse of a lesser degree of accuracy is still recognized as a necessity in the control of topographic and hydrographic surveys.

Control surveys include not only horizontal control but vertical control. This is obtained over large areas by the processes of first order leveling. In the network of first order leveling which now covers the United States, there are over 100 closed circuits varying in circumference from 100 to 4,700 miles. The present instruments and methods date back to about 1899 and since that time the Coast and Geodetic Survey has completed 35,000 miles of first order levels. In this type of work, the

average closing error is less than two-tenths millimeter per kilometer. First order leveling done by other government agencies and done by this bureau prior to 1899 adds approximately 17,000 miles to the mileage given above. It is intended to extend the present network over the United States until there will be very few points more than 50 miles from a first order leveling bench mark.

The datum for all work of this type is mean sea level, to which connections have been made at numerous points on the Atlantic, Gulf, and Pacific coasts. Before leaving the subject of levels, I beg to recommend to local engineers the desirability of using mean sea level as the datum plane for all engineering work. I feel safe in assuring you that the Director of this bureau will co-operate in every way possible in putting this recommendation into effect.

A description of geodetic operations would not be complete without mention of gravity measurements. For this work, a delicate pendulum apparatus has been devised to operate in a closed chamber where air pressure is reduced to about one-tenth of one atmosphere. Every possible correction which might effect the period of vibration of the pendulum is measured and applied. Some idea of the delicacy of these measurements may be obtained if it is noted that the correction to the period of the pendulum for flexture (due to rocking of the support) usually amounts to about one one millionth of a second. There are now about 325 gravity stations in the United States. These results have a definite value in studies of geology and isostasy.

The field results of all these processes are assembled in the Washington Office, where a force of mathematicians subjects all computations to least square adjustment. This force also carries on detailed computations and investigations regarding the size and shape of the earth, and closely related to this is a study of isostasy and also of map projections.

The second division of field work is Hydrographic Operations, which in turn are divided into Topographic surveys, Hydrographic surveys, Oceanography, Preparation of nautical charts, Preparation of coast pilots.

The principal method used for topographic work by the Coast and Geodetic Survey is the plane table and stadia method. The

advantage of this method lies in the fact that the construction of the map is coincident with the field work. Detailed topography is usually limited to such areas as may be covered by nautical charts, and for that reason, is limited to a narrow fringe along the shore line of our oceans, bays and rivers. Since 1922 this bureau has carried on a limited amount of aero photographic topography. This has develped into an intensive study of the relative merits of the aerial and ground methods, as they may effect chart production and correction. The aerial method seems to be most useful and economical in low flat country where tall grassy reeds or heavy timber makes ground work difficult. The Mississippi River Delta below Buras, the coast of New Jersey, and a large section of the coast of Florida are the only areas where aerial surveys have been made by the Coast and Geodetic Survey. If good ground control is available it appears to be more economical to do the work by this method, but the plane table method is by no means obsolete.

Certain kinds of hydrographic work may be done by field parties living on shore and working in inshore areas from launches and small boats, but the major part of this work is accomplished by sea-going vessels owned and operated by the Coast and Geodetic Survey. The floating equipment consists of 12 sea-going vessels, 12 tenders and a large number of launches and small boats. The location of the present working grounds of these vessels gives a good idea of the wide-spread geographical conditions under which the work of the U. S. Coast and Geodetic Survey is performed. Four vessels are working on the South Atlantic and Gulf Coasts in winter and on the North Atlantic Coast in summer. Three vessels operate in Alaska each summer. One is now in the Hawaiian Islands, one on the Pacific Coast and three are in Philippine waters. The entire operation of these vessels as well as their maintenance and repair, is in the hands of the commissioned officers, who as noted above, are civil engineer graduates. One of the larger units may be described as an oil burning steam vessel of about 1000 tons, carrying 12 officers and 70 men and able to operate 5 or 6 survey parties at a time. Or if engaged on deep sea work, she can remain at sea 3 or 4 weeks, working 24 hours a day whenever the weather permits. Since the expense of such a unit is approximately $12,-

500.00 a month, it is essential that there be no delays or lost time on the working grounds during favorable weather.

A vessel such as has been described above is the only unit capable of making all of the various kinds of hydrographic surveys. In shallow water, soundings may be made with a pole or a lead line from small launches or pulling boats. Soundings in harbors, rivers, or narrow channels are made entirely with the lead line from small launches, and inshore work along the coast in water too shallow for the vessel to maneuver in or in areas close to dangerous reefs, are sounded by the same method. Boats used for this work are usually hoisted on deck by the survey vessel when not actually at work.

Outside of the area mentioned above, a certain amount of sounding may be done by larger launches or by tenders, or it may also be surveyed from the vessel itself. In areas of not greater than ten fathom depth (a fathom is six feet), most of the soundings are still made by hand with the lead line. Until recent years the depths between ten and one hundred fathoms were measured either by the pressure tube or by the sand sounding machine. In depths greater than one hundred fathoms, the method of deep sea sounding was used in which fine drawn piano wire is wound over a measuring device and onto a reel by a steam or electric power. By this method depths up to three thousand fathoms are measured without difficulty and greater depths may be measured by using special methods. So far as the Coast and Geodetic Survey is concerned there is no such thing as bottomless depth. No place has yet been found on the face of the globe where bottom cannot be reached if proper equipment is available.

In recent years this bureau has been active in developing the method of echo sounding and this method has proved to be so satisfactory and economical that a large part of the soundings in water greater than 7 fathoms deep are now made by this method. This method makes use of two principles,—(1) that sound travels through water at a constant speed, depending on the density and temperature of the water, and (2) that sound is reflected back from the sea bottom just as an echo is given back in air from a wall or other large vertical surface. A device called the Fathometer has been perfected making use of these

principles so that a direct reading of depth of water is obtained from the face of a graduated dial. This device will operate perfectly from the survey vessel steaming at full speed, and this has been a great improvement over the older slower methods noted above.

No method of sounding is certain of revealing obstructions of small area like coral heads, boulders or sharp pinnacle rocks. The wire drag or sweep is used to locate such obstructions. This device has been used extensively along the rocky coasts of New England and Alaska and in southern waters where a coral formation is found.

The geographic position of a sounding is just as important as its depth. Within the limit of visibility of shore objects, position is determined by two observers each with a sextant, measuring simultaneously the angles between three objects, the geographic position of which have been determined. For work offshore, buoys of floating signals are located and the same method of angle measurement is used. If the water is too deep for mooring buoys, precise methods of dead reckoning have been devised. A recent method involving the velocity of sound in sea water is now being used with success in some areas but it is not yet perfected for use in shallow areas. It is called subaqueous sound ranging, or radio acoustic ranging. This method, together with radio bearings, carefully observed astronomic sights, and precise dead reckoning, form the present method of position control for soundings out of sight of land.

While engaged in sounding operations, it is possible to collect a large amount of scientific data regarding temperature of sea water at various depths, density of sea water, specimens of sea bottom, and ocean currents. The Coast and Geodetic Survey co-operates regularly with other Government Bureaus and with scientific organizations in the collection of such data for the study of oceanography.

The results of survey methods described above, as well as others which follow, form the original data from which the various publications of the bureau are compiled. The chief product of the bureau is nautical charts. It is not necessary to emprasize the importance of accurate nautical charts nor their necessity for the operation of vessels. Without them vessels could

not operate under modern conditions. This bureau issues about 727 separate charts covering the waters of the United States and its possessions. No other agency issues or is authorized to issue such charts. The process of compiling and printing these charts forms a major part of the work of the Washington Office. Last year about 280,000 charts were produced. Supplementing these charts and giving necessary information not possible to show on charts are 15 volumes of coast pilots or sailing directions. In addition to the production of nautical charts, the Coast and Geodetic Survey is charged with the production of aviation maps covering the civil airways of the country. Twenty-three strip maps and one sectional map for use of aviators are now published and additional ones are in the course of preparation. Information necessary to keep these publications up to date is collected not only by field parties but by Field Stations, located in seven of the principal seaports of the country. At each station an experienced officer is in charge of the collection and distribution of such items of nautical interest as may be noted day by day.

Tide and current observations are grouped in another direction of the work of the Bureau. Since every sounding must be reduced to its proper value at mean low water, it will be seen that tidal observations are closely related to all hydrographic operations. Numerous automatic tide gauges are maintained by each field party and vessel on the working grounds and in addition, 28 principal stations in various sea ports are constantly maintained for the collection of tidal information. The voluminous records of these operations are collected and subjected to thorough scientific analysis before the results are available for final use. The value of mean sea level is determined from these results. Another important work of the Division of Tides and Currents is the prediction of times of high and low water annually in advance. They cover ninety-two world ports, with further reference to 3500 other places scattered over the entire world. Of these ninety-two principal ports, about two-thirds of the predictions are made in our office and the others are obtained by exchange of information with foreign powers. They are furnished in printed form called Tide Tables. The predictions issued by this bureau are produced by means of an intricate ma-

chine capable of solving involved problems of wave motion. Along with tide observations and closely interwoven with them are tidal current investigations. This feature of the work of the bureau cannot be separated from hydrographic or tidal surveys. Predicted values for currents in advance as well as for rise and fall of tide are issued annually in advance in printed form. The production of these tide tables and current tables reached 42,000 volumes last year.

The fourth division of field work is Magnetic observations. In point of view of number of persons engaged, this is one of the smallest divisions but the importance of reliable magnetic knowledge cannot be minimized. Magnetic surveys on land and the use of the magnetic compass for steering vessels at sea are two fundamental operations. For the collection of this information three methods are used,—(1) observations by field parties engaged primarily in other classes of work, (2) observations made at selected points by especially equipped magnetic observers, and (3) continuous hourly records at permanent magnetic observatories, of which five are maintained constantly. The results of these observations are analyzed and issued regularly in pamphlet form. During the last few years the bureau has been charged by law with the collection of seismological data. Recording instruments of latest design are being installed at each magnetic observatory and the results are used in co-operation with other scientific bodies. In California a large amount of first order triangulation has been done along old earthquake fault lines and in areas of suspected earthquake activity so that any future movement of the earth may be measured more closely than has ever been possible in the past. Such knowledge should prove of immense value in scientific research.

In addition to the publications that I have mentioned, a large number of pamphlets giving results of the various classes of work and numerous manuals of field work are published for the benefit of the public. These are distributed at nominal cost. It is felt that the results of the work of this bureau will become more useful as the public comes to know more about the Coast and Geodetic Survey.

In concluding this talk, I beg to call your attention to the fact that the work of a survey vessel is usually called "Combined

Operations.'' This term is used on account of the numerous classes of work that are required in order to produce a finished survey of a given area. In the course of a season, the personnel on board a survey vessel may be called upon to perform practically any or all of the field work that I have described above. It is the varied nature of the work which makes the Coast and Geodetic Survey such a unique governmental activity.

APPENDIX

Geodetic Work Accomplished and Projected in Louisiana

W. S. Patton

In the extension of the fundamental control surveys over the United States, the Coast and Geodetic Survey has projected four arcs of first-order triangulations, which will be valuable in surveying and mapping and other engineering operations in the state of Louisiana. One of these arcs will run from th vicinity of Shreveport eastward, through Vicksburg and in the state of Mississippi. The second arc will extend from th vicinity of Fort Smith, Arkansas, southward, through Shreve port to the vicinity of Port Arthur, Texas. While some of this arc does not lie within the state of Louisiana, it is very close to its western boundary and can be used for the control of surveys and maps in the western part of the state. The third arc will begin near Mobile, Alabama, and run westward to New Orleans. The fourth arc will start at Donaldsonville, extend southward to the vicinity of Morgan City and thence westward as close to the coast as possible to Corpus Christi, Texas. It is expected that these arcs will be completed within the next eight months. Work has already begun on two of them.

During the winter of 1929-1930, the engineers of the Coast and Geodetic Survey extended an arc of first-order triangulation along the Mississippi River from Cairo, Illinois, to New Orleans, Louisiana. Some years ago a line of accurate traverse was extended along the Texas and Pacific Railroad and the Louisiana Railway and Navigation Company from Mansfield, Louisiana, to Naples on the Mississippi River.

In addition to the first-order triangulation and traverse mentioned above, there is a continuous narrow network of third-order triangulation extending along the entire gulf coast of Louisiana. Some of the coast triangulation is comparatively old and no doubt a number of the stations which have been established have been lost. It is expected that within the not distant future such revisions of the coast triangulation will be made as may be necessary to provide a sufficient number of stations for hydrographic and topographic surveying connected with the hydrographic charts.

In recent years all of the horizontal control stations have been marked with a metal tablet set into blocks of concrete. The marks are rather large and substantial and few of them should be disturbed by industrial development or by natural agencies. At present, data in the form of geographic positions of the stations, the lengths of the sides of the triangles and the azimuths of the triangle sides are in manuscript form at the office of the Coast and Geodetic Survey at Washington, D. C. It is expected that the data for the new arcs, which are projected, together with the data for the old work, will be put in printed form in order that it may be more readily usable by engineers.

A number of lines of levels have been run in the state of Louisiana; some by the Mississippi River Commission and others by the United States Coast and Geodetic Survey. The general locations of these level lines are as follows:

United States Coast and Geodetic Survey.

Shreveport west to Texas Line.
Shreveport southwest to Texas Line.
Shreveport to Alexandria.
Alexandria to Mansura.
Mansura to Naples.
Baldwin west to Texas Line.
Bayou Sale to South Bend.
Bayou Sale to New Orleans.
Baldwin to Weeks Island.
Baldwin to Bayou Sale.
Greenville to Vicksburg (La. portion).

Corps of Engineers, U. S. Army.

Parkeville northeast to Arkansas Line.
Shreveport to Jeters Landing.
Shreveport to Bodcau.
Bodcau to Monroe.
Shreveport to Alexandria.
Barbin Landing to Mansura.
Alexandria to Barbin Landing.
Mansura to Naples.
Naples to Smithland.
Baton Rouge to New Orleans.
Smithland to Baton Rouge.
New Orleans east to Mississippi Line.
Archibald to Concordia.
Archibald to Columbia.
Jonesville to Concordia.
Jonesville to Acme.
Concordia to Vidalia.
Monroe to Rayville.
Monroe to Columbia.
Rayville to Archibald.
Acme to Barbin Landing.
Parkeville north to Arkansas Line.
Delhi to Crowville.
Smithland to Ft. Adams.
Gilbert to Newlight.
Steins Bluff to Glendora.
Vidalia to Ft. Adams.
Vicksburg to Vidalia.
Vicksburg to Rayville.
Lines around "Delta."
Vidalia to Vidalia.
Monroe to Monroe.

The triangulation and leveling referred to above form part of the general network of horizontal and vertical control which the Coast and Geodetic Survey is extending over the country. This work is a Federal project and is designed to supply to states, counties and cities accurate geographic positions and elevations for use in extending local control surveys for their various classes of engineering work. The data, of course, furnishes the foundation for the topographic surveys and maps made by the United States Geological Survey. Congress has made a substantial increase during the past year of the funds

available for these fundamental control surveys and the Coast and Geodetic Survey is executing them as rapidly as possible. It is expected that during the coming decade most of the urgent needs of the states, cities and counties will have been met by the Coast and Geodetic Survey.

The general plan which has been adopted is to have arcs of first-order triangulation and lines of first-order leveling spaced at intervals of about one hundred miles with cross arcs for the purpose of adjustment. The same spacing of the lines of first-order leveling is contemplated in the scheme. The intermediate areas will be crossed by arcs of second-order triangulation and second-order lines of leveling so that when the whole scheme has been completed there will be few places in the United States which will be more than approximately twenty-five miles from a first or second order triangulation station or leveling bench mark.

The accuracy of the triangulation and leveling of the first and second order is very high and it is believed that the results obtained in executing these classes of work will be all that will be required for any engineering or scientific purposes.

The bench marks set on the leveling lines are metal tablets properly inscribed, which are set into blocks of concrete, stone or brick buildings, or in railroad structures. The average distance of the bench marks apart is approximately two miles. Whenever the line goes through a city, two or more bench marks are established and, also, a like number are established when the line crosses a principal highway or railroad.

The engineers of the Coast and Geodetic Survey conducting this geodetic work make connections with existing bench marks or horizontal control surveys. It is especially important that the lines of level should be connected with the existing bench marks of the highway department of a state.

The triangulation and leveling data for Louisiana are now in manuscript form but copies of them can be obtained, at a small cost for copying, by addressing the Director, United States Coast and Geodetic Survey, Washington, D. C.

In the interests of the engineers of a state, it is most desirable that any change in the description of a bench mark or triangulation station be sent to the Coast and Geodetic Survey

at Washington, D. C., in order that the records may be kept up to date. It is especially desirable to have notice of any marks which have been destroyed during industrial development or by natural forces, for accurate descriptions of the triangulation stations and bench marks may save time and money to the state and county engineers to whom data may be sent.

DISCUSSION

PRESIDENT FROST: We want to thank you for this very interesting talk, Commander Schoppe. It has been most interesting to me because I did not know anything about it. I was particularly interested in the accuracy with which you measure the large areas as well as a small area. However, recently I attended a meeting of the electrical engineers when they were talking about the effect of electric waves, and they were measuring time down to the millionth of a second, so I do not doubt you can measure to the closeness of the figures you have given us.

After this talk, I am sure there are many of you with questions on your minds. If so, we would be glad to hear from you at this time.

PROFESSOR DERICKSON: Commander Schoppe, how closely can a position at sea be determined by astronomical observation?

COMMANDER SCHOPPE: I think the latest conclusion on that line is about one-quarter of a mile. It may be closer, but we are not prepared to say. The accuracy of those positions depends greatly on atmospheric conditions, and we have not adopted and perfected the type of sextant necessary. This has only been brought to our attention in recent years. We did not have the equipment until very recent years for that type of work.

PRESIDENT FROST: Any other questions? You stated you have made some astronomical locations adjacent to New Orleans. Have you changed the location of the monument in Lafaye Square recently?

COMMANDER SCHOPPE: We have information on it, but it will not be available until the least square adjustment is made, which will be about a year. It will change a trifle—just a frac-

tional part of a second of latitude, which is about 100 feet on the earth's surface, so I do not think we will have to do much chiseling on the monument.

If anyone has any involved questions to ask, I will be glad to talk them over with you at the office. Because of the lateness of the hour, many may not ask questions they otherwise would like to ask.

THE NEW STORY OF ANCIENT WROUGHT IRON

By R. Carson Hamlett.

Read before the Society April 13, 1931.

Last October, the A. M. Byers Company placed in commission a new $12,000,000 plant near Pittsburgh, Pa., for the manufacture of wrought iron by a new process developed by Dr. James Aston, for a number of years the company's chief metallurgist. The true significance of this sentence can be grasped only by one who knows something of the story of wrought iron, which I will briefly sketch. It is a story of business romance, an unfinished tale for which the above company is now writing what may prove to be the most interesting and important chapter.

To begin with, wrought iron is centuries old. Seven generations after Adam, Tubal-Cain smelted wrought iron. The Pillar of Delhi, erected about 1600 years ago, is of wrought iron. Wherever steel is now used, wrought iron was once employed. Steel supplanted it because mechanical means wree devised to produce steel in large quantities and, hence, at low cost. Wrought iron, on the other hand, was inseparably bound to human labor. Wrought iron called for puddling, and puddling could be done only by human beings. Now, the Byers process offers a mechanical means of making wrought iron. That is why it promises so much.

Wrought iron is practically pure iron with which has been combined approximately 6 per cent by volume or 3 per cent by weight of a glasslike substance, iron silicate. The silicate is minutely and uniformly distributed, and each particle serves as a protective barrier against the inroads of rust. When fractured, wrought iron exhibits a dull, gray, ragged surface similar to that of a hickory stick broken across the grain. Steel, too, starts with well-nigh pure iron to which is added carbon to make it hard and manganese to make it tough. The fracture of steel is clean, bright and decidedly crystalline. Steel has a greater tensile strength than wrought iron, and for certain purposes, where strength is the chief requisite, stands supreme.

The "forte" of wrought iron is twofold: it is capable of resisting corrosion and of withstanding shock and constant vibration which would result in the fracture of most metals. Wrought iron has a soft, uniform texture which cuts easily—an advantage in such operations as pipe-threading; and it welds readily because of its natural slag content. Wrought iron was the inevitable product of the crude equipment of the ancient iron-workers. They alternated layers of charcoal embers and iron ore and blew upon them with bellows. Slag, formed by the melting of the silicon in the ore, began to show at 2,100° F. To melt the iron, itself, required a temperature of around 2,700°. At this temperature, the slag, in liquid condition, rose to the top because of its lighter weight, while the iron sank to the bottom. With the poor facilities at hand, it was difficult to maintain as great a heat as 2,700°, and the iron began to solidify. To keep it refining as long as possible, the iron workers resorted to stirring or rabbling.

It so happens that the working of iron in a bath of slag is necessary to produce wrought iron. What takes place is this: Molten iron contains, in solution, many times its volume of gases, chiefly carbon monoxide. As the metal cools and begins to solidify it can no longer hold these gases. Accordingly, they escape in what constitute myriads of small explosions, so inconsequential that they produce no noise. But during this phenomenon, which may be likened to the popping of corn, the iron forms pealike globules which are thoroughly impregnated with silicon. These pasty particles, loosely cemented together by the slag, form a spongy mass. In the words of the iron worker, the metal "comes to nature". This spongy mass is then removed from the furnace, mechanically squeezed to remove the excess slag, and put through rolling mills. The product is commercial wrought iron.

We see, then, that stirring or rabbling is essential to bring about the required union between the iron and the silicious slag, and was, therefore, a necessary operation in the early days in the refining of iron ore. In 1874, in England, Henry Cort invented the puddling furnace for making wrought iron from pig iron. It gave the British iron industry a great impetus because it provided for the utilization of bituminous coal

instead of charcoal. The vast use of charcoal had depleted the forests to the point where Queen Elizabeth had decreed that they must be conserved. Cort's furnace was of the reverberatory type, which means that the heat was deflected from the roof down upon the pig iron which rested upon the sand bottom of the furnace. In 1830, John Hall, also an Englishman, further improved the puddling furnace—his principal contribution being the idea of lining the furnace with iron ore.

America was slow to adopt the puddling-furnace practice as developed in England because her virgin forests gave a plentiful supply of charcoal. Eventually, however, the United States took up the new method, and puddling furnaces arose in great numbers. In 1850 there were 552 wrought-iron establishments, whose products were worth $22,629,271. All of them depended upon puddling. Puddling, in turn, called for man power. Two men, working a "turn" of ten hours in the intense heat before the furnace, were able to produce only about 2,800 pounds of wrought iron. It required nearly tw hours to refine each charge of pig iron and to work it w rabbles into two of the spongy, silicate-bearing balls.

Then, in 1855, came the Bessemer converter for ma steel. It took pig iron, the product of the blast furnace, purified it at the rate of a ton a minute. Six years later t open-hearth furnace provided an additional means for making steel inexpensively, as compared with wrought iron. By these methods, a ton of pig iron could be converted into steel at half the wages paid puddlers for working a like amount of wrought iron.

At first the wrought-iron industry did not feel this invasion of its field. Wrought iron was established, steel was untried. But soon the difference in price began to tell. It mattered little that wrought iron was superior for certain purposes. Steel was much lower in cost, and customers began buying it and using it where they had previously used wrought iron. Even so, in 1870, 523,214 tons of iron rails were made as against 30,357 tons of steel rails. But during the next decade steel passed wrought iron in total production.

One by one the wrought-iron makers junked their puddling furnaces and went to making steel. Andrew Carnegie threw

his weight on the side of steel. Steel forged steadily ahead, while wrought iron slowly but steadily slipped back from its once commanding position. By 1929, steel, the Titan of the modern industrial world, had reached a production of 56,433,000 long tons. The output of wrought iron, on the other hand, remained practically static for a number of years, at around 500,000 tons annually. Not only did it lose ground to steel but, during a period of unequaled expansion in the use of ferrous metals, it dropped to one-fourth of its own 2,000,000-ton annual production in the "eighties".

It need not be supposed that the wrought-iron makers stood idly by and watched the mushroom growth of steel without trying to discover similar cost-reducing mechanical methods for turning out their own product. Scores of men devoted the better part of their lives to the problem. J. P. Roe, E. L. Ford, W. C. Ely, H. D. Hibbard, and others, devised puddling machines. Most of them worked, but they had short-comings. As a class, they failed because they tried to simulate the action of the hand puddler. They were machines of the concrete-mixer type, in which the iron and the silicon were commingled by mechanical stirring or tumbling.

About ten years ago the Byers Company put Doctor Aston to work on the problem. He was not only a practical iron man but also a theoretical one, a professor of metallurgy at Carnegie Institute of Technology. Seeing where others had failed, he approached the matter from a different angle. Time limitations forbid a detailed account of his experiments. Suffice it to say that he came to a realization that the vital need was a means for breaking up the iron into small particles so as to bring about its impregnation with iron silicate. With this point established, success soon came, for he was on the right track.

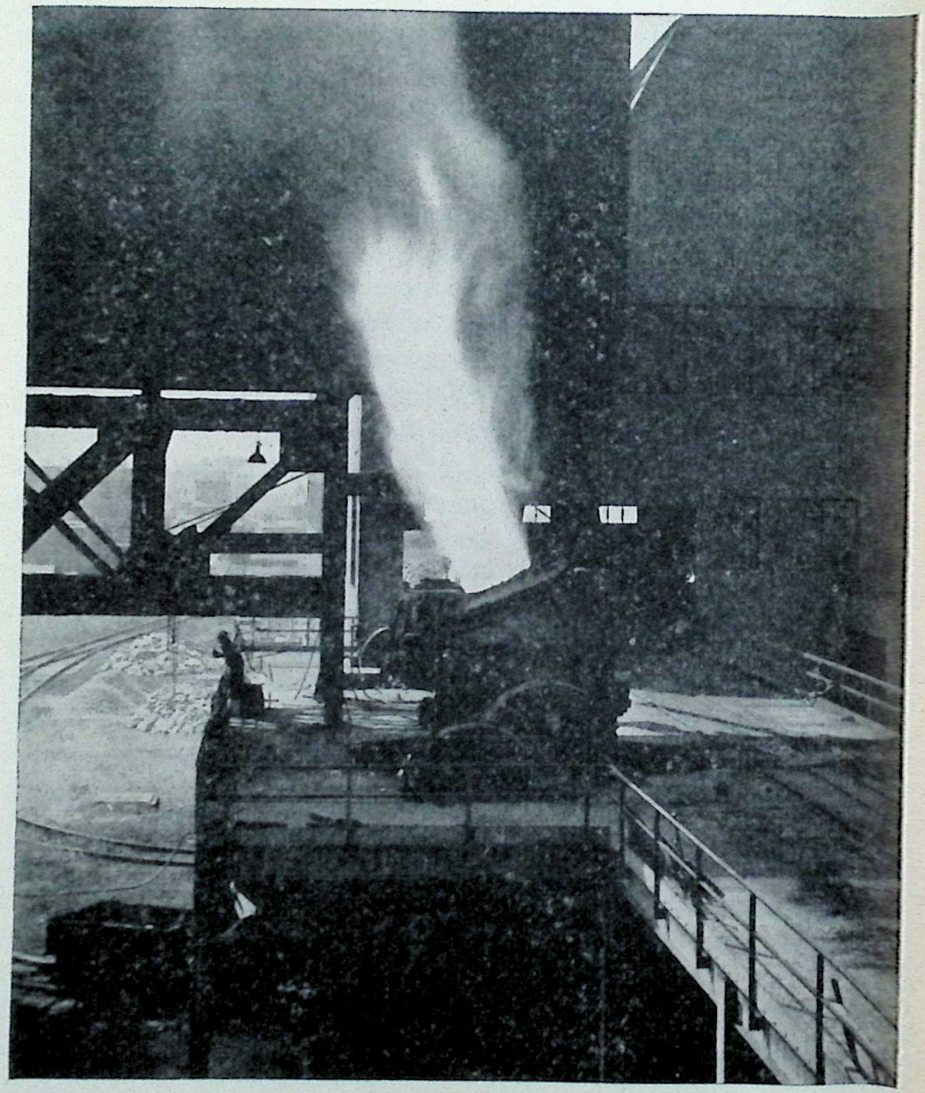
The process is extremely simple. It consists of pouring a stream of molten, purified iron, at about 2,750° F. into molten slag at about 2,400° F. When the iron strikes the cooler slag it is chilled and breaks up into plastic particles, just as does boiling taffy when poured into a glass of water—in short, it separates into congealed globules. The minute explosions previously described take place, and the silicious slag thoroughly

impregnates the iron. The Byers Company tested the commercial possibilities of the process thoroughly in an experimental plant at Warren, Ohio. They made pipe from the wrought iron and tried it out in service. They submitted samples to the United States Bureau of Standards, to the large petroleum interests, and to the leading railroads. They proved to the satisfaction of themselves and others that the new process material retained every desirable characteristic of the finest of hand-puddled wrought iron. Then, in 1928, they began the construction of the new plant at Ambridge, a few miles below Pittsburgh, on the Ohio River.

It is impossible here to describe the plant in detail. It is a modern, electrically operated mill completely equipped to turn out wrought iron and to roll it into the various plates, sections, and shapes which form the basis for making the manifold products to which wrought iron lends itself. Some of the equipment is notable for its size, and several units are of distinctive design. The connected load in motors is 50,000 h. p., and the blooming mill is powered by a 5,000-h. p. reversing, variable-speed motor. For handling materials throughout the mill there are 23 cranes with lifting capacities ranging up to 50 tons. A pump station on the Ohio River provides the water supply. As now outfitted, the plant will produce 25,000 tons of wrought iron a month; and it is so constructed that this capacity can be doubled by installing additional equipment. A plot of 127 acres is sufficient for expansion—an expansion which the company confidently expects will come when the economies of the new process are fully reflected in the form of an increased market for wrought iron. No one who sees this plant can doubt the faith of the company in the future of its product.

The new plant not only puts wrought-iron production on a similar plane with steel production but it actually borrows and adapts to its own needs the converter, which has heretofore been confined exclusively to steel-mill practice. First of all, pig iron is melted in cupolas, of which there are three with a combined melting capacity of 1,050 tons daily. Later on, if sufficient production is attained, blast furnaces will be provided to produce molten iron directly from the ore. The molten metal from the cupolas falls into a 10-ton transfer car stand-

ing on an elevated track. Excess slag is poured from the metal, and a compound with a soda-ash base is added to reduce the undesirable element, sulphur. The car is then pulled a few yards along its track to one of the two 10-ton Bessemer convertres, where it is emptied of its contents by tilting.



Two 10 Ton Bessemer Converters Remove the Impurities from the Molten Iron.

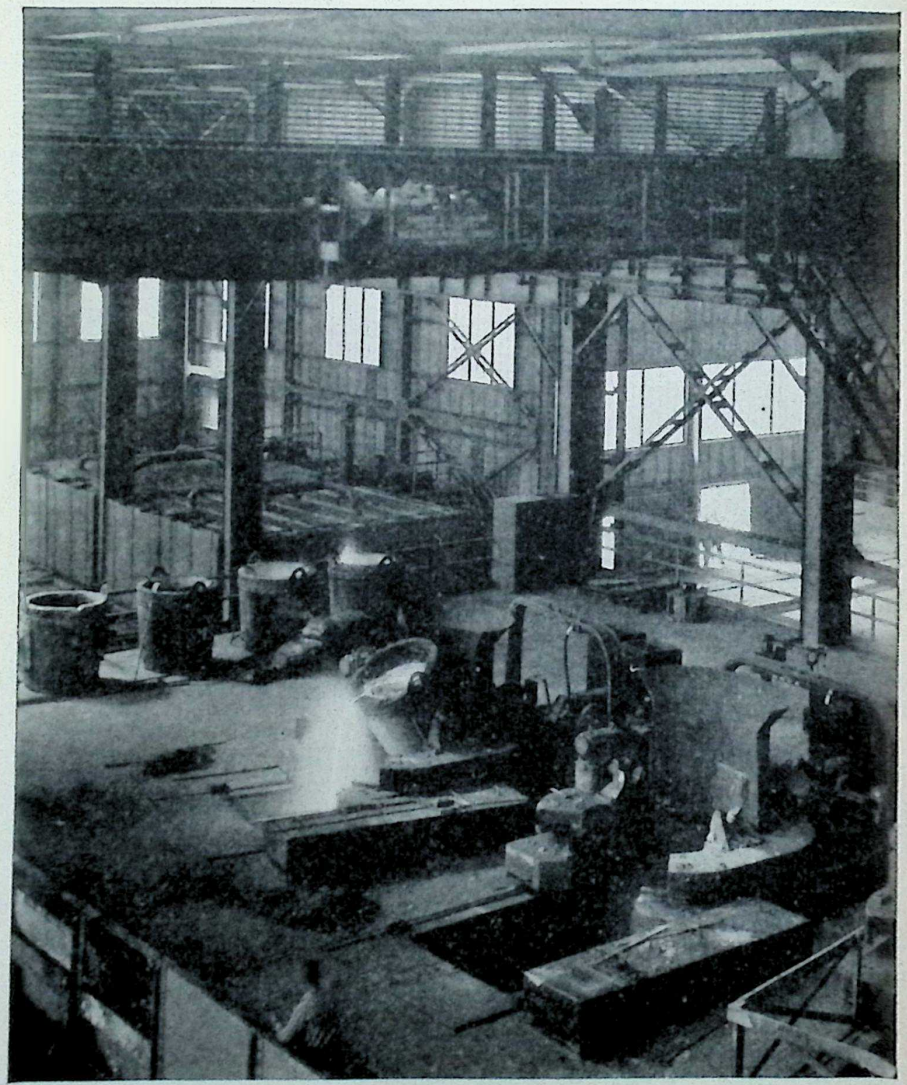
The converters are pear-shaped, refractory-lined steel vessels, each of which can be tilted on two horizontal supporting trunnions through an arc of more than 180°. Through one of the trunnions and a connecting pipe, compressed air is introduced into what is known as the "wind box", at the bottom, and thence into the converter through twelve openings termed tuyeres. This blowing of air through the metal oxidizes and removes the impurities. Incidentally, the heat generated by this reaction raises the temperature of the iron several hundred degrees. At the start of the "blow", the converter is tilted well over on its side and some of the tuyeres are uncovered. A greater volume of air must therefore be supplied, as some of it escapes.

The compressed air is furnished by two duplex, single-stage compressors which are of new design. A 42 x 27 inch compressing cylinder is mounted at each end of the two frames, making a total of four cylinders. Driving power is provided by a 2,500 h. p. synchronous motor mounted centrally between the frames. These compressors are designed for discharge pressures of from 16 to 25 pounds, and are provided with clearance-pocket control for regulating the volume of the output. The actual delivery of each unit at 25 pounds discharge pressure is 22,250 cubic feet per minute. The machines are controlled from a glass-enclosed observation room known as the "pulpit", from which the operator of a converter looks out upon the spectacular and awe-inspiring monster and regulates its actions as it belches flames half a hundred feet into the air.

When the molten metal is charged into the converter it contains, roughly, 94 per cent of pure iron, 4 per cent of carbon, and 2 per cent of silicon, sulphur, phosphorus, and manganese. Six or seven minutes of blowing oxidizes and removes all these impurities except the carbon. The remainder of the total blowing time of approximately fifteen minutes is consumed in getting rid of the carbon, which is reduced to about 7/10 of 1 per cent. The operator judges the progress of the reactions by the color and the length of the flame, and regulates the angle of the converter and the volume of the air blast so as to produce the desired combustion. Of interest to steel

men is the fact that the operator can control the amount of air without the use of a "snort" valve.

By tilting the converter to its lowest position, the blow iron is poured into a ladle which stands on a railroad car below. This car is moved a few feet into the processing room, where the ladle is lifted by a 35-ton crane and about 6,000 pounds of



Processing—The Key Operation in the Manufacture of Wrought Iron.

its contents are poured into one of four processing machines on a platform overhead. The processing machine is a ladle mounted on a carriage which, by means of motors, can be oscillated both sidewise and backward and forward so that the stream of metal flowing from the ladle is distributed over the entire surface of the slag.

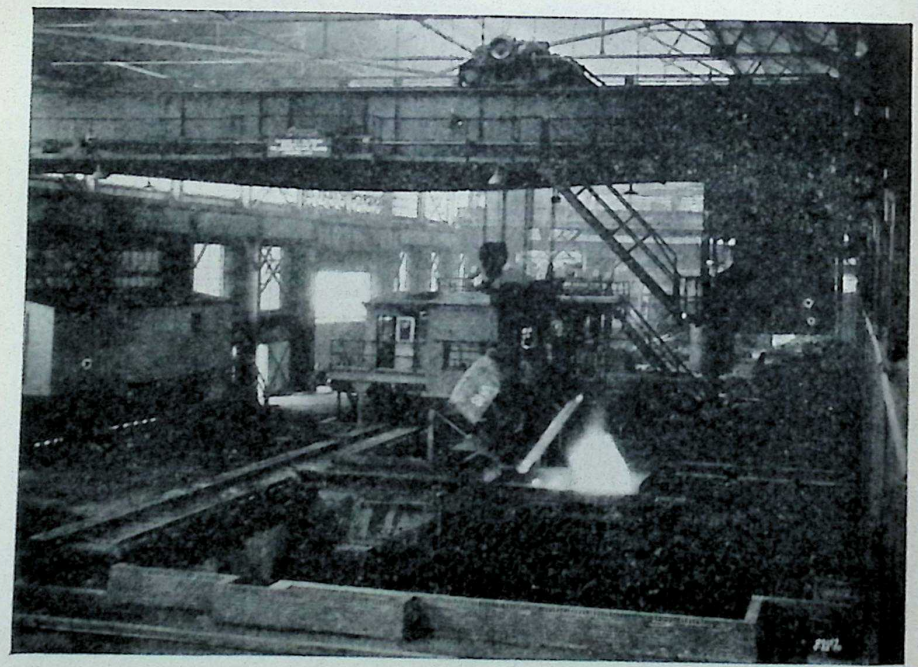
Meanwhile, the slag has been prepared in two tilting open-hearth melting furnaces fired by natural gas. What is known as a processing cup is filled to the desired level with molten slag. This is moved directly under the ladle containing the molten iron. The ladle is then tilted and the pouring starts. The iron falls approximately 12 feet, striking the slag in a fine stream. The surface of the slag seethes and effervesces as the chilled iron gives up its contained gas. By a stretch of the imagination, one may compare it to a vast decanter of carbonated water that has just been uncorked. Weighing facilities are provided so that the amount of iron poured can be controlled. This essential operation is called processing or shotting. The latter term arises from the fact that the iron is divided into shotlike globules. It required only about three minutes to pour 3 tons of the metal.

To facilitate the processing and the related operations, there is a standard-gage railroad track which describes an oval. A train, drawn by a 70-ton electric locomotive which takes power from a sunken third rail, travels around this endless track. Following the shotting, the train moves to an electric press adjacent to the blooming mill. There a crane picks up the cup with its slag and ball of spongy iron, pours off the excess slag into an empty cup on another car, and deposits the ball upon the bed of the press. The train then proceeds around the oval to the slag furnace, where another crane adds enough slag to the cup to make up for that lost during the processing operation.

The processes thus far described are those that replace hand puddling, and it is therefore of interest to take account of the economies they effect. At present capacity, approximately 40 tons of wrought iron can be made every hour with a force of 70 men. Under former methods this would have required 1,000 men and nearly 300 puddling furnaces. The size

of the ball that could be made in the puddling furnace was limited by the strength of a man, and ranged from 250 to 300 pounds. In the new plant, balls weighing from 6,000 to 7,200 pounds are produced regularly, and some of 10,000 pounds have been made. Moreover, the quality is always the same. One ball is just like another: there is no longer any chance for variation arising from the human factor.

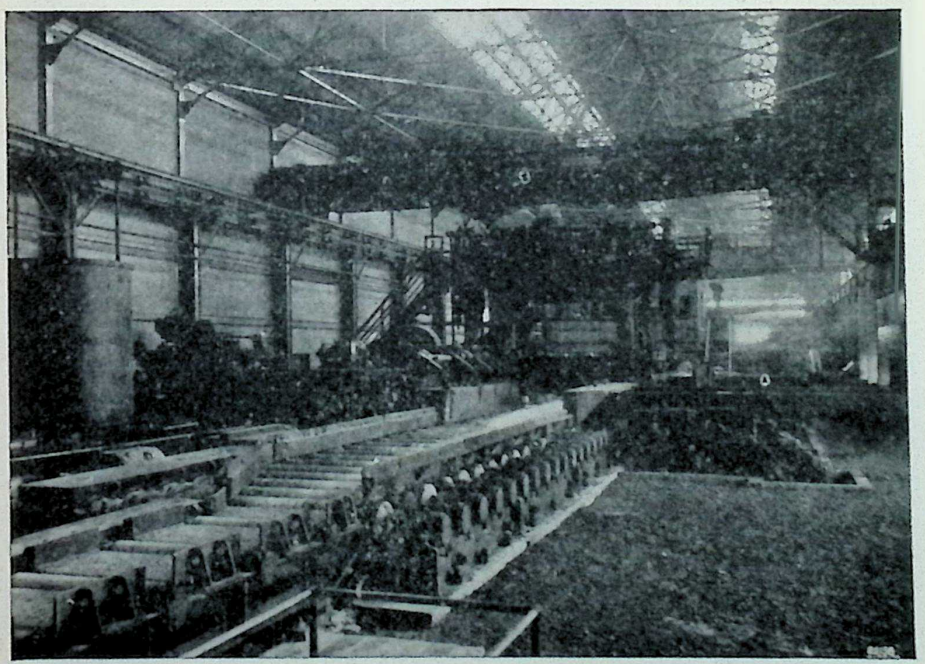
Once the ball is made, it undergoes the traditional treatment to convert it into commercial products. The new mill is equipped for essentially the same operations that have always been carried out. The chief difference is that larger and better machinery is provided. When the plastic, still red ball is dumped upon the bed of the electric press the bed is lowered, creating a steel-sided box 8 feet square, 8 feet deep, and open at the top. One wall of the box then moves forward and squeezes the ball against the opposite wall. It is actuated by a ram which exerts a pressure of 900 tons and is driven by a



In this 900 Ton Electrically Driven Press is Compacting the 6000 Pound Bloom. This is the First Press of Its Type Ever Manufactured.

variable-speed motor of from 1,200 to 2,000 h. p. The mass is then mechanically turned on its side and the process repeated. After numerous applications of pressure against the sides, the two walls facing the ends of the mass close in with a pressure of 200,000 pounds. The piece of compacted iron—with its excess slag squeezed out of it—is now a bloom 6 feet long and approximately 17 x 21 inches in end section. This press is the only one of its kind ever built.

When the bloom has been formed, the bed of the press is raised and the bloom is pushed by a mechanical arm on to rollers that carry it to the blooming mill. There, in a gigantic steel machine that weighs 1,500,000 pounds, it is directed back and forth between rolls until it is reduced to the desired section. Elongated into a strip, it then passes over rollers to a 500-ton shears, where it is cut into pieces which are caught in a cradle and weighed. Material thus formed is stored against future needs. For further working, the pieces are reheated in one of five furnaces fired by producer gas generated on the



This 40 Inch Blooming Mill Produces Billets and Slabs.

property. They are then rolled into suitable forms for conversion into the manifold products in which the iron finds its ultimate market.

Recalling for the moment that wrought-iron consumption now amounts to but 25 per cent of its one-time volume, it is obvious that the success of the new process will be measured in direct proportion to the expansion of the market. The economies it effects will, it is believed, lead to a greater use of wrought iron where it is undeniably the best material for the purpose. There will be no indiscriminate fight with steel. The trend is towards specialization in the use of metals, and it is upon this trend that the Byers Company bases its hopes and predictions for the revivification of the wrought-iron industry. A merchandising adventure is ahead. People and companies are being educated, through advertising and salesmen, to the merits of wrought iron. They are being shown that it is the most inexpensive material they can use for certain purposes. It has a wide field of its own without encroaching upon the domain of steel.

What is this field? Without attempting to itemize, we can suggest it by briefly considering pipe. By virtue of its resistance to corrosion and its other inherent qualities, wrought-iron pipe is especially suitable for certain services. In modern buildings, where piping is embedded in concrete and steel walls, it costs a lot of money to tear it out. If steel has been used where wrought iron should have been employed, a hundred times the initial saving made on the pipe cost may have to be expended in a few years for replacements. But it would be a waste of money to buy wrought iron where steel would do as well, or to buy brass where wrought iron would answer satisfactorily. There are no blanket rules to follow. Hot water, for example, has a different effect on metals than has cold water, while the corrosive action of Chicago water varies from that of New York water. Knowing these things, the company is selling wrought-iron pipe on a prescription basis: it is recommending it for specific uses according to the various factors involved. As a result, more and more wrought-iron pipe is going into buildings.

Wrought iron is highly resistant to breakage induced by vibration. Because of its ropelike structure, stresses do not centralize in crystallization planes as is the case with steel. For that reason, wrought-iron pipe is largely used in railway service. Air lines on most trains are today made from wrought iron, and train stoppages due to breakage have been almost eliminated thereby. Tie plates, subject to vibration and exposed to the dripping of brine from refrigerator cars, likewise are much more enduring if made from wrought iron. The province of wrought iron is so wide and enters so many fields that many pages would be required to discuss it.

All in all, it looks as though the wrought-iron industry is having a pronounced turn for the better.

DISCUSSION

MR. CARSON: Have any of you any questions you would like to ask about this process? It is something entirely new. We have never before had a modern process. It has been approved by the A. S. T., Federal Specification Board, American Railway Association, Bureau of Standards. The Bureau of Standards made a very comprehensive report. Research Bulletin 124 covers it. In the back of this book they have a summary on that,—the last item. I have a copy of "Metals and Alloys" which shows a reprint from this Government bulletin and gives all these data. Every time we get out anything new we are goiosing to have criticism. It is the same material, but there is quite a bit of discussion about our new process, and every time we have any criticism we hand them a copy of the "Metals and Alloys" reprint, which gives the full information on it.

PROFESSOR WILLIAMSON: Did I understand you to say that you took most of the carbon out in the converter?

MR. CARSON: In the vessel. It takes about seven mniutes to reduce the sulphur and the manganese and the other elements in there, and then the remainder of the 15 minutes time is used for reducing the carbon to seven-tenths of one per cent.

PROFESSIO WILLIAMSON: How much is the carbon content?

MR. CARSON: The finished product has about .0037 per cent. The base metal contains about thirty hundredths of one per cent.

The big difference between steel pipe and wrought iron pipe, of course, is the slag which forms these threads. The main difference is in the manganese content. By Byers pipe it runs about forty-two thousandths of one per cent, and on steel pipe it runs three hundred seventy-one thousandths of one per cent.

MR. LORIO: I would like to ask a question. It is a little bit off the subject, however. The thing that struck me as rather interesting, is to have the other fellow tell you what is in your own back yard. Did I understand you to say that the railway transfer boat "Gouldsboro" is an old monitor?

MR. CARSON: The old monitor "Chickasaw," built in 1863 at the Federal Ship Yard at St. Louis. It fought during the war.

PROFESSOR RICKER: Do you electrically weld this wrought iron pipe?

MR. CARSON: It can be. The strongest weld is the hot weld. I would like to say a little more on the welding of pipe with electric weld. You can get a very good weld, in fact you can get a good weld on any of them because of the fact that you have a natural flux in the material, the iron silicate. On tests they took 135 pieces,—a Bureau of Standards test,—135 pieces of wrought iron pipe and crushed those, and out of those 135, 128 broke elsewhere than at the weld, although the weld was put on the side and the pressure put on the top and bottom. Naturally the heaviest pressure was on the side. All of our tests were conducted by putting the pressure right on the side where the weld could get the heaviest strain, and with only seven fractures at the weld it shows you get an excellent weld in the material.

MR. NEWMAN: About what percentage of wrought iron pipe is galvanized, and why is it galvanized if it has a high rust-resisting quality?

MR. CARSON: Any ferrous material will rust. Of course, the wrought iron having a slag content will resist corrosion a whole lot better than steel without any slag barriers, but with a good heavy galvanized coating you will have a good clear water. I wish you were out where I shaved tonight. I am out at a place where the rust in the pipes is very bad. Heavy galvanized coating will take care of that, and all water lines should be gal-

vanized. While you get in steel and wrought iron pipe the same corrosion, there are two stages in the wrought iron and one in steel. With steel it has no slag barriers to hit, so it rusts right on through all the way. In slag, as contained in wrought iron, it will rust through the first stage the same as steel, and as soon as it gets down to the iron silicate barrier, which is incorrodible, then you will find that the corrosion practically ceases. Wrought iron having a pure base forms a very protective rust coating, which is a very fine coating and adheres very closely to the metal.

But with all water lines, if you will put on a heavy galvanized coating you will find it will stand up much better. In galvanizing of wrought iron, or steel, too, they always pickle the pipe so as to get a rough surface. Steel being very hard, does not give a very retentive surface.

A good way to test that is to cut off a piece about half an inch long, take a hammer and beat it. If it is wrought iron, the galvanizing will not break, but the wrought iron will. On a steel pipe it has not reached down and gotten the retentive hold. Hit that with the hammer and your galvanizing will flake off.

A MEMBER: Why is it that you cannot bend a piece of wrought iron pipe as you can a steel pipe?

MR. CARSON: You have not been able to in the past, for one reason. You have iron silicate, which is pure iron with iron silicate. When you start to bending that you do not have a solid piece of metal, and you have a very good chance of it breaking. With the Byers bending pipe we can get some very satisfactory bending done.

I might mention the Mississippi Insane Hospital intends using this bending pipe for the expansion coils. They think that will be the material to use, and now they can get it bent without so many failures. It will work out very nicely for that. The three and a quarter million dollar State Hospital for nervous diseases at Benton, Arkansas, is also using it for the same purposes.

PROFESSOR ANDERSON: For underground water uses or corrosion, how does wrought iron compare with cast iron?

MR. CARSON: Cast iron should be used in all cases. Possibly the only places wrought iron should be used, I should say, is where you have a difference in elevation. I am reminded of a place up in Arkansas, where you come down over a hill, over a bottom land and up over another hill. The pressure at the bottom of that hill runs 230 pounds, according to our calculation. There you have a good chance of a blowout with calking as used in cast iron pipe. In field ground sometimes you will have a settling that will crack the pipe, but with wrought iron pipe, if it has a tight screw joint, it will hold up better in conditions like that.

But we will never try to say anything against cast iron, because it is a superior material. We are trying to put our pipe on a prescription basis, use it where it is superior, and nowhere else. We know then that you engineers will have confidence in it, and if we build a material that has your confidence behind it, we know it will succeed.

THE PRESIDENT: Is wrought iron pipe being used for natural gas lines?

MR. CARSON: In some places. There is a term the oil men have gotten up, "hot spots," meaning by that the corrosion is very severe, such as crossing salt bayous. In those places they may be running this light weight line pipe, which A. L. Smith manufactures. They may be using that elsewhere, but when they get to crossing this bayou they will use wrought iron. But the cost of wrought iron has been almost prohibitive for the gas companies' use as pipe line. Wrought iron costs you about 70 per cent more than for steel. That sounds like a lot, but I think any of you who make up estimates on plumbing and heating systems, it will average 4.6 per cent. Those are the figures of a national firm of estimators that they made up for that purpose, 4.6 per cent additional cost for installing Byers over steel pipe. You get 100 per cent extra life. The underwriters say that.

MR. BILLINGSLEY: When will your new process be reflected in lower prices?

MR. CARSON: That is very hard to say definitely. I will not set any date, but I will say thsi, that as soon as the mill is oper-

ating on a capacity basis, or where we can get a definite idea of what it costs to operate, then prices will be lowered materially.

MR. TODD: Do you make wrought iron plates?

MR. CARSON: We are now manufacturing wrought iron plates, from one-quarter inch up to inch and a half thickness, up to 84 inches in width, and any length you desire. That is, in reason. New prices have just come out on carload lots. It will run only $60.00 a ton. Our price in the past was $90.00 a ton. We have cut 33 1/3 per cent off the plate prices.

MR. CARSON: Cast iron should be used in all cases. Possibly the only places wrought iron should be used, I should say, is where you have a difference in elevation. I am reminded of a place up in Arkansas, where you come down over a hill, over a bottom land and up over another hill. The pressure at the bottom of that hill runs 230 pounds, according to our calculation. There you have a good chance of a blowout with calking as used in cast iron pipe. In field ground sometimes you will have a settling that will crack the pipe, but with wrought iron pipe, if it has a tight screw joint, it will hold up better in conditions like that.

But we will never try to say anything against cast iron, because it is a superior material. We are trying to put our pipe on a prescription basis, use it where it is superior, and nowhere else. We know then that you engineers will have confidence in it, and if we build a material that has your confidence behind it, we know it will succeed.

THE PRESIDENT: Is wrought iron pipe being used for natural gas lines?

MR. CARSON: In some places. There is a term the oil men have gotten up, "hot spots," meaning by that the corrosion is very severe, such as crossing salt bayous. In those places they may be running this light weight line pipe, which A. L. Smith manufactures. They may be using that elsewhere, but when they get to crossing this bayou they will use wrought iron. But the cost of wrought iron has been almost prohibitive for the gas companies' use as pipe line. Wrought iron costs you about 70 per cent more than for steel. That sounds like a lot, but I think any of you who make up estimates on plumbing and heating systems, it will average 4.6 per cent. Those are the figures of a national firm of estimators that they made up for that purpose, 4.6 per cent additional cost for installing Byers over steel pipe. You get 100 per cent extra life. The underwriters say that.

MR. BILLINGSLEY: When will your new process be reflected in lower prices?

MR. CARSON: That is very hard to say definitely. I will not set any date, but I will say thsi, that as soon as the mill is oper-

ating on a capacity basis, or where we can get a definite idea of what it costs to operate, then prices will be lowered materially.

MR. TODD: Do you make wrought iron plates?

MR. CARSON: We are now manufacturing wrought iron plates, from one-quarter inch up to inch and a half thickness, up to 84 inches in width, and any length you desire. That is, in reason. New prices have just come out on carload lots. It will run only $60.00 a ton. Our price in the past was $90.00 a ton. We have cut 33 1/3 per cent off the plate prices.

SOME NOTABLE EUROPEAN LABORATORIES

By W. B. Gregory.

Delivered before the Society March 9, 1931.

About a year ago, having developed a tired feeling, the family decided that the cure was a trip to Europe. So with my daughter I sailed from New Orleans on the 14th of June, 1930, and two weeks later we landed in Havre; arrived in Paris about 2 a. m. Sunday morning, two weeks later.

There were vivid recollections of a former trip about thirteen years before, when the route was from New York by Halifax and zig-zagged across the Atlantic, around the northern end of Ireland, and to Liverpool.

It was very different this time; the outlook was quite different and conditions a great contrast to the former trip. There were a great many people from New Orleans on board, and college people from other parts of the United States, particularly from Texas and California.

When we arrived in Paris things were different. We finally came in the English Channel and down to Havre, and then to Paris. Paris in 1917 was very poorly lighted—a few blue lights here and there, often they were marked "Abrai" where one could enter a cellar to duck shells. This time Paris was a blaze of light, and the next day being Sunday, we went to the Luxombourg Gardens and found that the French Capital was a delightful place in June.

It so happened that the first week of July was the 20th Anniversary of the founding of the Comité France-Amerique, for better understanding and friendship between France and the Americas,—North and South. The Comité is sponsored by the French Government and its meetings are important international functions each year.

On Monday morning the affair started with a religious service at the Cathedral of Notre Dame. At that time we attended a mass; the music was by seventy-five male voices. It was a very beautiful and impressive ceremony. Memory recalled another occasion in the Cathedral of Notre Dame. It

was my good fortune on the Sunday after the armistice to be in that cathedral and to hear the Te Deum of Victory sung—a most impressive ceremony.

From these religious services we went at once to the Arc de Triomphe, under which the unknown soldier is buried. There we had the honor of meeting General Pershing, representing this nation at the meeting of the Comité and seeing him grasp hands with General Goureau over the grave of the Unknown Soldier. Colonel Collins of New Orleans was on his staff during the war, and we had a great deal to talk about. General Pershing said, "Be sure to see Colonel Collins when you go to Rome." Later in the summer we did go there and tried to see Colonel Collins.

That week in Paris was a wonderful event. We dined with the President of the Republic Monday night, and about eighty other notables in all, including General Goureau, General Pershing, Ambassador Claudel, the ex-presidents of many South American countries, and ministers from most of them. The second night another elaborate dinner by Mr. Raymond Poincairé. The French know how to put on a show, and they left nothing undone. The addresses were brief, and the food and wines we had were something to remember a long time. The dinners were at Maison des Americans, 9 Avenue Victor Emanuel, in the heart of Paris, and the building itself was one of the magnificent old palaces of Paris.

There was also a reception at the Paris Chamber of Commerce. It was a palace once occupied by royalty. The rooms and the grounds were very elaborate and beautiful. Also a reception at the Hotel de Ville, and finally the affair came to an end at the grand ball at the Palace of the Louvre. Of course you know that the Louvre houses the greatest art collection in the world. However, all of the palace is not given over to art. The Minister of Finance has his offices there, and the particular rooms in which we attended the ball were those decorated by Napoleon III.

On July 4th we called at the American Embassy. Ambassador Edge and Mrs. Edge gave a reception that day. During that week we found time to make a trip to the works of Rateau. During the war my work was in the water supply

office of the American Expeditionary Forces, who bought a great many pumps of that company. It was a pleasure to again meet the chief engineer of that company, Mr. Niel; we went with him to the pump and blower factory and had a very pleasant day.

Being in the Palace of Louvre reminded me of a former occasion in 1918 when in Paris and while stopping at the American University Club. About eleven o'clock the "alert" sounded because a German raid was in progress. About half an hour later they disappeared; the invaders were driven off and I went to bed. Next morning the information was given me that the Germans had returned about 2 a. m. and bombarded Paris in the worst way that ever happened before or since,—but it did not disturb my sleep. One must be physically tired and have a good conscience to sleep like that.

From the second floor of the Louvre we could look on the Eiffel Tower and River Seine.

We found time to go to Versailles for lunch but towards the end of the week notice came of membership in the advisory committee of the National Hydraulic Laboratory and a communication from Mr. John R. Freeman, who was chairman of that committee.

John R. Freeman is known to you as Past President of the American Society of Mechanical Engineers and Past President of the American Society of Civil Engineers. He is the only one to have the distinction of being head of two great engineering societies. He is a hydraulic specialist on water supply, and has been on the Board of Consulting Engineers for New York water supply for thirty years and for Boston and for cities on the Pacific coast from San Diego to Vancouver. He has also been connected with the water supply at Denver, done hydraulic work in Mexico and China; intimate friend of Presidents Roosevelt, Taft and Hoover; Doctor of Engineering of four universities; a scientist, and friend of scientists the world over.

He has sent to Europe the Freeman Scholars for five or six years; he keeps two or three men over there steadily in the schools and hydraulic laboratories of Europe. He is author of "Hydraulic Laboratory Practice", which is the best known

along that line ever published, and which describes the laboratories of hydraulics in America and Europe.

We met him at Bremen and now our trail began. We went across Belgium, through Cologne, where we spent one day; then to Bremen, and up to Bremenhaven.

In Cologne we had a very pleasant time seeing Cologne Cathedral and quaint architecture of Germany. We found a great deal to be admired in the way of simple architecture, and many things to wonder at, and concluded our own architecture of the eighties must have come from there. One day in the Cathedral at Cologne my daughter and I were walking arm and arm and the beadle came up to us and said, "You must not do anything like that in the Cathedral." So we obeyed the rules.

Then to Wilhelmshaven, the old naval base of the German Empire. They have a laboratory there to study harbor problems. Dr. Kruger, who presides there with two assistants, met us at the station,—one of the assistants in the uniform of the German army. That evening we were invited by Dr. Kruger to a cafe out where we could overlook the North Sea. There was a full moon, and we wore heavy wraps, although it was July. Next day we saw a very interesting laboratory devoted entirely to harbor problems.

Then we went to Hamburg, a most interesting place. It has a ship model laboratory, and one in which they make tests of propellers. Those of you who have been in Washington at the laboratory there for testing ship models will remember that models are made entirely of pine. In every European laboratory I visited in which ship models were tested, the models were made of paraffin. Of course, it is easier to work. The reason they use paraffin and we pine, is that if we used paraffin in Washington the temperature is so great at certain periods that the shape would be changed in hot summer months; in Europe they do not have the high temperatures to contend with. We next went to Hamburg; then from Hamburg to Gottingen, an old college town. A name known to every man interested in aviation is that of Prandtl. Prandtl is a great name in aviation as well as hydraulics. He has in

his laboratory some very interesting experiments arranged to show surface velocities and other interesting phenomena.

We were interested in seeing what the college boys were like. Many had faces gashed from duels with swords, but otherwise looked like our American college students.

From there we went to Hanover, and at Hanover we saw the laboratory of Dr. Franzius and Dr. Ostlerein of the technical university. They had a soil laboratory, a general mechanical laboratory and a hydraulic laboratory devoted to research. The soil test laboratory was being removed to new quarters and therefore was not at its best for inspection. However, we saw much of interest in the general laboratory, much the same as those in the best American schools and colleges. The hydraulic laboratory was particularly interesting. Our party was entertained at dinner most delightfully at the home of Dr. Franzius.

We went from there to Berlin. At Berlin we were conducted at once to the house of the Verein Deutscher Ingenieur (Germany's Society of Engineers) and met Dr. Seiferth, and Dr. DeThierry; the latter born in Genoa of English parents, and a very ardent German. The secretary of the association is Dr. Matchoss, and we were taken to lunch in the Society House, where addresses of welcome were made and we were given a warm welcome, indeed.

So much for traveling with Mr. Freeman. In our party were not only Mr. Freeman, my daughter and myself, but also Dr. Knapp of Southern California, a Freeman Scholar who joined us and traveled with us through Germany.

At Berlin we saw laboratories of soil physics and two very interesting steam accumulator plants, one with a capacity of 67,000 kilowatts, said to be the largest in the world, with a number of large drums, well insulated, to take the load of steam plant and store up until needed. Also we saw a Benson boiler operated under 3,200 pounds per square inch pressure. We inspected the German Westinghouse plant and had occasion to ask the man what first class mechanics were paid in that locality. He gave me the figure in marks, which reduced to American money was about 29¢ an hour.

We also went to Potsdam and to an outdoor laboratory near Potsdam, where there is a model of river hydraulics. They are studying a canal connecting the Danube and Don.

We next went to Dresden, which is the capital of Saxony, and Dresden is the place where Engles, the grand old man in hydraulics in Germany, started researches in river hydraulics about thirty years ago. Here we met Mollier, of Entropy fame. He was asked how he got that name, but he didn't know. For three or four generations the family had been German. Here we saw a laboratory, costing $20,000, for turbine testing only and especially for cavitation problems. They use glass flumes and a device for photographing the velocity of particles flowing in water in a most ingenious way.

Our journey next took us to Prague, in old Bohemia, which is now the capitol of Czechoslovakia. Here we saw the hydraulic laboratory of Dr. Smetana. It is located near a canal lock with plenty of water and completed only a year or two ago. It impressed me as one of the best we had seen.

It is a most interesting city, very much like Paris in some ways, but run down at the heel. Remember, Prague was the under dog, ground down by Austria for two hundred years. St. Vitus Cathedral we found interesting.

We went on then to Vienna, where we saw three laboratories. One was for ship models, one a general laboratory, and one belonging to the technical high school. The methods of taking photographs of contours was of particular importance, and this is mentioned in "Hydraulic Practices" by Freeman.

From Vienna we went to Gratz, and all this country from Vienna to Gratz, down through the mountains, was a very beautiful country. Here we met Dr. Schoklitsch and a Freeman Scholar named Schulitz. We spent Sunday on a plateau about 450 feet above the city, enjoying the wonderful view. Dr. Schoklitsch has written a book on hydraulic structures that will soon be translated into English.

Next, to Munich. Now you have all heard of Munich beer, and believe me, it is all right. (Laughter). Here we met Mrs. Freeman and Miss Freeman, and had a little larger party from that time on.

From Munich next day we drove to Oberammergau. We had heard about the Passion Play and made up our minds before going abroad that the Passion Play was one thing we could pass by very nicely. But affairs so shaped themselves it seemed best to go to the Passion Play, and we drove seventy miles through a beautiful mountain country, and on the way saw the largest open air hydraulic laboratory to be found in Europe, and one of the best in which Dr. Engles of Dresden was interested, and in which Dr. Kirschmer has done beautiful work. If you ever get the opportunity to go to the Passion play, don't miss it; it was well worthwhile, and we were deeply affected, much more than we thought possible.

Completing our stay in Oberammergau, we went back to Munich and there met Dr. Kirschmer, who was carrying on these experiments. In these large flumes, about 2½ metres wide and 2 metres deep, he was trying out salt velocity and comparing various methods of measuring velocity. At Munich we also visited the laboratory of Dr. Thoma, and he showed me with great glee a float in which he could get the height to one thousandth of a millimetre. He used this float to get the volume in a certain area; one-thousandths of a milletre seems undue accuracy. He also had a model of a centrifugal pump with glass bottom, and one could see the stream lines because of coloring matter injected through small tubes, and although it was revolving at high speed, he had prisms so arranged you could see the stream lines as though the impeller were standing still.

At Munich we saw the museum of mechanics by Dr. Osker von Miller, undoubtedly the greatest of its kind in the world, and bound to have a great influence on the future of Germany,—particularly its engineering. It has about ten acres of area, and many miles of aisles through the building. They have everything from telescopes, down to a model coal mine. Any boy can go in, press a button and start a piece of hydraulic apparatus going and watch what is happening in experiments, some of which are rarely done in American universities.

Then from Munich to Karlsruhe. There we have the laboratory of Dr. Theodore Rehbock. He is one of the great men

of Germany in river hydraulics. He was trying an experiment on scale of 150 to 200. He took lignite, sifted it so the particles were practically the same size, and specific gravity of 1.3. He built up the river bed with that. He had accurate readings of the river Rhine for ten years, and was trying, in the model, to simulate these changes. Then from his law of similitudes he figured the water that would be used and the proper time to apply it. After an experiment he would examine the bed and see if it was in the condition the next ten-year survey showed it was in. He said it was very satisfactory with scale ratio from 200 to 1, and also 150 to 1, but thought it might be more satisfactory with scale ratio 175 to 1, and the next experiment would be with that ratio. In small scale river experiments you cannot use sand. In lignite he has found very good material.

Our next stop was at Zurich, and here we celebrated the 75th birthday of the great engineer, Mr. Freeman. At Zurich we saw a new laboratory hardly completed, that of Dr. Meyer Peter. It cost $235,000, and it was the best we had seen anywhere. All windows of the laboratory can be darkened for photographic purposes, and the floor is built with angle iron to bolt and set up any piece of machinery for a test. When the work is finished, the plan is to clear it out and put something else there. There is some apparatus permanently fixed, but the whole idea is adjustability, and changes can be made with ease. He has a tilting glass flume in his laboratory.

From Zurich we drove out 26 miles to a hydro-electric plant. There were four units, each requiring 30 cubic metres per second. Now a cubic metre per second is about 35.3 cubic feet per second, so each unit required over 1,000 cubic feet per second, and developed 35,000 horsepower.

Leaving Zurich we went back to Paris, through Dijon, the city where D'Archy and Bazin did their experiments. We were glad to be back in Paris, to the Louvre with its beautiful art collections, with the splendid architecture of Paris, including Notre Dame and the Sainte Chapelle. You remember Sainte Chapelle was built by Louis X to house a very sacred relic, the crown of thorns he had found in the east, and this was to be kept in the Sainte Chapelle. However, it is still in

Notre Dame. We also visited Chartres, which has the most beautiful cathedral in Europe. The stained glass windows are wonderful.

We also visited foundries, marble works, etc. In one marble works, perhaps 20 men were employed, and we asked the proprietor what he had to pay his workmen. These men would take a plaster cast of statuary and do it in marble, and the best received twelve francs an hour, 48¢ in our money, and for doing ordinary work, 36¢ an hour. Compare that with wages in our country.

In Paris we also visited the laboratories of Sarbonne and saw the government laboratory for aviation and general laboratories at the Ecole Centrale.

We then decided to take a trip down to the caves in Southern France which were occupied by the Cro Mangon race 20,000 years ago. There are drawings and sculptures there that they left. We spent a very pleasant day at Les Eyzies, then on down to Toulouse, and saw a very interesting laboratory there devoted to hydraulics, then on to Carcasonne, which is the most beautiful mediaeval city left in France; then to Nimes, the Pont du Garde, built about 70 A. D.—one of the most elaborate aqueducts the Romans built. In France, if a man runs a drug store, he hangs out a sign from 12 to 1 and partakes of the midday meal. They run their government buildings the same way; everything is closed during lunch hour. That is the reason why we failed to see the inside of the Chapel of the Palace of the Popes at Arignon. Then to Cannes, down on the French Riviera. Then to Nice, Monte Carlo, and Menton on the coast of Italy, by train from there to Milan. The cathedral at Milan is one of the finest in Europe. At Milan we engaged the services of an English speaking chauffeur and an auto for the remainder of our trip to Italy. We first drove to Bellagio and Lake Como. We then drove back to Milan and to Geneva, and along the Italian Riviera, through Pisa, over to Florence, to Volterra, to Sienna, Orvieto and then to Rome.

At Rome we spent two or three days, continuing to Naples. This was about six weeks after the earthquake had occurred. Mr. Freeman is interested in earthquakes.

We went on to Adriano, which was the center of things, and from that place we left for Monteculvo and to Villanova, each of which had about 5000 inhabitants before the earthquake. One had a loss of 80, the other 180, lives due to the recent disaster. We talked with one man there who had a small boy with him. He said that the lad was all left of a family of ten children. The houses are very small, the first story being usually built with vaulted dome. They leave great masses of stone masonry in the corner. It looked as though they had used any kind of mud to stick together stones, not well bonded, but simply thrown together. We found to our surprise in these buildings, shaken down, there were often five or six inch "I" beams, showing that they could not be more than 50 or 60 years old. Round poles are often used for beams, the reason being that wood is very precious and expensive. We had a very interesting day in the earthquake country.

Along the coast of the Mediterranean, from Genoa to Carrara, to Pisa, the scenery is most beautiful, even more wonderful than the French Riviera.

At Rome, of course, we went to St. Peter's, to St. Paul's without the walls, and saw those things usually seen by travelers. Of course you know there is a north and south problem in Italy. Those of the north would not wipe their feet on the people of Southern Italy. Our chauffeur was from Milan and had no use for anybody beyond Rome.

From Rome we went through Perugia, to Venice. From Venice we came back through Padua and Brescia to Milan. On our way up we stopped at Assisi, visiting the two churches of St. Francis of Assisi. From Naples back to Rome we came through a little town of Mortecassino, where the oldest continuous library in the world is located, containing the manuscript by Frontenas on the water supply of Rome. Our ride in Italy started at Milan, and totaled 2,300 miles. It required about twenty days. We went through the valley of the Po; we crossed that water shed many times. Going back to Paris from Milan, we passed Lake Geneva and the historic castle of Chillon.

We sailed from Havre for New York, and I took occasion to run up to Ithaca to see the (hydraulic) laboratory of Cornell University. To my mind, the scenery in Western New York is hard to beat. Comparing the scenery with Northern Italy, it must be said that Bellagio is the most beautiful spot I have seen, but if you wish to see beautiful scenery in this country, let me recommend the Finger Lakes of New York.

In all, we visited about thirty laboratories, special research, general, mechanical, power plants and hydraulic laboratories. The method of attacking all problems there is different from ours. When we arrived at Karlshruhe, we were told by Dr. Rehbock, that if you are making experiments on a river, vertical and horizontal scales of models must be the same; he was very positive. Many other experiments have been made in Germany in which distorted scales have been used and they seemed to have gotten results. You see from this that the experts do not agree on all details as yet. They are great on precision experiments over there. The instruments they use are most beautifully made and most carefully adjusted. They are great, too, on using the skimmer weir. If a man is making an experiment, of any kind, he has a water supply which comes from a skimmer weir; by this device the head cannot vary appreciably. They are almost universal in European laboratories. They are attacking special problems of hydraulic turbines,—they are studying cavitation in many laboratories.

Mention has been made of the splendid laboratory in Zurich, whose keynote is adjustability. Some good hydraulic work has been done in America; an example was the weir investigation of Schoder and Turner at Cornell. They made experiments which have been checked by Rehbock in Karlshruhe to ¼%. But there are others in this country that differ by 3½ to 5% and we do not know why. We noticed in some European laboratories apparatus for the Gibson method of velocity measurement. They are trying out Prof. Allen's Salt Velocity Method. They have no prejudice against using ideas that originate in America. Screw pumps are quite in evidence. They are coming to use them more and more. In this city we have the Wood screw pumps for drainage. Engineers

are familiar with the type. Over there they are an innovation. Photography is a valuable factor in European laboratories. They are never in a hurry about their work; they simply will not be hurried. There were two schools I saw over there that interested me, particularly one at Milan, the School of Mechanical, Electrical and Civil Engineering. This school had been built and endowed by the citizens of Milan because they saw they had in that territory very important engineering problems to work out and wanted technical graduates to do the work.

Another one was in the school at Zurich. Mr. Freeman told me when there he saw Mayer Peter and asked how he justified spending $235,000 on a hydraulic laboratory only. Here is an old institution; Switzerland has only two small rivers, and these well regulated. He answered, "You forget that the bridge being built over the Hudson River is being erected by one of our graduates, and one of the largest of the recent dams in California by another. We plan to turn out engineers who can solve the difficult problems of the world." And that, it seemed to me, was a mighty good answer.

MINUTES OF THE MEETINGS AND BUSINESS OF THE SOCIETY

Minutes of Meeting of the Board of Direction, February 9th, 1931.

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

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

Communication from the Interstate Bank & Trust Co. was read and the Treasurer was advised as to proper action to be taken.

The following members were elected to life membership in the Society in view of their having complied with the requirements for that grade of membership: Messrs. George G. Earl, A. M. Lockett, Jules Godchaux and V. L. Willoz.

Communication from Mr. A. P. Lipman was read and the Secretary was instructed in regard to action to be taken in the matter.

There being no further business, the meeting adjourned.

F. A. MUTH, Secretary.

Minutes of the Society, February 9th, 1931.

The meeting was called to order about 8:10 p. m., President Frost in the chair, F. A. Muth, Secretary, and 62 members and guests present.

The minutes of the previous meeting were read and approved.

Report of the Employment Committee was read and chairmen of other committees present were called upon for their reports.

The Society then listened to a most enlightening address on "The Work of the U. S. Coast and Geodetic Survey," by Lieut.-Commander Ray L. Schoppe. This address was illustrated with numerous lantern slides and was followed by an interesting discussion. A rising vote of thanks was then tendered the speaker.

The meeting then adjourned to the usual collation.

F. A. MUTH, Secretary.

Minutes of the Board of Direction, March 9th, 1931.

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

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

A report was submitted upon the advisability of having the Society pursue as one of its activities the matter of securing adequate stable bench marks in this locality which can be used by the S. S. Coast and Geodetic Survey to tie into the primary network. On motion, duly seconded, the President appointed the following committee: Mr. John

Klorer, Chairman; Messrs. J. L. Porter, John Reiss and Bryson Vallas. The Secretary was instructed to write to the committee in regard to the matter.

There being no further business the meeting adjourned.

F. A. MUTH, Secretary.

Minutes of the Regular Meeting of the Society, March 9th, 1931.

The meeting was called to order about 8:10 p. m., Mr. Frank G. Frost, President, in the chair, F. A. Muth, Secretary, and 74 members and guests present.

The minutes of the previous meeting were read and approved.

The President announced that Mr. James M. Robert, Chairman of the Motivation Committee, would introduce the student members who had been taken into the Society within the last year or so, and he made an appropriate introduction in presenting the students to the members of the Society.

Professor Douglas Anderson presented certificates of life membership to Mr. A. M. Lockett and Mr. George Earl.

The technical exercises of the evening consisted of "Some Notable European Laboratories", by W. B. Gregory, Professor of Experimental Engineering, Tulane University. This address was illustrated with maps showing the interesting trip of Professor Gregory and was followed by considerable discussion. A rising vote of thanks was given the speaker as the meeting adjourned to the usual collation.

F. A. MUTH, Secretary.

Minutes of the Board of Direction, April 13th, 1931.

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

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

The resignation of Colonel A. M. Shaw was accepted with regret.

The following were transferred to non-resident grade of members: S. Jessen, R. G. Malone, B. E. M. Skerrett.

Communication from Mr. James M. Todd relative to financial assistance for Mechanical Engineering students from Tulane and L. S. U. who attend the spring meeting of the A. S. M. E. in Birmingham was read. On motion, duly seconded, it was voted to appropriate $20.00 to L. S. U. and to Tulane University for the purpose mentioned above and the Secretary was instructed to write the necessary letters to the Deans of the universities concerned.

Invitation from the Orleans Levee Board to participate in a boat ride to view the seawall and other lakeshore improvements was accepted and the Secretary was instructed to thank the levee board in accepting

the invitation. The Entertainment Committee was authorized to prepare the details for the trip.

On motion, duly seconded, it was voted to appoint a committee to arrange a Golf Tournament for the members of the Society, which tournament is to be without expense to the Society. The following committee was appointed: Messrs. James M. Todd, Chairman; F. N. Billingsley, H. L. McLean and D. W. Stewart.

The matter of amending the constitution to provide for a nominating committee for officers and to consider student membership provisions was discussed. On motion, duly seconded, it was voted that the President appoint a committee to prepare necessary amendments to the constitution, to be presented for action of the Society. The following committee was appointed: Messrs. James M. Todd, Chairman; F. N. Billingsley, F. A. Muth.

There being no further business, the meeting adjourned.

F. A. MUTH, Secretary.

Minutes of the Society, April 13th, 1931.

The meeting was called to order about 8:10 p. m., President Frost in the chair, F. A. Muth, Secretary, and 69 members and guests present.

The minutes of the previous meeting were read and approved.

Acceptance of the Board of the invitation of the Orleans Levee Board for a boat ride to view the sea wall and other lake front improvements was made. On motion, duly seconded, it was voted to hold the boat ride at a convenient time to the Levee Board, about the 9th to the 15th of May.

Announcement was also made of the appointment by the President of a committee to arrange for a Golf Tournament. On motion, duly seconded, it was voted that the committee be authorized to proceed with necessary arrangements.

Announcement was made of the spring meeting of the American Society of Mechanical Engineers, to be held in Birmingham beginning April 20th. On motion, duly seconded, it was voted that inasmuch as Mr. Frank G. Frost, President of the Louisiana Engineering Society, would attend that Convention, he be designated official representative from the Louisiana Engineering Society to that Convention and that the Secretary conduct the necessary correspondence in regard to the matter.

The technical exercises of the evening consisted of a paper on "A New Story of Ancient Wrought Iron," by Mr. R. Carson Hamlett. This paper was followed by motion pictures and considerable interesting discussion. A rising vote of thanks was then tendered the speaker and 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.

JAMES M. ROBERT, 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 ISSU
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
JAMES M. ROBERT, 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.

LOUISIANA ENGINEERING SOCIETY

OFFICERS FOR 1931

President, FRANK G. FROST, 317 Baronne Street.
Vice-President, FRED. N. BILLINGSLEY, 702 Interstate Bank Bldg.
Secretary, FRANK A. MUTH, 7705 Willow Street.
Treasurer, WALTER B. MOSES, 425 S. Peters Street.

DIRECTORS

J. H. O'NEILL, 637 Lowerline Street.
A. L. DUNLAP, 5524 Prytania Street.
E. S. BRES, 311 Maritime Building.
JAMES M. TODD, 818 Maritime Building.

STANDING COMMITTEES

On Technical Papers
C. C. Wiggins, Jr., Chairman
J. M. Robert
George P. Rice
R. J. Kuhn

Motivating Committee
James M. Robert, Chairman
W. B. Gregory
George R. Hammett
Charles M. Kerr
James M. Todd

On Library
Ralph Earl, Chairman
C. W. Ricker
A. J. Harris
P. F. Hoots

On Publications—Division "A"
James M. Robert, Chairman
Frank A. Muth

On Publications—Division "B"
John T. Eastwood, Chairman
D. W. Stewart, Vice Chairman
F. N. Billingsley

On Entertainments and Outings
Ole K. Olsen
Walter B. Moses

On Finance
F. N. Billingsley, Chairman
Walter B. Moses
James M. Todd

On Membership—Division "A"
D. W. Stewart, Chairman
A. L. Dunlap
E. S. Bres
H. B. Henderlite
J. L. Henning
O. O. Melancon
W. I. Neel
Ira W. Sylvester
Bryson Vallas
B. W. Pegues

On Membership—Divison "B"
J. S. Barelli, Chairman
E. S. Lanphier
C. J. Wyler

On Employment
R. H. Baumbach, Chairman
R Bassich

On Civic and Industrial Affairs
A. M. Lockett, Chairman
D. Derickson
J. F. Coleman
James M. Todd
A. T. Dusenbury
John H. O'Neill
J. D. McNiven

The headquarters of the Society are in the State Museum Building, Jackson Square.

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

PROCEEDINGS
OF THE
LOUISIANA ENGINEERING SOCIETY

VOL. XVII. JUNE, 1931 NO. 3

CONTENTS

EDITORIAL NOTES AND COMMENT: PAGE
Imagination and the Engineer 143
Wood, Its Practical Application in Engineering 144
The Spring Meeting of the A. S. M. E.—April 20-23 145
The Outing 145

PAPERS AND DISCUSSIONS:
Wood—Its Practical Application in Engineering.
By W. H. Scales 146
Discussion 165

MINUTES OF MEETINGS AND BUSINESS OF THE SOCIETY 170

EDITORIAL NOTES AND COMMENT

Imagination and the Engineer. A certain professor of English in a well known university not so long ago was discussing with a friend of his one of the engineering students who had made a good record in the professor's English class. Said the professor—"You know, it is a pity that that boy should be studying engineering. He should be an author. *He has too much imagination to make a good engineer*". (The italics are ours).

Can you *imagine* that? Too much imagination to make a good engineer!

Can some one explain to this poor benighted editor how it would be possible for all the wonders of modern civilization to exist in fact if they had not first existed in the *imagination* of their engineer inventors? Engineer Watt had to *imagine* the steam engine before it became a fact. Engineer Fulton had to *imagine* the first steamboat before it ran. And so on through the countless engineering achievements contributing to the com-

fort and convenience of man. How could there now exist in reality the electric light, the radio, the airplane, the submarine, shoe machinery, electric transportation, the Hell Gate Bridge, the Empire Building, etc., unless they had first existed in the *imaginative fancy* of their engineer creators?

Comparisons are always odious, but who would exchange Watt for Bacon, Fulton for De Maupassant, De Forrest for Dickens, or the Wrights for Voltaire? Thomas Edison has some two thousand inventions to his credit. The electric light is just one of them,—the result of his imagination. Suppose some impending cataclysm decreed there should be obliterated from the face of the earth either the electric light or the complete works of Shakespeare—*one* of two thousand products of the engineer's imagination as against *all* the products of the admittedly great writer's imagination. Suppose, too, that civilization should be required to make a choice in the above situation. Can there be any doubt as to the outcome?

The blast furnace, the automobile, the sewing machine, the reaper, the Woolworth Building, Bakelite, automatic heating, vulcanized rubber, electric refrigeration, the Diesel engine, the Quebec bridge, all had their first existence as pure imagination.

"Too much imagination to be an engineer;" as if an active imagination is not the engineer's main "stock in trade."

It is to smile a very sardonic and disputatious smile.

Wood, Its Practical Application in Engineering. The excellent article published under the above title in this issue deserves more than passing notice. It dispels some of the traditions which seem to have obtained a more or less firm footing. It is interesting to note, for instance, that one-fifth of the forest lands of this country are already administered on a permanent basis—i. e., the balancing of timber cut by an equal amount of new growth. Another interesting point; that the lumber from live trees and dead trees is equally serviceable.

Still more interesting, too, is the fact that grading is so well regulated that it is now possible to specify a certain stress desired, and to have delivered a grade which will be guaranteed by the sellers to give the required strength.

The Spring Meeting of the A. S. M. E. April 20-23. The Louisiana Engineering Society was well represented at the Spring Meeting of the American Society of Mechanical Engineers held in Birmingham, Alabama, April 20th to 23rd inclusive. Noted there were Messrs. Frost, Todd, Hammett, Stewart, Wiggin and Robert.

There were two notable features of the meeting besides the many excellent papers which were presented. First in importance was the large number of engineering students sent by a number of Southern universities. Louisiana was well represented by a student delegation from Tulane and another from L. S. U. The faculty of L. S. U. was ably represented by Dean Lassalle and Professors Whipple and Johnson. The keen interest displayed by the students in all that they saw and heard was not less than that displayed by the older members of the profession.

The second notable feature of the meeting was the great number of interesting excursions. Birmingham outdid herself in making it pleasant for her guests. If any guest did not get both profit and pleasure while attending the meeting, it was certainly the fault of said guest and not the fault of Birmingham.

The Outing. On May 14th, the Entertainment Committee, (Walter Moses and Ole Olsen) "did its stuff" in the form of an outing. Through the courtesy of the Levee Board, two boats were furnished to take the members on an inspection trip of the new seawall and improvements on the lake front. The crowd exceeded expectations to such an extent that several trips by each boat were required before all members present could be accommodated. Lunch and cold drinks were served. The outing was enjoyed by all and remarks were heard that such occasions should be more frequent than they are.

The Entertainment Committee is always glad to organize excursions. Let them have your ideas.

PAPERS AND DISCUSSIONS

WOOD—ITS PRACTICAL APPLICATION IN ENGINEERING

(An Explanation of Some Erroneous Ideas and Improper Uses.)

By W. H. SCALES,

Read before the meeting of the Society Monday, May 11th, 1931.

Most of the papers read before this Society are on one specific subject and have continuity. Because of the tremendous field covered by the usage of lumber, a paper of almost any length could be prepared on one of probably several hundred subjects. My talk tonight, however, will be more or less disconnected and possibly disjointed because I intend to briefly touch on many subjects based on the general theme of "Wood". In other words, my paper will somewhat resemble the old-fashioned mother-hubbard dress,—"covers everything and touches only the high spots".

The National Lumber Manufacturers Association. Like all trade associations, the National Lumber Manufacturers Association has many interests and activities. It is interested in anything which has to do with forests, forest products, and their utilization. This includes forestry, statistics, research, trade-promotion, legislation, production and manufacture, distribution, and use. The Trade-Extension division of the Association, of which I am a representative, may be called the technical and research bureau of the Lumber Industry. The research program is extensive and includes many items, the results of which will be of greatest value to engineers. Primary research is being carried on in the Association's own laboratory and in conjunction with such organizations as the U. S. Forest Products Laboratory, U. S. Bureau of Standards, Underwriter's Laboratory, and the Universities of Illinois, Ohio State, Minnesota, California, etc.

Lumber—Its Uses and Abuses. As engineers, you are probably most interested in wood and its utilization from a struc-

tural standpoint, and therefore my remarks will be confined largely to that phase.

Probably the earliest known construction material in which a manufacturing process is involved is lumber. Through the ages, man has used lumber and as knowledge increased the uses to which wood is put have kept pace. In Biblical times we find that King Solomon had 15,000 hewers of wood and 3,000 overseers in the forests of Lebanon. King "Tut" slept on a wooden bed, and Ulysses sailed a wooden boat. The Ark saved the chosen remnant of the race from the Deluge. Lumber has always been the most common material. And because of its very commonness, everyone has assumed the view that he knows all there is to know about lumber. To most people, lumber is "just lumber", and therein lies the cause of much trouble. As a matter of fact, few people really know much of anything about lumber as compared to their technical knowledge of other materials. This has resulted frequently in the improper use of the material which in turn has caused many to say "We can't get as good lumber as we used to." As a matter of fact, better lumber is available today. Formerly only the choicest trees were cut, the choicest logs sawn into lumber and only two grades were available. Today the entire log is utilized as far as possible and we have many grades, ranging from the select grades used for finish purposes to the various "common" grades. In between lie the utility and structural grades. I will have more to say on the subject of grades. Suffice it to say that lumber for any specific purpose can be obtained readily. Low grade material cannot be specified and used and high grade results be expected or obtained. One of the activities of the engineers of this Association is the aiding of engineers in proper specifying. Lumber properly specified and used will give the results desired of it.

The Lumber Industry—A Few Facts. We sometimes hear people say that the lumber industry is a declining one. Facts are usually dry and statistics more so, but I am sure you will be agreeably surprised at a few I shall give.

We still have 135 million acres of virgin forests or about 40% of our original stand. We have more saw timber than any

nation except Canada and Russian Siberia. One-fourth of our land area is better fitted for tree growing than anything else. Most of the denuding of forest lands was for agricultural purposes and not lumbering as most people believe. The U. S. Government has 159,750,520 acres of forest land, 81,000,000 acres of which are commercial timberland all administered on a permanent basis—that is, growth balances use. This is one-fifth of the forest lands of the country. It should be remembered that wood is our only renewable natural resource. Trees are as much a crop as cotton or corn and for proper utilization must be cut when "ripe". The growing time for grain is about 90 days, but for trees it ranges from 30 to 150 years. "Second growth" material is satisfactory if it is controlled during growth. True forest conservation is the using of trees when they are "ripe" and then reforestation; not letting the trees stand unused until they die, fall, and decay.

Do you know that the U. S. Census Bureau shows the lumber industry as fourth in size in number of wage earners; fifth in amount of wages paid, and ninth in value of products? The industry represents 10 billions in capital, $3,600,000,000 in annual products, and 1,000,000 employees. In the states of Washington, Oregon, Mississippi, Idaho, Arkansas, Florida, Louisiana, Alabama, California, Montana, New Mexico, and Texas, it is first in number of wage earners, and in the first five states named is also first in value of products. It is the second most important industry in Arizona, North Carolina, South Carolina, Minnesota, Tennessee, Wisconsin, Oklahoma, and South Dakota. All the gold that has come out of the Americas since the Spanish conquerors looted the Aztecs and Incas is not equal in value to the forest products and their manufactures in a single year.

More than half of our supply of timber in the United States is now found in the Pacific Coast States. In 1872 the rabid conservationists said our timber would be exhausted in 30 years. During that time consumption increased 50 per cent and in 1900 the supply was twice that estimated in 1872. But the calamity howlers again decreed a 30-year respite; and today we find we still have 40 per cent of our original stand. Of course, some areas have been denuded and some species

badly cut out, but that does not mean exhaustion of entire supply.

Some use figures are interesting; between 40 and 45 per cent of the lumber made is used on farms; about 38 per cent of all timber cut goes into fuel, and 33 per cent into structural material. Forest fires account for 5 per cent of our annual "take" from our forests, but insects and disease exact a 6 per cent toll. Over 80 per cent of all buildings built are of frame construction, and we average around 300,000 frame houses annually. One freight carload out of every seven is lumber or forest products, and 1929 loadings would make a freight train about 24,000 miles long. About 8 per cent of the production goes to export; and of domestic distribution, 75 per cent is by rail, 15 per cent by water, and 10 per cent local handling. The freight bill alone on lumber is around one-half billion dollars annually. In turn, the railroads use about one-sixth of the annual timber cut. The United States uses over one billion wooden pencils a year and over five million trees for telegraph and telephone lines. Mining takes 260 million cubic feet of wood. Twenty-five years ago there were about 2,000 known uses for wood; today there are over 4,600 and the number is rapidly increasing.

I mentioned forest fires—the next time you are in the woods or are driving through a forest, remember that 22.3 per cent of all forest fires are caused by smokers' carelessness and camp fires, and 26.5 per cent by incendiarism.

There are 1177 kinds of trees in the forests of the United States; of these 182 are of special interest because of their commercial value. I imagine the average person is familiar with probably a dozen. Of these 1,177 kinds of trees, many have from 5 to 35 names; as Loblolly pine is one of Louisiana's products, you will be interested to know it is called

Cornstalk Pine
Indian Pine
Buckskin Pine
Maiden Pine
Sap Pine
Frankincense Pine
Torch Pine
Foxtail Pine
Prop Pine
Bastard Pine
Shortstraw Pine
Bog Pine
Long-shucks Pine
Oldfield Pine
Bull Pine

With a total of 35 various names.

Wood Technology. Now for a few important and useful facts on wood and its properties.

Sapwood and Heartwood. Sapwood is the outer, light-colored portion of the tree trunk through which water passes from roots to leaves. In most woods sapwood can be readily told from heartwood. For uses exposed to the weather, sapwood should not be used as it is not as decay-resistant as heartwood. For protected, interior uses it is entirely satisfactory. Therefore, for exposed parts of exterior window and door frames, for the members of sash, for mud-sills and similar uses, all-heart should be specified. If a heart specification is difficult of obtaining, for timbers, then treated material should be used, and sapwood is preferable in treated lumber as it absorbs the preservative better. But, because sapwood is not as durable as heartwood, some people have concluded that it is also not as strong. Over 500,000 tests by the Forest Products Laboratory on practically all species show that there is no difference in mechanical properties between sap and heartwood.

Dead and Live Trees. And closely related to this is the subject of lumber from dead and live trees. We often find specifications which say "all lumber must be cut from sound, live trees." If this were enforced to the letter, it would be impossible to fill such an order. All heartwood is dead wood, only the sapwood as "alive". Again the Forest Products Laboratory says, "As a matter of fact, when sound dead trees are sawed into lumber, and the weathered or charred outside is cut away, there is no method known to the Forest Products Laboratory by which the lumber can be distinguished from that cut from live trees, except that the lumber from dead trees may be partly seasoned when sawed. All the information available indicates that timber cut from insect or fire killed trees is just as good for any structural purpose as that cut from live trees of similar quality, provided the wood has not been subsequently injured by decay or further insect attack."

Cutting When Sap Is Down. Speaking of sap, the fallacy about the durability of lumber cut in various seasons is about like the old idea of taking no water with your meals. Time of cutting has no effect on durability if the timber is properly

cared for. But the results of methods used in handling logs in different seasons does have a bearing. Posts, poles and other rough products cut in late spring and early summer are more subject to insect and fungus attack and seasoning proceeds more rapidly with consequently a greater amount of checking. All these can be reduced or avoided by proper logging methods. These is practically no difference in the moisture content of green wood in winter and summer.

Moisture Content. Probably the single most important factor in lumber and its use is moisture content. The amount of moisture in a given piece is the controlling factor as to whether it will perform satisfactorily or not. Moisture content affects durability, size, shrinkage and expansion, strength, nail holding power, appearance, and painting qualities. Let us briefly consider this all-powerful factor.

In the first place, excessive moisture should be considered as much a defect as knots, splits, or shakes. While this has been known to a more or less degree for centuries, little attention was paid except for special purpose stock such as furniture and the mechanical arts. Until 1867, moisture control or "seasoning" was by means of air-drying, or piling outdoors. In that year, kiln-drying was introduced, but it was not until 1890 that it was a commercial success. Today both air and kiln-drying are used. Each has its proponents and for some purposes it is not denied that each has its advantage or superiorities. From the viewpoint of the structural engineer there is no advantage of one method over the other, except possibly speed in preparing a special cut order.

For re-manufacture purposes, it has been customary to specify that lumber shall be dried for a certain period, if air-dried, or to a certain per cent of moisture content. This has not been the case, however, in lumber used in construction. Practically all of the structural lumber used in Louisiana in which strength or stiffness is a factor is Southern yellow pine. The grade-rules of the Southern Pine Association now provide for a maximum moisture content for each size and grade.

Just how does moisture content affect the properties of wood?

Size—Shrinkage and Expansion. While the moisture-content of wood is above the saturation point of the cell walls, addition or subtraction of moisture does not affect the size and there is no shrinkage or expansion. This "saturation point" varies for different species, but in general runs around 25 per cent moisture content. When, in seasoning, moisture is drawn from the cell walls, shrinkage takes place. Moisture is given off (or taken on) much more rapidly at the ends of a timber where the ends of the grain are exposed than on the sides. This is why doors usually bind at the top and bottom and not at the lock. To overcome this, see that doors and sash are given one, and preferably two, good sealing coats of paint or varnish on the tops and bottoms just as soon as they are fitted —and see to it that they are so painted. Flooring is kiln-dried to a low moisture content and then protected and stored in dry sheds. If it is placed in a damp building it will likely swell and buckle. On the other hand, if it is allowed to be exposed to rain and weather or lay in a damp room, it will expand and when laid in a dry room will probably shrink and show cracks. The moral is: don't put flooring into a building until the plaster or walls and slabs are dry and protect the material as it should be. If your flooring goes wrong, don't cuss it and the manufacturer; find out what you or your workmen did to mistreat it. And remember that in most species of wood the radial shrinkage is about three-fifths as great as tangential shrinkage, hence shrinkage in quarter-sawed or edge-grain flooring or boards will be about 60 per cent of that in plain-sawn.

End or longitudinal shrinkage for most purposes is so small as to be negligible. If extremely long pieces of flooring or siding are butted together with a fine, tight joint, and there is a considerable range in the moisture conditions of the surrounding air, it is quite possible that the accumulated end shrinkage may amount to enough to open the joint. But under ordinary conditions, excessive end-shrinkage can be traced to compression wood or excessive cross grain in the pieces in question.

The effect of moisture is vividly shown in house framing. Green lumber used in studs, sills, joists, can cause much trouble in cracked plaster and stucco. Use dry lumber only for framing, and then frame so that the shrinkage widths or

thickness of wood is kept to a minimum. So doing will reduce the causes of cracks, but don't for a moment think that green lumber is the sole cause; poor foundations and too small supports cause more cracks in plaster, stucco, and masonry than all other causes combined.

Durability. Green lumber or lumber with high moisture content is not as durable as dry lumber; it is less resistant to insect or fungus attack. You won't have dry-rot in dry lumber which is kept dry and given ventilation. Green lumber invites decay. Good lumber properly prepared and used is enduring. In this country we have numerous buildings from 100 to nearly 300 years old, built of lumber, that are sound and in constant use today. There are still many wood bridges, carrying traffic, that are from 60 to 80 years old and perfectly sound; in most cases traffic conditions and not physical have caused replacements. And in Europe, in the Scandinavian countries, there are frame churches in daily use which are over 800 years old. But sapwood used in exterior places, or green lumber, will not give such service and it should not be expected.

Strength. Green lumber, as it comes from the tree, is from 40 to 60 per cent as strong as properly seasoned lumber. Heavy timbers used in mill construction or bridges are often shipped green from the mill. However, by the time they are in the structure and subjected to loading, they have seasoned sufficiently to give the required strength, and they gain in strength as they season in place. Care should be taken under such conditions to allow for shrinkage, and also it is advisable to delay painting for a time to permit full drying.

Nail Holding Power. Nails or screws driven into green lumber are likely to loosen, because as the wood dries out the fibres shrink away from the nail or screw.

Painting. Everyone knows that paint should not be applied to a wet or damp surface, and the effect is the same when paint is put on green lumber. If you must use green lumber, let it dry out before you paint it.

The question naturally arises, "If moisture content is such an important factor, how can I know when I am getting prop-

erly seasoned material?'' The answer is to specify as the U. S. Government recommends, that all lumber be graded according to the rules of the specie association governing the species involved, and preferably that all such lumber be officially grade-marked. Furthermore, the lumber be purchased on specification and not price, and from reputable dealers or mills. I shall touch on this later.

Paints and Painting—Warp and Checking. A whole evening could be profitably spent on this broad subject and it is not my intention to dwell on it here. I have just mentioned that green lumber should not be painted. There are cases where this is not 100 per cent true. If you have a number of large timbers either in stock or awaiting use and which are not to be put into final position for a few days or longer, I would recommend your painting the ends, and ends only, of such timbers. Sometimes paint is applied an inch or two back from the ends on all sides. But do not paint the rest of the timber—leave it bare. This will retard the rate of seasoning and lessen the amount of checking. If the whole timber is painted the effect as far as checking goes is practically nil. ''Boxed heart'' (pith of tree within the timber) timbers will usually show more checking than ''side cut'' timbers (no pith in timber) of the same section, and end-painting becomes relatively more valuable in boxed-heart timbers. Practically any paint will serve the purpose.

Not many realize that improper painting (from a moisture-proofing standpoint) is a cause of warping of properly seasoned lumber. If a board is painted the same on both sides, ends and edges, and one side is exposed to a greater degree of moisture change, the board will cup or warp. Of if one side is painted with a less moisture-repellent material and both sides are exposed to equal moisture conditions, the board will likely warp. No known commercial coating will completely prevent wood from taking on or giving off moisture, and unequal coatings or unequal conditions cause unequal rates of change in moisture content and hence unequal shrinkage or expansion on the two faces of the piece. It is for this reason that all trim, millwork, etc., should be back painted before erection.

In like manner, high-grade furniture, cabinet work, etc., is given a sealing coat on its back or concealed surfaces in order to equalize the moisture content changes.

As you know, paints, varnishes, and other surface coverings have varying degrees of moisture-proofing. Contrary to most people's ideas, spar varnish is not usually as water repellent as ordinary varnishes, but it stands up under moisture without turning white or cloudy and otherwise deteriorating. Aluminum paint has rapidly come into use because of its unusually high moisture-proofing qualities, its long life, and high visibility. You will be interested to know that at the U. S. Naval Air Station at Pensacola, telephone poles treated with 16 lbs. of creosote were painted 45 days after treatment with two coats of aluminum paint (2 lbs. aluminum powder to 1 gal. of bronze liquid) and after over a year's service show no discoloration or breaking down of the film and are still silvery bright.

Insulation. Another property of wood that is known to everyone, but which is given little or no thought, is its qualities as an insulator of heat. We see examples of it around us all the time—the handles on coffee pots and tools, etc., and because it is so common, we just take it for granted. But not so many know that tests by the Bureau of Standards and several leading universities have shown that some of our commercial I'' lumber approaches closely the insulating values of the commercial thicknesses of a number of the well-known insulating "boards". Roughly, the conductivity of wood varies as its weight; the lighter woods being the better insulators.

Mechanical Properties. When we speak of high strength, we usually think of steel; yet pound for pound, wood is stronger. Thy this on a layman and watch his reactions: Tell him that a wood post is stronger than a masonry column of the same size. Very likely you will receive a scornful laugh. But, the allowable load on good brickwork piers ranges from 150 to 400 lbs. per square inch (depending on mortar and quality of units); on concrete from 450 to 1,000 lbs. per square inch, and on timber from 500 lbs. per square inch on the cedars and soft light woods to 1,450 lbs. per square inch on extra dense

heart Southern yellow pine. We do not think of wood as a pillow, yet in spite of years of research, wood ties are preferred in railroad construction because of their resilience, shock absorbing power, and ability to stand the punishment of heavy traffic. For the same reasons we prefer wood floors to dance on, wooden indoor running tracks, gymnasium floors, and stage floors. The ability to absorb shocks and its resiliency is a valuable factor where vibration or impact stresses are encountered. Resistance to abrasion, or wear resistance, varies with the species of wood, and for the same species varies with the manufacture; edge-grain or quarter-sawn lumber is more resistant to wear than flat sawn.

Treating of Wood. The Society has been most fortunate during the past year in hearing several splendid papers on treatment of wood. These have had to do with preservative treatments, and I shall not dwell on them. We all know that wood burns, and in the minds of some this is almost an unpardonable sin. However, engineers are now coming to accept the fact that fires and fire-hazards are not a matter of materials but of occupancy of structures, good-housekeeping, and the proper methods of construction, and that a relatively few dollars spent on fire-control measures are worth far more than any protection that we formerly thought was inherent in certain materials and not in others. Just a few figures on this: Do you know that 56 per cent more fires per 1,000 buildings occur in masonry walled buildings than do in frame; that 1 per cent of the total number of fires cause 66 per cent of the total dollars loss; that 97 per cent of all fires are confined to the building of origin and that two-thirds of the dollars loss is in contents? Practically all agree that if we could find a "fire-proof" wood that we would have the ideal structural material. I predict that in less than ten years such a material will be readily available. Treating of wood to make it fire-resistant is now a fact and such wood is being used in increasing quantities, especially in and around New York City. There are probably 150 methods of such treatment, but only a few have shown commercial possibilities. The ultimate treatment will make wood fire resistant, decay resistant, and insect resistant, capable of painting, staining or varnishing if desired,

and weather-proof against leaching of the treatment when exposed to outside service.

American Lumber Standards. During the past five years you have heard a great deal about "American Lumber Standards" and "American Standard Lumber", and no doubt a great deal of what you have heard or read has created an erroneous idea of what they are and their purpose. You all know of the "Simplified Practice" or "Elimination of Waste" work of the Department of Commerce which has resulted in the reduction of sizes, shapes, and what not of brick, tile, screws, bolts, etc., etc. "American Lumber Standards" is the name given to that work done in and by the lumber industry, under the auspices of the Department of Commerce. Because these American Lumber Standards were promulgated by the Government, recognized and approved by such organizations as the American Society for Testing Materials, the American Railway Engineering Association, and the American Association of State Highway Officials, many engineers and other specifiers have assumed that they are the actual grade-rules upon which softwood lumber should be purchased and have accordingly specified and insisted upon what they believed were the actual grades of lumber as set forth in American Lumber Standards. As a matter of fact, no lumber is produced and graded according to American Lumber Standard grades as set forth in the Government bulletin "Simplified Practice Recommendation R16-29, Lumber", and it is not intended that any lumber be so produced. It should be remembered that American Lumber Standards cover soft woods, of which there are 46 kinds named in the Standards. Obviously, with the great range in physical and mechanical properties of these woods, in locality or region of growth, in differences of conditions of logging and manufacture, and finally in suitability for various uses, it is neither feasible nor desirable to have only one set of rules by which all manufactured shapes, articles, and products of the 46 different kinds of woods shall be graded and classified. However, it is entirely feasible and desirable to have a common basis for all such grading rules, and that is exactly what American Lumber Standards afford. The introductory paragraph to Part IV, Structural Material of

American Lumber Standards, reads: "The following provisions are for use as a basis for the preparation by lumber manufacturers of grading rules for structural material. It is understood that these basic provisions are not to be used as grading rules, but are merely a standardized working basis to enable manufacturers of the various species to coördinate their grades as far as possible." Using American Lumber Standards as a basis, the nine specie or regional lumber associations have rewritten their grade-rules, and if you specify official association graded lumber—and see to it that you obtain it—your lumber will be, with one or two minor exceptions not of interest to engineers, American Standard Lumber. This "Simplified Practice" work has reduced the number of grades and grade-rules from an indefinite and indeterminate number and quality to a few.

Grades and Grade-rules. Association grades and grade-rules are the only recognized, official, and standard rules applying to any particular species or region. This does not imply that other rules do not exist, but such other rules are not recognized standards of the industry. Practically all of the departments of the Government, most of the state governments and departments, and railroads, oil companies, etc., are specifying and purchasing lumber by direct and strict reference to association official grades. For the structural and civil engineer, there is practically no occasion to go outside of such grades and rules. Standard grades and rules provide for re-inspection and a definite method of handling cases of complaints or question as to quality. Specifiers of lumber for special purposes, as the manufacture of furniture, wood parts to machines, etc., sometimes purchase on special specifications. Such special cuttings are not considered as standard, are the subject of special contract and order, and are not subject to re-inspection service except as may be provided for in the special contract. Even in the case of highly special use or needs, it is recommended that the engineer or other specifier consult with the engineers of the National Lumber Manufacturers Association or of the specie or regional association covering the wood in question, as it has been found that frequently by means of a slight adaptation of the standard grades or a slight

variation in the consumer's manufacturing or use process he can avoid special contracts and cuttings, thus materially lowering costs without detriment to quality, at the same time probably opening a larger field of competition and making for more continuous and speedy deliveries. Formerly because of the multitude and conflicting grading rules, it was common for engineers and specifiers to write their own lumber grade specifications. Today there is no more need for this than there is for the engineer to write the manufacturer's specifications for structural steel or cement or brick.

Grade-Marking. Just as much care should be taken to obtain accuracy and conformity to standard practice and trade conditions in specifying of lumber as is done in the case of any other material. And equal care should be exercised to see that specified materials are furnished. Unfortunately, in the case of lumber these vital fundamentals are not carried out as they should be. In spite of standardized rules and manufacturing processes, we know that lumber, the same as many other materials, is made by some to their own ideas and standards, or else the product is of sub-standard quality, or there is outright substitution. The few who practice these unmoral methods of doing business cast a reflection on the high standards maintained by the vast majority of producers.

You would not consider accepting cement in plain sacks from an unknown producer; you require in any work of consequence that steel be tested or accompanied by mill certificate; when you buy shoes you want to know something of their manufacturing pedigree; you ask for Campbell's soups and Arrow shirts or other equally representative brands. If you are a wise buyer, you require some sort of identification of everything you purchase—except lumber. Why should you take "just any lumber"? As specifiers you owe it to your clients or your employers to protect them—and yourself—from improper grades and kinds of lumber as much as you do for any other material. Why then, don't you protect them and yourself? You say you do by inspection? Let us be honest between ourselves. How many among you or among your inspectors *really* know lumber grades? It is only when a shipment is palpably "off grade" or the inspector thinks it is time for

him to do something that a rejection is made. Too frequently our job inspectors are inexperienced men—how many times have you seen an inexperienced engineering graduate doing the inspection work? He should be on the job learning about materials by actual contact with them, not by fighting with dealers and manufacturers and learning by "sad experience". If then, in spite of standardization there continues to be off-grades, sub-standards, substitution, or just plain human errors, how can you protect yourself and clients or company and be sure of getting what you specify?

Closely allied to American Lumber Standards is the answer—official grade-marking. All species of structural lumber and in all standard grades can now be had officially "grade-mark". There are individual grade-marks based on individual grades, not conforming to or recognized as American Lumber Standards. Official grade-marks are those registered, protected, and policed marks of the official, specie or regional lumber associations which have produced and have charge of the recognized standard grade-rules. Only such rules and marks are recognized as "official" by the Government. You should also rceognize only such grades and marks. They are policed by the traveling inspectors of the associations, and the mills under such control must, by agreement, hold their grading up to a standard above 95% accuracy. Only licensed mills may use the official stamp or brand.

By this, I do not mean, nor intend to convey the idea, that many non-association, non-marking mills do not produce excellent quality, on-grade lumber, graded according to standard rules. Many mills do, but I do say that the only way you and your clients can *know* that they are getting on-grade lumber of the grade specified, without inspecting every piece, is to require that it be identified by official means of a mark, or in case of unbroken carlot shipments by an official association certificate from the mill and approved by the association in charge. Such certified lumber can be bought with the same safety as to quality and freedom of worry as buying a Stetson or Knox or Disney hat.

And requiring that your lumber be identified by grade-mark or car-card certificate in no wise eliminates or reduces competi-

tion. Hundreds of competing mills can and will and do supply such lumber. And those mills which do not can do so upon meeting the requirements for manufacture, inspection, etc.

Thus it will be seen that specifying and obtaining of American Standard Lumber of any desired species or grade or quality and for any given use is a simple matter and you and your clients or employers can be just as fully protected in their lumber purchases as they are in any other material.

As was previously stated, the engineers of the National and regional lumber associations will gladly coöoperate with you in studying your needs and aid you in preparing your specifications.

Species Marking. An adjunct to grade-marking is species-marking. You will find all oak and maple flooring marked to show its species. A great deal of cypress lumber is so marked. In the pines and firs, such marking is not common.

In Louisiana and the South generally, the commonly used structural species is Southern Yellow Pine. This generic name includes long-leaf and short-leaf and other branches of the species. I do not intend at this time to go into the question of the qualities of short and long-leaf pine and of dense and non-dense lumber; but there are times, for one reason or another, when a specifier wants long-leaf exclusively. In such a case, in addition to requiring the official grade-mark or official car-card certificate, the specifications should require that the mark or certificate include the words "long-leaf" or the initials on the mark of L. L. Y. P. The reason for this is apparent when it is realized that, in spite of the claims of many people that they can tell by ordinary visual inspection the difference between long and short-leaf lumber, it is often quite difficult to identify the species when the pith is present in the piece, and practically impossible to positively identify when the pith is absent. Color, weight, density are not positive criterions, as some short-leaf lumber may possess all the visible characteristics that some people claim are exclusive to long-leaf. The only reliable test in such case is the cell examination under the microscope. Therefore, when you want long-leaf lumber exclusively, say so and require that the lumber be so identified.

Stresses. You all remember the childhood verse, "First's the worst, second's the same, and last's the best of all the game." So it is with this paper, and I have left the best to the last.

We probably all realize that if trees grew without knots and lumber had no splits or shakes or other defects, and all lumber were "clear", there would be but little need of grades and all lumber of a species could probably be used at a single given stress value. But knots and other defects do affect the strength of a timber and obviously to assign a single stress value would be to work an undue hardship and be an economic waste. Lumber is the only structural material which can be and is given a strength rating on visual inspection. You cannot look at a piece of steel and positively say it should be used at a 16,000 or 18,000 lb. stress; it might be an alloy steel and good for 50,000, or it might be a poor grade and good for less than 16,000. Again, you can tell nothing of the strength of a concrete girder or column by looking at it; you don't know if it has the designed amount of steel or if the steel is properly placed, or if the mix and water-cement ratio were correct. But as a result of grades based on American Lumber Standards and the application to such grades of the findings of considerably over one-half million tests on all commercial species by the U. S. Forest Products Laboratory, it is possible for one familiar with grade-rules and the effect of defects on a piece of lumber to visually inspect it and accurately rate it as to its strength.

When designing in steel, you design for a given working stress and do not worry about "grades". When you design in concrete, you assume a working stress and require the contractors to produce a concrete of that value. But in lumber construction, designers have thought in terms of species, grade, and stress simultaneously. This has led, at times, to confusion and error; design for a certain stress value and specify a grade that is good for a stress either lower or higher, resulting in either weakness or excess costs. This is a situation which has received careful study from the technical men of the lumber industry.

While you all probably use a number of species of woods in your engineering work, I amagine that the species which you use almost exclusively where a structural use is involved and where stresses are computed or provided for, is Southern Yellow Pine. The grade-rules of the Southern Pine Association are based on American Lumber Standards, and each structural grade has a definite stress value in bending, horizontal shear, and compression parallel and perpendicular to the grain, there being three different values assigned to each grade according to the conditions of use, namely "entirely dry", "sometimes wet but mostly dry", and "always wet". Hence a 2,000 lb. stress allowance, in untreated timber, in an "always dry" use, is reduced to 1,300 lbs./sq. in. for the "always wet" condition. But, when creosoted or otherwise equally treated, the necessity for reducing stresses is eliminated, and thus we have in structural square edge and sound grade a 1,600 lb. stress for "always dry" and untreated and the same for any use when treated. Not all engineers realize these significant facts, or if they do, fail to take them into consideration in designing and frequently the designs are unduly costly or result in estimates which are overly high and cause a change in design to other competing types.

If then, these "ifs" and "ands" and "whereases" in timber design could be done away with, it is certain that designers and specifiers would be relieved of much work and worry and undoubtedly the economics of timber design would become more apparent. I am sure you would all welcome such a change.

My "last and best" is just that change. At a recent meeting of the Technical Advisory Committee of the National Lumber Manufacturers Association, the representatives of the Southern Pine Association announced that it was the intention of that Association to refrain as much as possible from the issuing of grade-rules covering structural grades and instead request engineers and architects to design for whatever stress they wish, and order the lumber and timbers by the stress value selected. The Southern Pine Association now has grades based on American Lumber Standards and officially approved by the U. S. Forest Products Laboratory for stresses

of 2,000 lbs., 1,800 lbs., and 1,600 lbs., and expects shortly to receive the same official recognition for values of 2,300 lbs. and 1,400 and 1,200 lbs. These will give the engineer and architect the opportunity of designing on the basis of working stress values of 1,200, 1,400, 1,600, 1,800, 2,000, and 2,300 lbs. per square inch in bending—surely a wide range for all purposes.

This, gentlemen, completes the technical phases of my rambling talk tonight. However, I have two short announcements I would like to make. First, that the National Lumber Manufacturers Association maintains an office at 308 Interstate Bank Building in New Orleans, where will be found specimens of many kinds of woods and a considerable file of data of value to engineers on the subject of wood and its utilization. As members of the Louisiana Engineering Society I cordially invite you to make use of the facilities of this Association. If we cannot give you the data on any problem or question on wood we will tell you where it can be found if it is available. The lumber industry maintains this service for your use.

Second: (And this gives me great pleasure). The War of 1812 is prominent in the history of Louisiana and especially of New Orleans. In 1814 after the Battle of Bladensburg, the British captured Washington and burned the White House, President Madison and his famous wife Dolly making a dramatic exit just ahead of the invaders. About the time that the Battle of New Orleans was taking place reconstruction was begun, and the new roof was held in place by sturdy trusses made of the South's famous yellow pine. In those days truss design was not an exact science and the White House trusses were built to carry the top floor ceiling and the roof only, without any other occupancy.

Early in the present century, there was a demand for more rooms in the Executive Mansion, and the attic was converted. During the next 15 or 20 years further remodeling took place. Unfortunately, this work was not under the careful eye of an engineer and when the workmen found a web-member interfering with a door or partition—well, it was "just too bad" for the member. And when the bottom chords formed a stum-

bling block, it was not considered poor construction to cut away the 10x10's until only 4" of depth was left. That the trusses continued to stand up and carry not only their original design load but that of floors and piled up records and what not and that after such abuse, is both a miracle and a tribute to the qualities of the good timber and good workmanship that went into the trusses.

But no construction of any kind could indefinitely stand up under such treatment, and in 1927 the roof and top floor were reconstructed. It was found cheaper to replace than to rebuild the trusses, and they were removed after 112 years of continuous service, sheltering 26 Presidents of these United States.

Of the trusses removed, one is now on display in Washington, and the National Lumber Manufacturers Association and a number of patriotic societies were fortunate in obtaining a large part of the salvaged historic timbers. Except for an end piece over the north portico, which had been attacked by powder post beetles, the timbers were as sound as the day they were erected.

In my hand I hold a gavel made from this historic old timber which has so faithfully served the Nation. Its days of heavy duty are over, but its usefulness continues. It is with the greatest pleasure, Mr. President, that I present to you and, through you, to the Louisiana Engineering Society, this gavel which has within it the sturdy characteristics of its parent tree and our forefathers who hewed it over a century ago, and may it continue to be an emblem of their virtues and of good rule and order.

DISCUSSIONS

CHAIRMAN: In the name of the Society I thank you. We have all listened to a very interesting talk on timber. To start the discussion, I was very much surprised to hear Mr. Scales tell us that there is as much good timber now as in the past. We have certainly not been taught that. Everyone says it is not like it was in the "old days." From my own experience I remember the old northern soft pine that was easy whittling lumber. The old fellows would sit around the country store and they would while away the time whittling. I have not seen any of it recently. This has been a very interesting topic and we should have a number of questions on it.

PROF. DERICKSON: I would like to ask you, in designing timber structures, is it good design to splice wood tension members with steel plates?

MR. SCALES: They are designed with wood joints and steel plates wherever possible, except in heel joints of trusses. On heel joints and structures carrying very high stress, you get better results with steel plates.

PROF. DERICKSON: About two years ago there was a failure in one of the western states and they ascribed it to the use of steel plates, and pointed out the inequality of shrinkage and expansion and unusual strain brought on special parts.

MR. SCALES: You probably refer to this condition. You cannot run the bolts close together on a wood-steel combination joint like on steel. You must design for the increment of stress between each series of bolts, just as you would in structural steel. You must have the proper area both in sheer and bearing for steel and wood. The sheering values of wood can be increased 50 per cent over ordinary values for wind stresses. Some specifications allow 33 1-3 per cent increase in timber designs; others recommend 50 per cent. The reason for the greater allowance is that timber is more resilient, will take punishment from impact and come back and have a quicker and more complete recovery than any other material.

PROF. ROBERT: I was rather struck by the statement that of all timber cut, only 33 per cent is used in structural uses and 45 per cent is used on farms. What si that large amount of 45 per cent used for?

MR. SCALES: Everything imaginable. For troughs, cribs, repairs to fences, building barns, farm houses, used in repairing machinery—farm machinery partly of wood. Anything at all that wood can be used on. This is between 40 and 45 per cent of the total lumber output; not total cut. Get the point there. I probably didn't make myself clear. Of the "take" from our forests, of the standing timber, 6 per cent is account of insects and disease, 5 per cent fire, 38 per cent fuel, 33 per cent structural, and of the 33 per cent, 40 per cent is for farm purposes.

PROF. ROBERT: Another question. I have been told by a large timber dealer who owns considerable amount of timber land and

sells a great deal of timber to the automobile industry, that a large concern has only one specification for lumber, namely, they will buy any lumber that will hold a screw. I wonder if that is the reason so many bodies rot out?

MR. SCALES: I don't blame you for asking. Yet, don't blame the material altogether. Let's see what you are getting. A great many companies in the last few years, in purchasing, purchased "just lumber," and some possibly do that yet. But they have changed their specifications—I mean the large corporations.They were buying things that should not have been bought. And that is where our job comes in. Educate them. They were not kiln drying it as they should. They were putting in green lumber. It loosened up.

How many of you have the tops of your cars painted about three times a year? One reason they go to pieces is, you get a small leak in the top and don't put on top dressing. It allows moisture to get in and down into the wood. Then out comes the hot sun and cooks it. No ventilation; everything imaginable to foster decay is there. One of your greatest troubles is right over the windshield. Another place is back over the rear window and under it.

Now how does that work out? I bought a car in Florida in 1925, drove it four years and eight months, and turned it in last summer. I got a long price for it, and every fellow who looked at it first took the door and started riding it to see if it was loose. It was perfectly tight. That was an old car of standard make. It was built in the factory; just ordinary materials. And I have seen car after car of the same make go to pieces six months to a year after purchase, and yet that car ran four years eight months perfectly sound. "How in the devil did you keep that car that way?" was the usual question. I took care of it. It regularly got its coat of top dressing. Now I have another make of the combination bodies, white oak and maple. And all of the wood is treated. I don't think there will ever be any trouble from that body. The last of this week that car is going to have the top dressed.

PROF. ROBERT: How is it treated?

MR. SCALES: A special treatment made for it, I think "tri-treat." If you are having trouble with your car body (the body

going bad), it may be you have gotten a poor body; but you will find on 90 per cent of the late cars, it is your own fault.

MR. DE TARNOWSKI: You made a statement that you can get as good lumber or better than before. You can explain, possibly, why the common saying is that insect pests do not attack the old timbers as readily as the dry kiln timbers. I talk particularly of termites.

MR. SCALES: That is a lot of "hooey." Now it is generally recognized that certain species of lumber are more resistant to insect attacks. Cypress is recognized as termite resistent. You will find Mr. Termite will make a dessert of oak and of all the more expensive woods. The more expensive, the better they are. But your termite trouble cannot be said to be greater in kiln-dried or air-dried materials. I know of one piece of construction in this city, in contact with the ground, in place thirty years and had no termites in it. The material was taken down, laid 15 or 20 feet away, allowed to lay there 30 days, and was full of termites. I have seen buildings thirty years old without any, and all of a sudden termites showed up.

Termites are not the result of any one particular thing. They travel, fly and start new nests. We have always had termites. But the trouble comes from upsetting Nature's balance. They were here in fossil times. Termites will not molest you if they have something to eat, but if starving they are going to eat. You build a building and take away Mr. Termite's supply of food from the earth and he comes into your building ,and as long as he has moisture he will live there. The earth is their home. There is no reason why anyone should get excited over them. I happened to be on the Lumber Yards and Producer's Sub-Committee of the California Termite Investigating Committee and I have done a good deal of study on the subject. They have termites out there in greater numbers in a minute than we have in a month. They are handling it. But don't let anyone tell you kiln-dried wood is more subject to termites than others.

If I may, I would like to say you can obtain better lumber than you used to get because we manufacture it more accurately, now, to specifications and grading rules, and you can now buy lumber guaranteed to comply to certain stress values. Now you

cannot get any kind of lumber at any old price. If you buy at price, you will get just what you pay for, just as in shoes and automobiles. A Ford will not give you everything you ask for in a Cadillac. You must pay for good lumber. If you want certain results met with, specify for those results and you will get them. You cannot expect to use any old lumber—just lumber—and get A-1 results from it.

MR. LORIO: You have stressed more on the pine lumber. We are noted here for our cypress. The point that came up in my mind is this: do certain climatic conditions due te localities require different types of lumber, or can lumber be used universally?

MR. SCALES: There probably have been a few instances where in taking lumber away from its native habitat it didn't do so well. But I speak of yellow pine, because you use more of that than anything else. Cypress is not used as a structural material as much as pine. You use it for siding, panels and trim, and where there are adverse conditions of moisture, but you can use it elsewhere with good results. For durability in exterior use you must use the heart grades.

For moisture conditions tidewater red cypress is preferable to yellow or upland cypress as it is more decay resistant.

MINUTES OF THE MEETINGS AND BUSINESS OF THE SOCIETY

Minutes of the Board of Direction, May 11th, 1931

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

The minutes of the previous meeting were read and approved and bills on hand were ordered paid, including obligations of the entertainment committee for refreshments in connection with the boat ride on the lake front scheduled for May 14th.

Announcement was made that upon receipt of communication from the American Engineering Council the President appointed a committee to look into the matter of bridge clearances on rivers, and after careful consideration by the committee it was voted that the Society take no further action in the matter and that the committee be discharged with thanks for their services.

Communication from the Central Council of Social Agencies was read and the Secretary was instructed as to reply to be made.

The matter of the A. S. M. E. Boiler Code was brought up for consideration. On motion duly seconded, it was voted that the President be authorized to appoint a committee to make a study of the boiler code and to submit report with recommendation to the Board.

There being no further business the meeting adjourned.

F. A. MUTH Secretary.

Minutes of the Society, May 11th, 1931

The meeting was called to order about 8:10 P. M., Mr. Frank G. Frost, President, in the chair, F. A. Muth, Secretary and 66 members and guests present.

The minutes of the previous meeting were read and approved.

Announcements were made by Chairmen of various committees. The special committee appointed to make arrangements for a Golf Tournament made a report and the date May 21st was set for the Tournament. All members interested were requested to communicate with the committee.

Announcement was also made of the boat ride to be held, with the members of the Society as guests of the Orleans Levee Board, on May 14th.

Mr. W. H. Scales delivered an address on "Wood—Its Practical Application in Engineering." The paper was followed by some interesting discussion. A rising vote of thanks was then tendered the speaker and 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.

JAMES M. ROBERT, 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
JAMES M. ROBERT, 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.

LOUISIANA ENGINEERING SOCIETY

OFFICERS FOR 1931

President, FRANK G. FROST, 317 Baronne Street.
Vice-President, FRED. N. BILLINGSLEY, 702 Interstate Bank Bldg.
Secretary, FRANK A. MUTH, 7705 Willow Street.
Treasurer, WALTER B. MOSES, 425 S. Peters Street.

DIRECTORS

J. H. O'NEILL, 637 Lowerline Street.
A. L. DUNLAP, 5524 Prytania Street.
E. S. BRES, 311 Maritime Building.
JAMES M. TODD, 818 Maritime Building.

STANDING COMMITTEES

On Technical Papers
C. C. Wiggins, Jr., Chairman
J. M. Robert
George P. Rice
R. J. Kuhn

Motivating Committee
James M. Robert, Chairman
W. B. Gregory
George R. Hammett
Charles M. Kerr
James M. Todd

On Library
Ralph Earl, Chairman
C. W. Ricker
A. J. Harris
P. F. Hoots

On Publications—Division "A"
James M. Robert, Chairman
Frank A. Muth

On Publications—Division "B"
John T. Eastwood, Chairman
D. W. Stewart, Vice Chairman
F. N. Billingsley

On Entertainments and Outings
Ole K. Olsen
Walter B. Moses

On Finance
F. N. Billingsley, Chairman
Walter B. Moses
James M. Todd

On Membership—Division "A"
D. W. Stewart, Chairman
A. L. Dunlap
E. S. Bres
H. B. Henderlite
J. L. Henning
O. O. Melancon
W. I. Neel
Ira W. Sylvester
Bryson Vallas
B. W. Pegues

On Membership—Division "B"
J. S. Barelli, Chairman
E. S. Lanphier
C. J. Wyler

On Employment
R. H. Baumbach, Chairman
R. Bassich

On Civic and Industrial Affairs
A. M. Lockett, Chairman
D. Derickson
J. F. Coleman
James M. Todd
A. T. Dusenbury
John H. O'Neill
J. D. McNiven

The headquarters of the Society are in the State Museum Building, Jackson Square.

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

PROCEEDINGS
OF THE
LOUISIANA ENGINEERING SOCIETY

VOL. XVII. AUGUST, 1931 NO. 4

CONTENTS

EDITORIAL NOTES AND COMMENT: PAGE
Some Phases of Law of Use to the Engineer in Louisiana 171
Our Meeting Place 172
The Engineering Mind 173
Our Engineering Golfers 174

PAPERS AND DISCUSSIONS:
Some Phases of Law of Use to the Engineer in Louisiana.
By Henry Bell Cooley.
Introduction 175
Chapter I—Surveying and Boundaries 177
Chapter II—Drainage 183
Chapter III—Buildings and Builders 187
Chapter IV—Walls in Common 193
Chapter V—Arbitration and Award 205
Chapter VI—Patents and Patent Rights 218
Chapter VII—The Engineers' License Law 224
MINUTES OF MEETINGS AND BUSINESS OF THE SOCIETY 227

EDITORIAL NOTES AND COMMENT

Some Phases of Law of Use to the Engineer in Louisiana. Day by day the Engineer is emerging from the position of oblivion and inconsequence to which the public has thus far relegated him. Day by day the public is beginning to recognize in the engineer a keen analytical ability which can be put into service for the public good. This recognition takes the form of placing upon the shoulders of the engineer greater responsibilities. No longer is it universally true that the engineer is the cloistered worker in some unkempt back room. Quite frequently, now, the engineer must deal not only with facts, but must be an amateur diplomat and lawyer as well.

Published in this issue is an admirable paper with the title shown at the head of this editorial. It seems quite opportune to publish it now, because it is becoming increasingly true that the engineer's technical activities cannot be divorced from a certain amount of legal admixture.

More and more is the engineer being called upon as an arbitrator, and the chapter on arbitration is especially commended for your perusal. Any engineer doing large construction work must at some time run into the harassing question of party walls, and this chapter gives clearly and concisely the high points of the law on this subject. All the other chapters, too, are clearly written and we believe that the publication of the whole paper is a service to our membership.

Note what the author has to say in the last chapter on licensing of engineers. A revision of our State License Law is something we must continually keep in mind. The author's ideas on the license law have the advantage of both the engineering and legal viewpoint, and, therefore, are worthy of very careful consideration. If it is true that "constant dropping of water wears away stones," then it behooves us to "drip" constantly.

Our Meeting Place. Quite frequently at meetings one hears remarks to the effect that our place of monthly meeting should be changed. This whole matter has been discussed both in meetings and in these pages several times before. There have been several reasons advanced, but the outstanding ones have been two in number. First, the room we now have is undesirably and disagreeably noisy, and, secondly, it seems to be such an out-of-the-way place.

As to the first, it is believed there can be no disagreement. All too often during papers or discussions the members have missed some interesting or important point and have been otherwise disturbed by shrieking trains, the yelling of passing urchins or rowdies, noisy automobiles, and sometimes fire engines or police patrols. These disturbances take place with entirely too much regularity to be tolerated.

The question as to whether or not the meeting place is out of the way may be a debatable one. Our meetings are made up of a large number of regular attendants. One will see these same faces meeting after meeting. It would be interesting to know the approximate "center of gravity" of the homes of these regular attendants to determine first if our present location *is* out of the way, and secondly, which other of the locations possibly available would be nearer this "center of gravity." It may even be possible to increase the number of regular attendants if a more centrally located meeting place were found.

We have heard other objections but of less significance, to our present location. One of these is the extreme unattractiveness of the present meeting place and its location. Another is the fact that Little Theatre week occasionally comes during the week of our meeting, and the parking problem, (Yes, engineers now have automobiles), adds to the discomfort of attending the meetings.

The time has probably come when the matter should again be investigated by a committee especially appointed to consider the whole situation and make a recommendation.

Naturally, the survey would have to include not only the meeting place but the library as well; whether or not the library should be kept together with the place of meeting, or whether it would be of more service to members in a separate location. And last, but very important, the increased expense of some new location over our present would have to receive extremely careful consideration.

The Engineering Mind. Glenn Frank, university president, editor and critic, declares that some of our national trouble is not that we have listened to the engineering mind, but that we have not listened to it.

> "The engineering mind has been until now the servant instead of the sovereign of American thought and administration," he writes. "America's next move must be for the emancipation of the real engineering mind—and many men who are not engineers

have it—so that the leadership of America's next quarter century may plan our economic and social order as a good engineer builds a good bridge or dams a river so that it recreates rather than ruins the land through which it flows."

Our Engineer Golfers. The First Annual Golf Tournament of the Society was held at Colonial Country Club on Thursday afternoon, May 21, followed in the evening by a dinner for the members and guests.

Whereas this was the Louisiana Engineering Society's first effort at "golfing" it proved quite interesting to the members, and the success of the event speaks surely that it will be an annual affair of the future.

Thirty-eight golfers, of which 34 were members, and four guests, left the 19th hole to follow the little white ball down the fair-ways, and "around" the greens, to return to the 19th hole for further sustenance, and discussion of the why's and wherefore's of large gross scores.

Mr. L. L. Newman took on all contestants to romp home with the Society Trophy, which he is privileged to keep until next year, when it is to be returned for competition.

The more select group of Presidents and Past-Presidents, bowed to the superior golfing ability of Mr. W. Horace Williams. He likewise has the privilege of keeping the President's Trophy for one year, when it is to be returned for competition.

The 1931 Golf Tournament Committee hopes that the event will be an annual affair, and sincerely feels that the entry list will grow each year.

We understand that a group of engineers has under development a new type of golf ball—one that squeals when it is lost. This should cut down materially on the cost of playing golf.

The tournament and dinner was an occasion of real enjoyment for those who participated. The committee worked hard to make it so, and signal success was their reward.

The committee was composed of Messrs. J. M. Todd, Chairman, F. N. Billingsley, H. L. McLean, and D. W. Stewart.

PAPERS AND DISCUSSIONS

SOME PHASES OF LAW OF USE TO THE ENGINEER IN LOUISIANA

By Henry Bell Cooley.*

INTRODUCTION

It was the intention of the writer when he first conceived the idea of this paper, to write upon Engineering Jurisprudence in general. After considerable work had been done along this line he realized the enormity of the task and decided to touch on various topics of law relating to engineering situations in Louisiana. This plan has been followed except that in Chapter VI there is a discussion of Patents and Patent Rights which necessarily deals with United States Law and not with Louisiana Law. With this exception also, it is the writer's feeling that he has covered the various branches of the law selected as completely as it was possible to do. In the case of patent law, however, the subject was too large to do more than point out in a general way some of the reasons why patents were allowed or were not allowed and to show the effects of letters patent.

It was thought preferable to treat each subject in a broad way covering it as fully as possible. If the paper was confined to a series of engineering situations and a question as to the party's rights or obligations subsequently arose, the very situations which might be most likely to arise in the future might easily be overlooked, whereas, under the form adopted, the principles set forth may be transposed to fit any of a number of situations which may arise.

It must be remembered that while it was attempted to present all of the Louisiana law on each subject, with the excep-

*Note—Submitted to the Graduate Faculty of Tulane University in partial fulfillment of the requirements for the advanced degree of Civil Engineer, and is published here by permission of the University. Mr. Cooley, the author, is both a practicing engineer and a practicing lawyer ,and the paper, therefore, carries both the engineering and the legal viewpoint.—Editor.

tion of Patents and Patent Rights, at the same time there are many other factors entering into a problem which may effect the solution, such as the law of agency, contracts, etc.

The writer wishes to acknowledge the assistance given him in the preparation of this paper by Professor Donald Derickson, Head of the School of Civil Engineering of Tulane University, whose suggestions have been found very valuable.

CHAPTER I.

SURVEYING AND BOUNDARIES

A great number of decisions by the Supreme Court of Louisiana on the subject of surveying and boundaries have laid down certain rules governing the running of new lines, the re-running of old lines, the weight to be attached to various factors in the location of survey lines, the function of the parish surveyor and other information which should be of service to all who do surveying work in Louisiana.

It often happens that a line, which was originally run, has been lost by lapse of time, and the necessity of re-running it arises. The question naturally is asked as to what importance should be given the various marks and evidence which may be discovered to show where the original line was located. The weight of opinion is that, where the line has to be restaked, natural monuments should be given preference over all other evidence, such as courses and distances where the latter cannot be reconciled with the location of the natural monuments,[1] the measurements of the original survey,[2] distance measured, if said distance is not sufficient to reach the natural monument described as a boundary.[3] The natural monument prevails over all other evidence except in cases where it is patent on the face of the papers that the natural boundary such as a lake, island or river, was erroneously located in the original survey, in which case the natural monument will be disregarded.[4] The artificial monuments rank with, but slightly inferior to natural monuments in preference.[5] Courses are given preference over distances,[6] although both are looked upon as unreliable,[7] the distances being regarded by the courts as more

1. Le Breton v. Lewis, 5 Rob. 479; Wells v. Compton, 3 Rob. 171; Leonard v. Forbing, 109 La. 220, 33 So. 203; Administration of Tulane Educational Fund v. Stair, 148 La. 11, 86 So. 595; Nattin v. Glassell, 156 La. 423, 100 So. 609; Passera v. City of New Orleans, 167 La. 199, 118 So. 887.
2. Hall v. Caplis, 109 La. 483, 33 So. 570.
3. Brand v. Dannoy, 8 Mart. (U. S.) 159.
4. Theriot v. Caffery ,160 La. 76, 106 So. 698.
5. Barker v. Houssier-Latreille Oil Co., 160 La. 52, 106 So. 672.
6. Mahaffey v. Miller, 159 La. 610, 105 So. 731.
7. Barker v. Houssier-Latreille Oil Co., 160 La. 52, 106 So. 672.

liable to be wrong, due to the liability of the chainmen to make errors.[8]

In the interpretation of the descriptive words in a deed or grant, the fixed measurements will govern.[9] The quantity set forth in the title controls where the only other indication is a proportion of the whole tract such as "one quarter of the land held by grantor," and there is no description by boundaries;[10] but when there is an error as to the quantity contained within certain limits, but none as to the limits themselves, the limits govern.[11]

It has been held that the lines as established in the field, control the lines laid out on the map, provided the field lines may be located.[12] In all cases, a boundary line is straight unless the contrary is shown,[13] and the rule is that the destination should be reached by the shortest line possible.[14]

When lots are sold together with improvements and the division lines, as afterwards run out, show that the buildings fall partly upon each of two lots, in the absence of evidence to the contrary the buildings will be considered as fixing the boundaries and not the measurement by metes and bounds.[15] It was considered that the buildings were far the most important part of the thing sold.

If the title describes a tract of land as that lying between the land of "A" and the land of "B", it means that the tract begins where "A's" land ends and ends where "B's" land begins.[16] Where contiguous lands are set apart as distinct bodies on the maps of the United States survey, they may serve as boundaries even though their limits are unmarked and can only be determined from the original field notes of the survey.[17] The same is true where land is conveyed as the

8. Administrators of Tulane Educational Fund v. Stair, 148 La. 11, 86 So. 595.
9. Guglielmi v. Geismar, 46 La. Ann. 280, 14 So. 501.
10. Innis v. McCrummin, 12 Mart. O. S. 425.
11. Cuny v. Archinard, 5 Mart. U. S. 238.
12. Shreveport v. Simon, 132 La. 69, 60 So. 795.
13. Henderson v. St. Charles Church, 7 Mart. (U. S.) 117.
14. Leonard v. Smith, 111 La. 1008.
15. Riddell v. Jackson, 14 La. Ann. 135, Lyon v. Dobbins, 26 La. Ann. 580.
16. Archinard v. Miller, 8 Mart. (O. S.) 713.
17. Randolph v. Sentilles, 110 La. 419, 34 So. 587.

"S. W. ¼ of section 32" and as bounded by the land of named persons. The latter description will control in identifying the land.[18] When land is conveyed as being bounded by the land of certain named parties and the sale is for a lump sum, there is no increasing or diminishing the price because the quantity falls short of that expressed in the conveyance.[19] But where there are no limits or boundaries given and the sale is for so much an acre, the purchaser may require a diminution of the total price.[20] Nor can a man who has purchased an indefinite quantity of land go beyond a line which existed long before his purchase and which was referred to in the description.[21] In other cases it has been held that a reference to the plat should control indefinite descriptions where express mention was made of the plat in the description.[22]

Where a party owns lots One and Two and sells lot One, the limits established by him govern, and not the ancient lines.[23] This is an exception to the rule that ancient lines control over the newer dividing lines run according to the distance and bearings given in the title.[24] It is the duty of the surveyor when the old line cannot be located and it is necessary to re-run it, to trace as nearly as possible the lines as originally run.[25] This must be done without regard to the title of either party.[26]

There are two systems of land measurements used in Louisiana, the French and the English, either of which may be used,[27] as the French measure has never been abolished.[28] The French system will be found to predominate in the older surveys while the English system prevails in the later surveys.

---

18. Ganucheau v. Momeot, 130 La. 463, 58 So. 150.
19. Johnston v. Quarles, 3 La. 90; Barrow v. Miller, 16 La. Ann. 114; Marigny v. Nivet, 2 La. 498.
20. Fiske v. Fleming, 15 La. 202.
21. Williamson v. Hymel, 11 La. 182.
22. Millikin v. Minnis, 12 La. 539.
23. Orillion v. Slack, 4 Rob. 120.
24. Williamson v. Hymel, 11 La. 182; Lemoin v. Monela, 9 La. Ann. 515; Lebeau v. Bergeron, 14 La. Ann. 489; Benedict v. Veith, 7 La. App. 567.
25. Smith v. Almond, 157 La. 265, 102 So. 330; Opdenweyer v. Brown, 155 La. 617, 99 So. 482.
26. Zeringue v. Harang, 17 La. 349.
27. McKenzie v. Lee, 10 Orleans App. 207.
28. Ibid.

In cases where land is sold and the description reads "Frente al rio" or "Frente a la levee," it has been held that this description conveys a riparian estate and the vendee is entitled to the river as a boundary.[29] This does not apply where there is privately owned land between the vendor's property and the bank of the river.[30] The front on the river refers to the front found on the river in a period of ordinary high water and not one resulting from exceptionally high stages of water.[31]

In places where the front of the property is built up by alluvium, the rear line remains the same although the front line gradually encroaches farther and farther into the old bed of the stream.[32] The boundary should follow the thread of the stream and not either of the banks when a stream is selected as one of the boundaries.[33] The thread of a stream is the line midway between the banks at the ordinary stage of the water, without regard to the channel or the deepest part of the stream.[34] Meander lines are not run as boundaries of the land surveyed, but for the purpose of defining the line of the bank in order that the quantity of land in the tract may be computed. The thread of the stream and not the meander line is the boundary,[35] but the meander line must conform to the shore line, otherwise the deed is considered as conveying only to the line so run, and not to the water's edge.[36] In this connection a shallow body of water which was really nothing more than a low place which filled with water after an overflow was not regarded as a stream within the meaning of the law regulating titles to estates bordering on streams.[37]

In many parts of Louisiana the United States Government has established corners, and land has been conveyed accord-

---

29. Morgan v. Livingston, 6 Mart. (O. S.) 19.
30. Livingston v. Hierman, 9 Mart. (O. S.) 656; Cambre v. Kohn, 8 Mart (O. S.) 572.
31. La. Branch v. Montegut, 47 La. Ann. 674, 17 So. 247.
32. Riviere v. Spencer, 2 Martin (O. S.) 79.
33. Red River Parish v. Caddo Parish, 118 La. 938, 43 So. 556; Nattin v. Glassell, 156 La. 423, 100 So. 609.
34. State v. Burton, 106 La. 732, 31 So. 291.
35. Palmer Co. v. Wilkinson, 141 La. 874, 75 So. 806.
36. Bruning v. New Orleans, 165 La. 511, 115 So. 733.
37. Hall v. Bossier Levee Dist., 111 La. 913, 35 So. 976.

ing to these corners. The government corner, whether checked by private surveys or not, remains correct, as it cannot be changed in an action between individuals,[38] no matter how clearly it may appear that the location is in error; and a survey departing from notes of a government survey was held to be erroneous.[39] On the other hand it has been held that the government corners are correct and entitled to be considered as such only until they are proved otherwise.[40]

The work of the parish surveyors has more weight than that done by other surveyors. The work of the latter will not have the same binding effect as a survey made by a surveyor commissioned by the State, nor will his proces verbal prove itself nor obtain full faith in the courts of Louisiana,[41] while a survey by a parish surveyor under an order of court, proved by him, will be presumed correct until the contrary is shown.[42] The parish surveyor when establishing a disputed boundary must notify the parties in order that they may know of his work.[43] The surveyor shall only stake his line temporarily and not set up any permanent monuments until the work is approved by the court.[44]

If the boundaries of a piece of land are not sufficiently defined in the act whereby it is sold, they may be established by evidence outside the act, including particularly evidence as to the construction which the parties to the contract have themselves placed upon it.[45]

The writer feels that all plats and surveys in a parish should be submitted upon plans drawn to the same scale and referenced into certain permanent marks in the parish which would be established by the police jury. These points could be established at small expense to the parish and if located properly could be used by each surveyor without much additional

38. Houston Ice & Brewing Co. v. Murray Oil Co., 149 La. 228, 88 So. 802.
39. Smith v. Almond, 157 La. 265, 102 So. 330.
40. Gaubert v. Gaubert, 1 La. App. 719.
41. Buisson v. Grant, 4 Rob. 360.
42. Jewel v. Porche, 2 La. Ann. 148.
43. Reynaud v. Champagne, 14 Orleans App. 179.
44. Railways Realty Co. v. Roussel, 11 Orleans App. 255.
45. Croom v. Noel, 143 La. 189, 78 So. 442.

labor on his part. It would render the keeping of the records much easier and much safer, and the time and expense consumed in establishing such a system would be more than repaid by the time saved all parties using the records. Under the present haphazard systems used in most parishes it would be difficult to estimate the number of valuable documents which have been lost in the past. The different sizes of these maps alone, make them hard to file or preserve and even those which are filed are being gradually worn out because of constant folding and unfolding.

CHAPTER II

DRAINAGE

The subject of drainage is one which is naturally divided into several divisions. First there is gravity drainage and drainage which requires the use of pumps or other artificial means for its disposal; there is drainage by individuals, by groups of individuals forming drainage districts, by state and municipal bodies who are required to drain land, either because they are created for that purpose or because it is necessary to drain the land in connection with some other work which they are charged with executing, and there are city drains and sewers as distinguished from open ditches or canals in rural communities. In the case of drainage districts, how they are formed, their rights and obligations, how the taxes supporting them are levied and collected, what comprises the limits of such districts and the rights and obligations of people dealing with such boards, either as members of the districts or as individuals contracting with the boards, are all subjects covered by special provisions and laws and largely depend upon the act which creates the individual board and district. For this reason each case of this kind is different and should be considered in the light of the facts of each case and the instruments creating the district and designating the various details concerning it.

The subject of natural or gravity drainage, however, is covered by a few simple rules; which, while they may be stated very easily, seem to cause considerable difficulty in their application.

There are certain servitudes, among them that of drains due from one estate or tract of land, to another estate. This servitude implies that the situation of the estates in their natural condition shall be preserved by man after he has commenced to use the land. The land below or at a lower elevation is required to receive the water which drains from the upper tract of land, provided such flow is according to the laws of nature.[1] The work of man on the dominant estate, the

1. C. C. 660.

one claiming the servitude due from the servient estate, will not be permitted to create such a servtiude. For example, the owner of one estate would not be permitted to pump the water from his land over on the land of his neighbor although he could change the direction of the flow of water across his land provided it flowed in the new direction by gravity.[2]

The proprietor of the land below can do nothing to prevent the use by the dominant owner of this right of drain—such as raising a levee along his property to prevent the natural flow of the water across his land or by placing dams in ditches or canals which flow across his land carrying water from his neighbor's estate.[3] Nor can the owner of the upper estate do anything whereby the natural servitude due by the lower is made more burdensome.[4] This latter condition has been interpreted by the courts to mean that the proprietor of the upper estate had a right to do anything which may be necessary in order to cultivate his land and he may plough his furrows in any direction he wishes or make such ditches as may be necessary to properly drain his land. If a drainage district is formed which enlarges certain natural drains and bayous to take care of the drainage of the district and the water which would naturally come down upon the land from the areas at a higher elevation which drains in that direction, and subsequently another drainage district is formed on the lands above the first district and ditches and canals are dug which cause the water to flow much more rapidly down upon the land below than before and which overtaxes the ditches and bayous of that drainage district and causes the land to overflow, it has been held that this is a right of the dominant owner and the other party cannot obstruct such right—either by damming off the flow of water or by an injunction through the courts.

The party whose drainage is obstructed by the person on the lower estate has a right to compel the servient owner to

---

2. Petite Anse Coteau Drainage Dist. v. Youngsville Drainage Dist., 146 La. 161, 83 So. 445.

3. C. C. Art. 660; Hooper v. Wilkinson, 15 La. Ann. 497; Ludeling v. Stubbs, 34 La. Ann. 935; Shaffer v. State National Bank, 37 La. Ann. 248; Foley v. Godchaux, 48 La. Ann. 466.

4. C. C. Art. 660.

remove such obstructions[5] and has also a claim for any damages which he may have suffered due to such act on the part of the owner of the lower estate. He has no right, however, to go upon the land of his neighbor to remove such obstruction, as his remedy should lie through the courts and not by direct action on his part.

The right of drain is one which is not easily lost. The period of prescription is ten years[6] and means that there must be no use of the right for a period of ten consecutive years by anyone owning the land or occupying it under any claim whatever. This discontinuance must be open and absolute and the prescriptive period begins to run from the time when some act contrary to the servitude has been committed.[7] Acts contrary to the servitude consist in the destruction of works necessary for its exercise,[8] but if the proprietor of the estate to whom the servitude is due is prevented from using it by an obstacle which he can neither prevent nor remove, the pre scription of non-usage does not run against him until this ol stacle has been removed.[9]

If a party sues for damages due to the blocking of a ditch by the owner of the lower estate, the burden is upon such party to show that the blocking of the ditch was the proximate cause of the damage and it was held that the floating of timber down a drainage ditch was not the proximate cause of the overflow of the lands higher up.[10]

The engineer is generally interested in drainage in one of several ways; either to drain the property into a natural drain which borders the property; to drain from one estate on to the property of another which adjoint the property to be drained, but is at a lower elevation; to drain a district for a board specially created for that purpose; to drain certain structures, such as railroads or highways, as an incident to the

---

5. Herbert v. Hudson and Lambert, 13 La. 54; Honore Leonard v. Joseph Kleinpetre, 7 La. Ann. 44.
6. C. C. Art. 789.
7. Ibid.,Art. 790.
8. Ibid., Art. 791.
9. C. C. Art. 792.
10. Caillouet v. Coguenheim, 111 La. 60, 35 So. 385.

construction of such work; or to drain or divert temporarily the water from a certain locality during the erection of some structure, such as a building, culvert, bridge, etc. In the first situation the matter is a simple engineering problem which contains no complications involving the rights of others. In the second case the rules set forth in this paper may be of use to the engineer in guiding him in such work. The drainage of a district, as pointed out, is largely dependent upon the instruments creating the district and such special laws as relate to such matters. The engineer, when called upon to drain railroads and highways must remember that the condition of the country through which the railroad or highway passes must be maintained in as good condition as it was before constructing the road as far as the drainage is concerned. Sufficient drainage structures must be provided under the road to prevent the flooding of the upper lands by water backing up against the embankment and sufficient ditches must be supplied on the lower side to carry off the water from the culverts and ditches. In no case should the natural drainage be blocked unless a substitute is provided which is equally as good. In the case of railroads the right-of-way for ditches would have to be acquired from the property owners, but, in some cases, the public highways may be drained by ditches which are dug across private property, the only restriction on the engineer being that they should be located so as to cause as little inconvenience to the owner of the land as possible. Where an engineer is called upon to divert water from a construction site and it is possible to carry that water upon the land of the owner and discharge it into an existing drain, he encounters no difficulty. If, however, he is unable to do this, and it is necessary to carry the water over the land of another—unless that land consists of a servient estate with relation to the estate where the structure is erected, he will be compelled to handle his drainage as best he can by agreement with the other property owner.

CHAPTER III

BUILDINGS AND BUILDERS

The right to specify the type of building and the manner of its construction is generally regulated by the governing body of each municipality.[1] This right, however, must be authorized by the legislature of the State, either by special legislation or by means of a charter, and there are, in such matters, the measure of the authority to be exercised.[2] This power is not one of the incidental or implied powers which municipal corporations may exercise in the absence of express legislative authority, and the power is strictly construed. If the act authorized a municipal corporation to prevent the reconstruction of old buildings within certain limits in wood, it does not include the right to prevent the repairing with shingles the roofs of buildings which were formerly covered with similar material.[3] Nor may such a law be made retroactive and the owner of building erected prior to such act be made tc grade the lot on which it stands as provided in the act.[4] Where such restrictions are placed upon certain classes or parts of buildings, as in the erection of awnings and sheds, there is an implied authorization to erect such structures provided the manner of doing so as provided by law, is complied with.[5] Under the police power the municipality has the right to condemn a building or prohibit an attempt to repair one where its condition, due to fire or otherwise, is considered to be too dangerous to warrant such a step.[6] The ordinance, under the same authority, may prohibit the erection of wooden buildings within the fire limits of the city.[7]

The engineer or architect is generally called upon to design buildings and to supervise the erection of them. It sometimes happens that an owner has engaged an architect or an

---

1. Monroe v. Hoffman, 29 La. Ann. 651.
2. State v. Schuchardt, 42 La. Ann. 49, 7 So. 67.
3. Ibid.
4. Sorenzen v. Woods, 1 McGloin 373.
5. Saviosa v. Chicago & R. Co., 1 McGloin 299.
6. Monteleone v. Royal Insurance Co., 47 La. Ann. 1563, 18 So. 472.
7. State v. O'Neil, 49 La. Ann. 1171, 22 So. 352.

engineer to design a structure and after the work is partly completed he changes his mind and decides not to proceed with the work. In this case the designer is entitled to compensation for his services although the fact that the plans are of no use to the owner will be given consideration by the court in deciding how much compensation to allow.[8] He is not entitled to compensation, however, when he prepares plans on condition that if they are refused by the owner he will receive nothing.[9] He is, however, entitled to full compensation where the plans drawn for a building which was to cost a certain sum of money exceeded that amount, provided the excess was due to extras which the owner insisted on having and which were not contemplated when the original contract of employment was entered into;[10] but he cannot recover for his services when the cost of the building, as called for by the plans, exceeds the cost specified by the owner through no fault of the owner.[11] The designer's commission is based upon the true cost of the building and does not include any loss which the owner may have suffered by reason of the contractor's default as this adds nothing to the value of the building.[12]

Work is generally executed under a contract which provides, among other things, that payment shall only be made upon the certificate of acceptance of the architect. This provision makes him primarily the judge of whether the contract has been fulfilled or not, and his findings will not be lightly overruled by the courts. They will do so, however, where it seems that his refusal was dictated by caprice or prejudice;[13] or where some minor condition of the contract had not been fulfilled but provisions had been made to execute it, as where the sub-contractors had not been paid but arrangements had been made to pay them out of the final payment to be received from the owner.[14] Where there is a provision in a sub-

---

8. Sully v. Pratt, 106 La. 601, 31 So. 161; Mohr v. Swoop, 13 Orleans App. 94.
9. Burk v. Rosenberg, 14 Orleans App. 324.
10. Mercier v. Munich, 9 La. App. 375, 120 So. 522; Diboll v. Grunewald, 7 Orleans App. 59.
11. MacDonnell v. Dreyfus, 144 La. 891, 81 So. 383.
12. Shepard v. Hero, 14 Orleans App. 127.
13. Dugue v. Levy, 114 La. 21, 37 So. 995.
14. Mahoney v. St. Paul's Church, 47 La. Ann. 1064, 17 So. 484.

contract that disputes between contractor and sub-contractor shall be settled by arbitration, the provision in the contract to the effect that the decisions of the architect on any dispute respecting the drawings and specifications should be final and conclusive, would have no weight as between the contractor and the sub-contractor.[15]

The plans and specifications form part of the same instrument and are to be read together, one interpreting the other. If the contract mentions only the main buildings, but it is to be executed according to a plan on which kitchens are marked, the contractor will be required to build them, as the plans form part of the contract.[16] The term "building site" as used in a contract providing for the filling of "building site," has been held to mean the entire lot and not merely the ground on which the building is erected.[17] If the specifications are clear and explicit as to the execution and acceptance of the work, positive evidence must be produced to prove a waiver of the conditions of the contract.[18] Where the contract calls for work to be executed on a unit price basis and the quantities fall below those estimated, the contractor can recover only for the work done.[19] The plans are the product of a representative of the owner and the contractor should not be charged with errors in the plans unless they are such as should have been easily detected.[20] It has been held that pencil marks on a blue-print will be disregarded as of no importance unless supported by express mention in the specifications.[21]

The surety on a contractor's bond is not bound beyond the extent of the provisions as they appear from the face of the contract, and his consent cannot be extended without his authority.[22] Surety is relieved from liability by a substantial change in the plans without his knowledge or consent.[23] But

15. Fritz Jahncke Inc. v. Fidelity & Deposit Co., 166 La. 593, 117 So. 729.
16. Suarez v. Duralde, 1 La. 260.
17. Myevre v. Liberty Realty & Securities Co., Inc., 156 La. 496, 100 So. 694.
18. Stewart v. Dixie Laundry Co., 6 La. App. 153.
19. Ruman Co. Ltd. v. Board of Comm., 3 La. App. 663.
20. Hebert v. Weil, 115 La. 424, 39 So. 389.
21. Kieran v. Louisiana Soldiers' Home, 5 Orleans, App. 72.
22. French Market Ice Mfg. Co. v. Landuer, 4 Orleans App. 80.
23. Ibid.

in order that surety may be discharged, he must show that the alterations were material and substantial and that they operated to the prejudice of the surety and were made without his consent.[24] The signer as surety on a building contract bond is liable even though he receives no compensation.[25]

Under special provisions of the law which applies exclusively to builders, the owner may annul the contract by paying the contractor the damages caused by the annulment; that is, by paying the contractor for the materials and labor employed and such damages as may be determined in each case.[26] The contractor may refuse to execute the work he has contracted to do and shall be liable only for such damages as his non-performance may have caused.[27] He is justified in refusing to do work in a manner condemned by law or correct rules of building construction.[28]

The building is generally erected at the contractor's risk and he is responsible for any damage to it during the course of erection. This is provided for by the insertion of clauses in the contract requiring the contractor to insure his work and to be responsible for any losses.[29] The contractor is not responsible for the loss of work which is destroyed, if the owner is in default for not having received it although he was duly notified to do so.[30]

It is not essential that the work be executed according to the letter of the contract as it has been held that substantial performance is all that is necessary.[31] Where one of several methods of construction is in use but another method was considered preferable, although more expensive, and the contract did not specify which should be used, it was held that the contractor did not breach the contract by using the cheaper

---

24. Diana Brick & Tile Co. v. Fidelity & Deposit Co., 9 Orleans App. 266.
25. McDonald v. Harris Gas & Oil Co., Inc., 2 La. App. 241.
26. Monarch v. Commissioners of the McDonogh School Fund, 49 La. Ann. 991, 22 So. 259.
27. Hayford v. Pugh, Teiss Orleans App. Dig. 36.
28. Industrial Homestead Assn. v. Junker, Teiss Orleans App. Dig. 35.
29. Munchow v Moore, 14 Orleans App. 417
30. Rapier v. Suburban Building & Loan Assn., Teiss Orleans App. Dig. 35.
31. Dugue v. Levy, 114 La. 21, 37 So. 995; Peterson v. Barry, Teiss Orleans App. Dig. 36.

method.[32] Even though the work is not completed, or is defective, the contractor may recover for the amount of the work actually executed after deducting such an amount as will be necessary to properly complete the building.[33]

The builder is not allowed to deviate from the plans and specifications, and all such deviations are at the builder's risk.[34] but if the owner consents to such deviation from the original plan, he is liable to the builder for such extra work as may be caused by the change[35] If the materials with which the altered structure is erected are furnished by the owner, it is presumed that the alterations were made with his consent.[36] A mere change in the site of the building, made for the convenience of the owner but which caused no additional expense to the contractor, is not such a deviation as will discharge the surety.

Contracts generally provide that no claims shall be allowed for extra work unless authorized in writing by the owner. Where the contractor executes such work without authorization, he cannot recover from the owner.[37] If the owner is present on the work from day to day, sees its execution and does not prohibit it, it will be assumed that he impliedly consented to the work and the contractor will be allowed to recover.[38] Under the provisions of a railroad construction contract where the contractor was required to make a claim in writing to the railroad before commencing work on changed plans, it was held that where the contractors failed to make written demand for such extra work, either before the work began or in any monthly estimate, they were estopped from making such claims afterwards.

In a recent contract,[39] which provided that if the contractor considered any work required of him by the engineers

32. A. M. Blodgett Const. Co. v. Cheney Lbr. Co., 129 La. 1057, 57 So. 369.

33 Industrial Homestead Assn. v. Junker, Teiss Orleans App. Dig. 35.

34. Sarrazin v. Adams, 110 La. 124, 34 So. 301.

35. Fossier v. Herries, 2 La. 490.

36. Andrews v. Jacobs, 4 La. 101.

37. Selby v. New Orleans, 119 La. 900, 44 So. 722.

38. C. C. 2734; Fossier v. Herries, 2 La. 490; Alston v. Ross, 4 Rob. 399; Percy v. Payroux, 5 Rob. 179, Doyle v. Ryan, 9 Rob. 402; Mathias v. Lebret, 10 Rob. 94.

39. O'Leary v. Board of Port Commissioners, 150 La. 649, 91 So. 139.

to be outside of the requirements of the contract, he should ask for a written ruling immediately, and if he considers the written ruling unfair he should file a protest, and the failure to file such protest within ten days should be construed as an acceptance of such ruling, it was held that where he made no protest to the ruling of the engineers as provided by the contract, that he accepted the same. It was stated in the contract that the bidders were to examine the location of the foundation of the proposed work and acquaint themselves with existing conditions. The contractor encountered a hard strata which required the use of additional equipment in order to drive piles through it.

As a general rule demurrage charges incurred by a contractor cannot be recovered from a defaulting sub-contractor, unless it is shown that the sub-contractor was made aware of the stipulations of such charges and warned in advance of his contract that he would be looked to for reimbursement in case of his own default.[40] The contractor is liable for the damages caused by his failure to complete the building within the time specified.[41] The right of the owner to retain the demurrage out of any money due the contractor and retained by the owner primes the claims of material men.[42] If the delay is due to failure on the part of designer to furnish proper plans, the contractor is entitled to an additional time allowance.[43] If the contractor makes no claim for such additional time for delays caused by the owner or his representative, if such claim is required in his contract, he waives his right to receive such additional time.

---

40. Brantley v. Comerford, Teiss Orleans App. Dig. 36.
41. Percy v. Peyrous, 5 Rob 179; Ellerbe v. Minor, 49 La. Ann. 863, 21 So. 583.
42. Teutonia Loan & Building Company v. Bush, 1 Orleans App. 30.
43. Mahoney v. St. Paul's Church, 47 La. Ann. 1064, 17 So. 484.

CHAPTER IV

WALLS IN COMMON

The engineer or architect is called upon from time to time to design structures adjacent and adjoining existing buildings. It is essential therefore that he knows his client's rights and obligations, in order that he may be able to design intelligently to the best interests of his client. While it may seem that these are points which are functions to be performed by an attorney, and undoubtedly are, yet very often the attorney is not consulted until after the work has started and the damage done. An attempt has been made in this chapter to cover the law as stated in the Civil Code and to point out the different situations which have arisen in the past to cause controversy, and the decisions of the courts in such cases. It is hoped that it will present the rules governing party walls to the engineer in such a way as to be profitable to him in his design and construction work.

In Louisiana the law governing Walls in Common or Party Walls, as they are called, is found in the Revised Civil Code of Louisiana and in the decisions of the courts interpreting the various articles of the Civil Code. There is but one exception to this and that is the Building Code of the City of New Orleans. The Legislature enacted Act 76 of 1910 which grants to the governing bodies of municipalities of over 100,000 inhabitants the right to adopt ordinances "providing for or relating to the construction, equipment, alteration, repair and removal of buildings, structures, walls and party walls," and provides for the repeal of all laws or parts of laws in conflict with this act. Under the authority so granted, the Commission Council of the City of New Orleans enacted Ordinance No. 9357 C. C. S., in October, 1926, entitled "Revised Building Code of the City of New Orleans." This ordinance contains the original ordinance together with all amendments inserted in the proper place.

In so far as the Building Code of the City of New Orleans creates a situation at variance with the Civil Code or the de-

cisions under the articles of the Code, the Building Code would govern, so far as the City of New Orleans alone is concerned; but where the Building Code is silent, the Civil Code and the decisions will govern. The points where the Building Code creates a situation distinct from the law as laid down in the Civil Code will be distinguished as they arise in the course of this paper.

The law grants to the property owner the right to rest the wall of his building on the line between his property and that of his neighbor. This right allows him to occupy only a limited portion of his neighbor's ground and also grants to his neighbor the right to become a co-owner of the wall by paying part of the cost thereof.

The doctrine of party walls applies only to walls erected with stones or bricks, and not merely a frame wall, at least as high as the first story. If the thickness of the wall does not exceed eighteen inches, then the center of the wall may rest upon the property line—in other words up to nine inches of the adjoining land may be taken by the party first building in order to erect the wall.[1] The restriction that the wall be built of bricks or stone applies only to the wall proper and it does not forbid the use of heavy foundation timbers or piling.[2] While the Supreme Court has not interpreted the term "bricks or stones," the intent of the article was to cover such walls as would be reasonably permanent in their construction and hence would include concrete, tile and walls of similar construction.

The person who first builds on the division line and exercises his right to rest one-half of the wall on his neighbor's land retains the sole ownership in the wall. He cannot compel his neighbor to contribute toward its erection,[3] neither may his neighbor make any use of the wall until such contribution is made. It remains the exclusive property of him who erected it, provided he paid the entire cost; and no use, how-

1. C. C. Art. 675; Mahaffey v. Miller, 159 La. 610, 105 So. 731.
2. Heine v. Merrick, 41 La. Ann. 195.
3. C. C. Art. 675.

ever small, can be made of it until the other party contributes his share of the expenses of construction.[4]

If the neighbor is willing to contribute for his half of the building of the wall, then this wall is a wall in common between the proprietors.[5] There is no such thing, however, as a wall held in common by adjoining owners unless both owners have contributed to its erection.[6] On the other hand, if the neighbor refuses to contribute to the raising of the wall he still preserves his right of making it a wall in common by paying to the party who made the advance for the erection of the wall one-half of the cost thereof.[7]

This right is one which is inherent in the land upon which the wall is built and one of which the owner of that land may avail himself at any time. The fact that he may have already built a wooden house on his lot, leaving a passage-way between the house and the property line does not deprive him of his right to subsequently avail himself of the wall built by his neighbor, provided he pays half of the costs.[8] It is not necessary that the builder of the wall give notice to his neighbor at the time the wall is erected—if the neighbor wishes to participate in its use he must pay only his share, provided that it is a reasonable charge.[9] Where walls are built on property so that a space is still left between it and that adjacent, they do not surround the premises under Civil Code Article 675; and cannot prevent the erection of a division wall on both.[10]

The right to make a wall one in common is one which is not lost by lapse of time. The servitude established on urban property by the Civil Code is without reference to title or agreement of the parties.[11] It is there by mere operation of

4. Faisans v. Minors Lovie, 1 McGloin 113; Jeannie v. DeBlanc, 11 La. Ann. 465; Lavergne v. Lacoste, 26 La. Ann. 507; Oldstein v. Firemen's Bldg. Assn., 44 La. Ann. 492, 10 So. 928; Costa v. Whitehead, 20 La. Ann. 341; Monteleone v. Harding, 50 La. Ann. 1147, 23 So. 990.

5. C. C. Art. 676.

6. Dubos v. Hardin, 13 Orleans App. 210.

7. C. C. Art. 676; Board of Administrators of Tulane Educational Fund v. Israel, 132 La. 676.

8. Carrigan v. De Neufbourg, 3 La. Ann. 441.

9. Board of Administrators of Tulane Educational Fund v. Israel, 132 La. 676.

10. Crocker v. Blanc, 2 La. 531.

11. Carrigan v. De Neufbourg, 3 La. Ann. 441.

law and its burdens and benefits accompany the land regardless of who the owners may be. While it may seem that it is in derogation of common right to permit a man to appropriate the land of another without paying for it, yet, as has been pointed out, the law grants a right to the neighbor in lieu thereof whereby he receives certain benefits. By paying a proportionate cost of building the wall he is allowed the joint use thereof with his neighbor; he may build against such wall, may make cavities therein for the purpose of erecting his building and may affix to it any work he pleases providing he exercises due precaution.[12]

The slightest use of a wall which has been erected at the sole expense of one of the adjacent property owners, by the owner of the land on the other side of the wall is sufficient to make the party so using it liable to the builder for half the cost of the wall. When this is paid it becomes a wall in common and until it is paid the builder may enjoin his neighbor from making any use of it. It is not essential that the neighbor use the wall as a support for his building, it is sufficient that he use it as one of the sides to enclose the building,[13] or for lateral support and to prevent his roof from leaking by embedding his roof into the wall of his neighbor.[14] In other words the slightest use of the wall renders the party who has not contributed to the cost liable to the builder for one-half the cost of the wall.

The presumption is that every wall which is a separation between buildings as high as the upper part of the first story, or between the yards and gardens in the cities and towns, and their suburbs, and even any other enclosures in the fields, is a wall in common if there is no title, proof or mark to the contrary.[15] So, where a wall of a brick house rests partly upon lot A and partly on lot B, in the manner in which walls in common are usually constructed, but there is no evidence as

12. Faisans v. Minors Lovie, 1 McGloin 113; Lavergne v. Lacoste, 26 La. Ann. 507; Heiderich v. Heiderich, 3 Orleans App. 485.

13. Canal-Villere Realty Co. v. Gumble Realty Co., 1 La. App. 123; Costa v. Whitehead, 20 La. Ann. 341.

14. Lehman v. Alorahan, 2 La. App. 328.

15. C. C. Art. 677.

to when the house was built or by whom the wall was paid for, it will not be assumed that the owner of the lot adjoining that upon which the house stands had forfeited his rights to make such a wall a wall in common.[16] It has been held, however, that the presumption that a wall is common applies only to a wall that separates two buildings and that no such presumption applies to a wall that separates a building from a vacant lot.[17]

The ownership of a wall resting upon the division line belongs entirely to him who has paid the entire cost of erecting the wall. If the owner of the adjacent lot sells his property, the person purchasing acquires only the rights his vendor had and nothing more. For example A, B and C own lot 1 and B owns lot 2 upon which a building is erected, the wall of which rests partly upon lot 1. In order to effect a partition lot 1 is sold. This does not convey to the purchaser any greater rights to the wall than the co-owners had, which was nothing more than the right to make the wall one in common.[18] The right which the original owner had to make the wall a wall in common by paying for it, passed with the lot to the vendee but nothing more. The vendor cannot sell the wall, as he ha no title to it, but only the lot on which part of the wall is built. If the purchaser desires to use the wall he must pay the owner of adjacent land for one-half of the wall.[19]

A division wall between a building and a vacant lot forms no part of the buildings and improvements on the lot. Such a wall remains the exclusive property of the owner of the building until his neighbor, the owner of the lot, has paid half.[20] If the vendor of the land adjoining that on which the building is erected, has made use of the wall and has not paid his share of the cost, the purchaser is liable to the person who advanced the cost of the wall for a proportionate share thereof.[21] This is true even where the vendee knew nothing

16. Ribet v. Howard, 109 La. 113, 33 So. 103.
17. Canal-Villere Realty Co. v. Gumble Realty Co., 1 La. App. 123.
18. Heiderich v. Heiderich, 3 Orleans App. 485.
19. Lavergne v. Lacoste, 26 La. Ann. 507.
20. Cordill v. Israel, 130 La. 138, 57 So. 778.
21. Auch v. Labouisse, 20 La. Ann. 553; Florence v. Maillot, 22 La. Ann. 114; Chism v. Lefevre, 27 La. Ann. 199.

of the claim against his vendor and purchased in good faith assuming the wall to be a wall in common.[22] So also where the owner of the soil permits his tenant to build against a wall which has not become one in common, the owner of the wall may look to the proprietor of the adjoining lot for payment of the proper contribution.[23] The right of the owner of the wall to collect part of the cost of the wall from a neighbor who has not previously paid his share, follows the land even though bankruptcy proceedings have intervened. Thus, the purchaser who acquires from the assignee of a bankrupt can assert a claim against a neighbor who made the bankrupt's wall one in common before the sale to the present owner.[24]

Repeated mention has been made of the fact that if the adjoining property holder wishes to make a wall one in common he must pay half of the cost thereof. The question arises as to what is meant by the word "cost" in this connection. The Civil Code says, "Every proprietor adjoining a wall has, in like manner, the right of making it a wall in common, in whole or in part, by reimbursing to the owner of the wall one-half of its value, or the half of the part which he wishes to hold in common."[25] It has been held that one-half of the cost of the wall means one-half of its value as of the time of using it.[26] It has also been held that where there is no demand for contribution at the time of erecting the wall, only one-half of its value at the time it is made one in common and not one-half of the cost of construction may be recovered from the neighbor wishing to make it a wall in common.[27] In an early case it was held that the person wishing to make a wall one in common could be compelled to pay one-half of the cost of construction only where the owner of the adjoining lot was previously notified of the intention to build and an opportunity given him to contribute to the cost of the wall, to see that no useless expense was incurred in its erection and to

22. Winters v. Reynolds, 24 La. Ann. 113.
23. Faisans v. Minors Lovie, 1 McGloin 113.
24. Irwin v. Peterson, 25 La. Ann. 300.
25. C. C. Art. 684.
26. Canal-Villere Realty Co. v. Gumble Realty Co., 1 La. App. 123.
27. Augustin v. Farnsworth, 155 La. 1053, 99 So. 868.

see that the wall was well built. Where no such notice or opportunity had been given, the owner of the adjoining property will be bound to pay only one-half the value of the wall at the time he first makes use of it.[28] On the other hand it has been held that a party can recover from his neighbor who uses a wall built by him only one-half of the cost of building said wall. In these cases the wall had enhanced in value between the time it was constructed and the time it was used by the neighbor.[29]

The Civil Code grants to the party who builds first, the right to rest one-half the thickness of his wall, not to exceed nine inches exclusive of plaster which may be three inches thick, upon the land of his neighbor. Should he encroach upon the adjoining property to a greater extent the owner of the latter has several alternate remedies. If the wall is entirely upon his property he may require its demolition.[30] If partly on his property but to an undue extent, he may require the thickness of the wall on his side of the line to be reduced to the proper proportions. Or he may accept the status quo by making it a wall in common. Should he adopt the latter course, his obligation to pay half the cost of the wall is as complete as if there had been no encroachment.[31]. Where the builder of the wall erroneously, but in good faith, placed more than one-half of the division wall upon the land of his neighbor who, though present and aware of this fact, made no objection, it was held that one-half the value of the wall which he afterwards used must be paid by him without prejudice to his ownership of the excess of land taken.[32]

The provision in Art. 675 of the Civil Code restricting the right of one co-proprietor to rest a wall in common no more than nine inches upon the land of his neighbor applies only to the wall itself and not to the foundation, which may

---

28. Graible v. Hown, 1 La. Ann. 140.

29. Auch v. Labouisse, 20 La. Ann. 553; Florance v. Maillot, 22 La. Ann. 114; Gerald v. Katzinstein, 5 La. App. 28.

30. C. C. Art. 508.

31. Heiderich v. Heiderich, 3 Orleans App. 485; Marion v. Johnson, 23 La. Ann. 597; Murrell v. Fowler, 3 La. Ann. 165.

32. Davis v. Grailke, 14 La. Ann. 338; Monteleone v. Harding, 50 La. Ann. 1147, 23 So. 990; Pokorny v. Pratt, 110 La. 609, 34 So. 706.

extend further.[33] The Court held that the Civil Code granted an owner the right to replace an old wall with a new one of greater height, should he so desire. The additional width of such a wall would have to be placed upon the land of the party erecting the wall.[34] The additional weight of such a wall would require a foundation with a greater bearing area than the old wall required. Hence, as the wall should rest in the center of an adequate foundation and as the foundation must be larger than one which would be required for a lower and lighter wall, the party building such a wall has the right to go on the property of his neighbor such distance beyond the nine inches as will be necessary for him to secure an adequate footing.

The party who builds before his neighbor and erects his wall on the dividing line between the two properties may place windows in the wall overlooking the land of his neighbor.[35] He has an absolute right to do this, a right of property and not a servitude, and he may make and close openings in it at his pleasure, subject only to police regulations.[36] A servitude of light cannot be acquired in a window cut through the wall, even though it belongs in whole to the party who erected the wall. His right to cut such openings is one of proprietorship based upon his undivided ownership of the wall, which right will be lost when the adjoining property holder pays half the cost of the wall. In this case the contributing party may close all openings in the wall in common.[37] It is presumed that the entire wall belongs jointly to both parties so that one would have no rights to the use of the wall, such as making openings, which would be detrimental to the co-owner. This ownership exists without reference to the line of division and a flue in the wall may be used jointly by both

33. Heine v. Herrick, 41 La. Ann. 195.
34. Pierce v. Musson, 17 La. 389.
35. Bryant v. Sholars, 104 La. 795.
36. Jeannin v. DeBlanc, 11 La. Ann. 465; Lavillebeuvre v. Cosgrove, 13 La. Ann. 323.
37. Lavergne v. LaCoste, 26 La. Ann. 507; Ribet v. Howard, 109 La. 113, 33 So. 103.

parties even though it is placed in the half of the wall that is entirely upon the land of one party.[38]

A municipal ordinance of the City of New Orleans,[39] passed under authority of Act 76 of 1910 previously referred to, provides that brick or masonry supporting walls of existing buildings, whether party walls or not, may be remodelled or repaired to conform to their present construction where the outside walls of such buildings are no longer used to support an adjoining building, or where there is separation between buildings; such remodeling may consist of the installation of ample ventilation and light. The Supreme Court of the State of Louisiana upheld the constitutionality of this ordinance and the act authorizing it, in a case where the Federal Land Bank in New Orleans demolished an existing building and erected a new building approximately fifteen feet from the wall of the adjacent building which was a party wall, having been paid for by the Federal Land Bank or the former owners of the land acquired by the bank and the owners of the adjoining land, and was used as such up to the time of the demolition of the old building. Subsequently, the owner of the adjoining building remodelled it and cut windows in the party wall overlooking the driveway between it and the building proper of the Federal Land Bank. The Court held that the defendant has a right to make such openings.[40] The ordinance further provides, however, that in the event the co-owner at any time in the future should erect an adjoining building, said co-owner will have the right to close said windows and use the party wall as originally intended.[41]

The repairs of walls in common are to be made at the expense of all who have a right to the same and in proportion to their interest therein.[42] Nevertheless, every co-proprietor of a wall in common may be exonerated from contributing to the repairs and rebuilding by giving up his right of common;

38. Weil v. Baker, Sloo & Co., 39 La. Ann. 1102.
39. Ordinance 9756 C. C. S.
40. Federal Land Bank v. John D. Nix, Jr., 166 La. 556, 117 So. 720.
41. Ordinance 9756 C. C. S.
42. C. C. Art. 678.

providing no building belonging to him be actually supported by the wall.[43] Where a wall has been repaired entirely by one owner and is afterwards used by the co-owner, the co-owner is liable to the person who repaired the wall for one-half of the cost of the repairs, even though the one who repaired the wall has been reimbursed by his insurance company for his half of the cost of the wall.[44]

"Every co-proprietor may build against a wall held in common, and cause beams or joists to be placed within two inches of the whole thickness of the wall, saving to the neighbor the right of diminishing with the chisel the length of the beam till it does not exceed the half of the thickness of the wall, in case he himself should wish to fix beams in the same place, or to build a chimney against it."[45]

Every co-proprietor is at liberty to increase the height of a wall held in common, but he alone must bear the expense of raising it and repairing and keeping the part above the wall held in common in good order.[46] If the wall in common cannot support the additional weight of the higher wall, the party wishing to build it higher is bound to rebuild the entire wall at his own expense and the additional thickness must be taken from his own property.[47] The neighbor who did not contribute to the raising of the wall held in common, may make the raised part common by reimbursing the other party for one-half of the cost of raising together with the value of one-half of the soil employed for the additional thickness if there is any.[48]

"Neither of the two neighbors can make any cavity within the body of the wall held by them in common, nor can he affix to it any work without the consent of the other, or without having, on his refusal, caused the necessary precautions to be used, so that the new work be not an injury to the rights of the other, to be ascertained by persons skilled in building."[49]

---

43. Ibid., Art. 679; Bank of West Carroll v. Brower, 5 La. App. 469.
44. Sullivan v. Smith, 11 La. Ann. 701.
45. C. C. Art. 680.
46. Ibid., Art. 681.
47. Ibid., Art. 682.
48. C. C. Art. 683.
49. Ibid., Art. 685.

The party wishing to raise the wall held in common has the right to demolish the old wall in order to build a new and stronger wall. The right to build on the property line includes the right to enter upon the neighbor's property to the extent necessary to erect the wall.[50] It is a right, however, which cannot be exercised with too much care and the party erecting the wall is responsible to his neighbor for all unnecessary damaegs suffered by his neighbor due to the builder's neglect.[51] The party erecting the wall is bound to restore his neighbor in every way to the condition he occupied before the building operations started, and furnish him with a new wall fit to support his building. He is bound to reduce to a minimum the injury and inconvenience occasioned to his neighbor, to occupy his property to the least extent and for the shortest possible time, and to hasten by all practical means the completion of the work and the restoration of his neighbor to the full enjoyment of his property.[52] The neighbor on his part must bear without indemnity, the inconvenience and injury resulting from the building operations so far as they are inseparable from the exercise of the right.[53] The neighbor's consent to do these things is not necessary; the builder has an absolute right to go upon the land of his neighbor to build the necessary foundations and other work and is only liable to his neighbor for any unnecessary damage he might be caused due to negligence on the part of the builder,[54] but the builder is not responsible for any damage which might have been suffered by his neighbor due to the neighbor's negligence in not protecting his property.[55]

It seems to the writer that a knowledge of party walls is essential to an engineer. He must know how much of the wall may be placed upon the property adjoining, must know how far he may extend his foundations, whether he may put win-

---

50. Breaux v. Laplace, Teiss Orleans App. Dig. 122.
51. Loney v. High 12 La. 271; Pierce v. Musson, 17 La. 389.
52. Heine v. Merrick, 41 La. Ann. 194, 5 So. 760; Levy v. Fenner, 48 La. Ann. 1389, 20 So. 895; Pokorny v. Pratt, 110 La. 603, 34 So. 703.
53. Gernon v. Soule, 1 Orleans App. 185; Levy v. Fenner, 48 La. Ann. 1389, 20 So. 895.
54. Heine v. Merrick, 41 La. Ann. 194, 5 So. 760.
55. Gettwert v. Hidden, 30 La. Ann. 30.

dows in his wall overlooking a vacant lot or close the windows in an existing wall when he makes use of it. These and other situations should be known and understood by the engineer or architect, even though the owner or designer may obtain such information from an attorney. In fact, it is probably safer to obtain legal advice to serve as a check on the design before starting operations than it is to wait until after complications have set in. The engineer's knowledge of such principles is merely for his own use and to make his understanding of the situation clearer when dealing with a legal adviser. It is not intended that the engineer should attempt to supplant the attorney nor to become his own lawyer. An old saying has it that "When a man is his own lawyer he has a fool for a client."

CHAPTER V.

ARBITRATION AND AWARD

The subject of arbitration should be of deep interest to the engineer. More and more the parties to a construction contract are inserting provisions in the instrument for a settlement of their differences by means of arbitration. The rules governing arbitration apply to all contracts which contain such provisions, whether they be construction contracts or not. It is in this broader sense that the subject will be treated of here, as the principles so set forth may be the ones most needed by the engineer or architect under the particular circumstances with which he is faced, whereas a narrow treatment, dealing only with engineering problems, might omit the very principles needed in a particular case.

There are two classes of arbitrators in Louisiana: the arbitrator properly so called, and the amicable compounders.[1] The arbitrators should determine the matter to be arbitrated according to the letter of the law, while the amicable compounders are authorized to moderate somewhat the strictness of the law in favor of natural justice—in all other respects they are subject to the same rules which are provided for arbitrators.[2]

"A submission to arbitration is a covenant by which persons who have a lawsuit or difference with one another, name arbitrators to decide the matter and bind themselves reciprocally to perform what shall be arbitrated."[3] An agreement to submit a question in dispute to amicable compounders is a contract and the parties should be held to the strictest good faith in all matters relating to the submission,[4] as the parties bind themselves reciprocally to perform what shall be arbitrated.[5]

An agreement to submit a question to arbitration does not carry with it the idea of submitting it to a court for settlement, and the word "arbitration" and "amicable lawsuit"

1. C. C. Art. 3109.
2. Ibid., Art. 3110.
3. C. C. Art. 3099.
4. Driggs v. Morgan, 2 La. Ann. 151.
5. McClendon v. Kemp, 18 La. Ann. 162.

used in an agreement between parties are not convertible terms. The word "arbitration" carries with it the idea of settlement of the dispute by disinterested third parties, while an "amicable lawsuit" is the friendly submission by the parties of the points in dispute to a judicial tribunal to be determined according to the forms of the law.[6] An agreement to refer differences which may arise in the future to arbitrators or amicable compounders, will not be specifically enforced by the courts. It is dependent for its execution upon the will of the parties as the courts will not in such a case, compel the parties to appoint arbitrators or to take steps which, as regards matters to arise in the future, will close the doors of the courts upon the parties. In this case the agreement was that the matters were to be finally settled by the arbitrators.[7]

The authority to make a submission for another must be specified and expressly conferred,[8] and an agent or attorney in fact cannot make a submission without a specific power to that effect.[9] The parties may submit all of their differences or only some of them in particular.[10] Consent to submit differences to arbitrators, however, is not consent to acquiesce in everything done under the submission; for example, where the arbitrators were commissioned to hear testimony without other parties present and this provision was violated and the testimony was taken before others.[11] Nor does an agreement to submit a suit, already pending between the parties, to arbitration mean that the pending suit is to be dismissed without the consent of the plaintiff;[12] and if, after the pending suit has been submitted to arbitration the defendant refuses to abide by the award, the plaintiff has the same rights as if the suit had not been interrupted nor the matter submitted to arbitration.[13]

---

6. Thompson v. Moulton, 20 La. Ann. 535.
7. Saint v. Martel, 127 La. 74; Townsend v. Fontenet et al., 47 La. Ann. 890.
8. West v. Importers & Exporters Ins. Co., 8 La. App. 98.
9. Rouseo v. Troxler, 14 Orleans App. 228; C. C. Art. 3101.
10. C. C. Art. 3102.
11. King v. King, 104 La. 420, 29 So. 205.
12. Flower v. O'Conner, 7 La. 198.
13. Fielding v. Westermier, 20 La. Ann. 51.

A submission or agreement to arbitrate must be reduced to writing,[14] and must be proved by written evidence.[15] The powers of the arbitrators are limited to what is explained in the submission.[16] A clause, "Whatever the arbitrators may determine the parties agree to abide by," cannot be considered as enlarging the purpose of the submission so as to cover all matters in dispute between the parties, and when the arbitrators exceed their powers in determining matters not submitted to them, their award will be null.[17] But where the parties definitely agreed in their contract to submit all differences which may arise to arbitration, this stipulation is binding and if either party appeals to the courts before submitting to or tendering arbitration the suit will be dismissed.[18] But the award is not binding where the specific dispute between the parties has not been presented to them for decision.[19] An award must decide the whole matter submitted and must not go beyond the submission. It must be certain, final and conclusive, leaving no matter of fact or law undecided.[20]

Every fact and question must be so presented by an award that the court will be enabled to act on the award itself and to execute it as a whole. The mere omission to determine an exact sum will not annul it, where the award gives the necessary information to enable the court to fix the amount without going outside of the award itself.[21] The arbitrator's award must be final, as they are judges whom the parties to the controversy choose for themselves. The report of referees is different as these are only appointed to relieve the court from scrutinizing long and intricate accounts.[22]

A certain time is allowed arbitrators and amicable compounders under the submission—if no time is expressed nor limited in any way, the power of the arbitrators may continue

14. C. C. Art. 3100; McClendon v. Kemp, 18 La. Ann. 162.
15. Raquet v. Carmouche, 5 La. Ann. 133.
16. C. C. Art. 3104; 3121; 3122.
17. Bethea v. Hood, 9 La. Ann. 88.
18. Alford v. Teblier, 1 McGloin 151.
19. Harrod v. Lewis, 3 Martin (O. S.) 311.
20. St. Patrick v. Dakin, 1 Rob. 202.
21. C. C. Art. 3127; St. Patrick v. Dakin, 1 Rob. 202.
22. Segur v. Brown, 1 Mart. (O. S.) 267; Merieult v. Austin, 3 Mart. (O. S.) 318.

in force for three months from the date of the submission unless the parties agree to revoke it.[23] If any of the arbitrators so appointed refuse to act, the parties are left at once to their legal remedy.[24] In the absence of agreement to allow more than three months, the submission is at an end after that time.[25] The time within which an award is to be rendered may be extended by the court or the parties, with the consent of the arbitrators. A person who attends the sessions of the arbitrators and makes no objection to the extensions, cannot on that ground afterwards object to the award.[26] After the date of certain irregularities charged by one party, of which he had complete knowledge at the time, he concluded himself by not raising an objection.[27]

It is usual to stipulate a penalty of a certain sum of money in the submission, which the party who refuses to abide by the award shall be bound to pay to the party who is willing to abide by it. This agreement, however, is not necessary and the submission is valid even though there is no penalty.[28] Where parties have submitted their differences to arbitration and have bound themselves within a fixed delay to comply with the award or be liable in a penal sum, they are bound by the agreement and the penalty is due.[29] If the agreement is to the effect that the differences be submitted to arbitration with a penalty stipulated to be paid by the party who refuses to abide by the arbitration, the penalty must be paid in order to sue on the award.[30] The party in whose favor the award has been made may sue the other party for either the award, or the penalty for nonperformance of the award, but he cannot demand both the award and the penalty unless the penalty has been stipulated for mere delay.[31] Mere neglect to make payment, even where demand is made for it, need not neces-

---

23. C. C. Art. 3105; St. Martin v. Westaye, 18 La. Ann. 320.
24. Lallande v. Bonny, 13 La. 462.
25. Hart v. Dupont, 138 La. 15, 69 So. 858.
26. Lattier v. Rachal, 12 La. Ann. 695.
27. Bryant v. Levy, 52 La. Ann. 1649.
28. C. C. Art. 3106.
29. Hunt v. Zuntz, 28 La. Ann. 500.
30. C. C. Art. 3130; Brown v. Stubbs, 47 La. Ann. 1480, 17 So. 880.
31. Jackson v. Hoffman, 31 La. Ann. 97.

sarily subject the defendant to the payment of the penalty.[32] And where the award has been partially executed it is a matter of judicial discretion as to whether or not the penalty will be modified.[33]

All persons may be arbitrators except such as are under some incapacity which would render them unfit for that duty. Thus minors under the age of eighteen years, persons interdicted and those who are deaf and dumb cannot be arbitrators.[34] The provisions in Article 3108 of the Civil Code prohibiting women from acting as arbitrators has been removed.[35]

Before proceeding to examine the differences submitted to them, the arbitrators should take an oath before a judge or a justice of the peace, "to render their award with integrity and impartially in the cause which is laid before them."[36] If they are not sworn, the informality is fatal to the award.[37] It is also an invalid award where the only evidence of the arbitrators' oath is a certificate at the foot of the report that it was sworn to and subscribed before a justice of the peace.[38]

The parties must make known their claims to the arbitrators, and prove them in the same manner as in a court of justice by producing oral or written evidence in the order agreed on between them or fixed by the arbitrators.[39] The arbitrators shall appoint a time and place for such hearing and must give notice to the parties or their representatives.[40] The parties must appear before the arbitrators either in person or through their attorneys, with their witnesses or documents. If either or both of them fail to appear, the arbitrators may proceed and inquire into the matters before them just as though the parties were present.[41] Where the arbitrators fail to fix

32. Bodett v. Lees, 12 La. Ann. 761.
33. Lowry v. Cobb, 9 La. Ann. 592.
34. C. C. Art. 3107.
35. Art. 34 of 1921.
36. C. C. Art. 3111.
37. Harrod v. Lewis, 3 Mart. (O. S.) 311; Bethea v. Hood, 9 La. Ann. 88; Overton v. Alpha, 13 La. Ann. 558; Sharkey v. Wood, 5 Rob. 326.
38. Penny v. Carl, 10 La. Ann. 202; Donovan v. Owen, 10 La. Ann. 463.
39. C. C. Art. 3112.
40. Ibid., Art. 3113.
41. Ibid., Art. 3114.

a time for a hearing and an award is rendered by them it is a nullity.[42] The refusal of one of the arbitrators and also the umpire to hear testimony on contested matters is also fatal to the validity of the award.[43]

It has been pointed out that the power of amicable compounders is much broader than that of arbitrators. For this reason the courts are less willing to upset the award of amicable compounders, who are allowed to moderate the strictness of the law somewhat,[44] than they are the award of arbitrators who are held to a strict observance of all the rules of law and procedure.[45] The award of amicable compounders within the scope of their authority is final as to the parties who have agreed to submit their differences to arbitration and is not reviewable by the courts.[46] The court will review the award of amicable compounders only when they are charged with having exceeded their authority, with fraud, or with irregularity in their proceedings,[47] such as the failure of the amicable compounder to cause himself to be sworn or some of the facts not having been placed before him.[48] If the award of amicable compounders is not impeached for one of the grounds stated above, the award must stand and the court cannot revise it. As a general rule the judgment itself of the court affirming the award is not appealable,[49] although the award of amicable compounders may be appealed from where there are grounds for exception to the award.[50] The award cannot be disturbed, however, because they have misconstrued the testimony of a witness, the obscurity of which was partly due to laches of the opponent, or because they never acted on certain vouchers which were never produced before them; nor does it

---

42. Dreyfous v. Hart, 36 La. Ann. 929; Penny v. Carl, 10 La. Ann. 202.
43. Dreyfous v. Hart, 36 La. Ann. 929.
44. David v. Leeds, 7 La. 177; Canty v. Beall, 17 La. 282.
45. St. Patrick v. Dakin, 1 Rob. 202.
46. In re Wallace, 31 La. Ann. 335; C. P. Art. 460.
47. Graf v. Friedlander, 31 La. Ann. 188; Amet v. Boyer, 36 La. Ann. 266; Davis v. Leeds, 7 La. 471; Canty v. Beall, 17 La. 282; Cobb v. Parham, 4 La. Ann. 148; Bird v. Laycock, 7 La. Ann. 171.
48. Mestier v. Chevalier Pav. Co., 108 La. 562, 32 So. 520.
49. Hopkins v. Louisiana Western R. Co., 33 La. Ann. 1138; Davis v. Leeds, 7 La. 471; Canty v. Beall, 17 La. 282; Cobb v. Parham, 4 La. Ann. 148; Bird v. Laycock, 7 La. Ann. 171; Janes v. Richard, 3 La. 486.
50. Lalande v. Jenfreau, 6 La. 333.

make any difference if the compounders themselves ask that the award be referred back to them.[51] The court said in this case that it doubted whether even the award of arbitrators could be disturbed for such causes.

Arbitrators have no authority to compel the attendance of witnesses before them or to administer an oath; but it is the duty of justices of the peace, on request of the arbitrators, to compel witnesses to appear and to administer the oath to them.[52]

If the arbitrators fail to agree, a third party called the umpire shall decide.[53] The umpire is either nominated by the parties at the time of the submission or is left to the discretion of the arbitrators. [54] If he is not appointed in the submission, the arbitrators have the power to appoint him, even though it is not mentioned in the submission. If the arbitrators cannot agree on an umpire, the judge will appoint one.[55] The umpire is required to take on oath similar to that taken by arbitrators, regardless of how or by whom he is appointed.[56]

It shall be the duty of the arbitrators and the umpire to determine the questions submitted to them as quickly as possible and within the time fixed in the submission.[57] To give an award after the time fixed in the submission would be a nullity,[58] unless the time had been extended by consent of the parties.[59] Nor can the arbitrators give their award before a certain time has expired where it is stated in the submission that such time must elapse before the award can be made.[60] All the arbitrators named in the submission must be present at all the proceedings and try the cause together, otherwise they cannot give their award. It is not necessary, however,

51. Bird v. Laycock, 7 La. Ann. 171.
52. C. C. Art. 3113.
53. Ibid., Art. 3116.
54. Ibid., Art. 3117.
55. Ibid., Art. 3118.
56. C. C. Art. 3119.
57. Ibid, Art. 3120.
58. Ibid., Art. 3123.
59. Ibid., Art. 3124.
60. Ibid., Art. 3125.

that they all sign the award.[61] Once the arbitrators have given their award they cannot retract it nor change anything in it.[62]

"The submission and power given to arbitrators are put at an end by one of the following causes:

1. By the expiration of the time limited either by the submission or by law, though the award should not be yet rendered.
2. By the death of one of the parties or arbitrators.
3. By the final award rendered by the arbitrators.
4. When the parties happen to compromise touching the thing in dispute, or when the thing ceases to exist."[63]

In addition to the main demands, the arbitrators may fix in their award such incidental charges as interests and costs; but their silence on these subjects is not cause for nullity.[64] Interest cannot be allowed, however, on an award which does not grant it.[65]

The award of arbitrators should be approved by the judge in order to be put in execution. This is not done to submit the matters in dispute to the judge to be examined on their merits, but is only intended to invest the award with sufficient authority to insure its execution.[66] If a party is not satisfied with the award, he may appeal from it even though such right of appeal was renounced in the submission; but before the appeal can be heard, the appellant should pay the penalty, if any has been stipulated. The penalty is due even though appellant subsequently renounces his appeal. If, however, he succeeds in having the award reversed the penalty shall be refunded to him, but if the award is affimed the penalty already paid shall not be deducted from the award.[67]

In cases where both parties to a suit pray the court that their dispute be submitted to judicial arbitrators, the judge

---

61. Ibid., Art. 3126.
62. Ibid., Art. 3131.
63. C. C. Art. 3132.
64. Ibid., Art. 3128.
65. Janes v. Richard, 3 La. 486.
66. C. C. Art. 3129.
67. Ibid., Art. 3130.

shall direct the cause to be referred to such arbitrators. These will be selected, one by each of the parties and one appointed by the court and may be either arbitrators or amicable compounders, as the parties may determine in their submission.[68] The court cannot of its own accord, or at the request of one of the parties, refer a matter to arbitration without the consent of the other party.[69]. If either of the parties neglect or refuse to appoint an arbitrator, the judge shall name all three.[70] The parties may agree that only one arbitrator or amicable compounder shall hear the dispute, in which case the judge will appoint the one they have agreed upon, or, if they fail to agree, will nominate one ex-officio.[71]

The arbitrators so appointed must be notified of their appointment by the parties and must take an oath before a judge or justice of the peace to perform their duties faithfully, which oath must be in writing at the foot of the order of court appointing them, and must be annexed to the award which they render.[72] But the oath may be taken after the reduction of the award to writing.[73] If the persons appointed refuse to act as arbitrators, they must immediately notify the court of their refusal.[74] After they have taken the oath they shall not be allowed to resign except for reasons deemed sufficient by the court.[75] Prior to taking the oath, however, they may refuse to serve.[76] After the documents in the case have been placed in their hands, at the request of one of the parties, they shall give at least three days notice to the adverse party of the time and place at which they intend to commence their proceedings.[77]

The party who wishes to produce witnesses before the arbitrators shall obtain summons from the clerk of the court where

68. C. P. Art. 444.
69. Ibid., Art. 445.
70. Ibid., Art. 446.
71. Ibid., Art. 447.
72. Ibid., Art. 448.
73. Nott v. Daunow, 7 Martin 1.
74. C. P. Art. 449.
75. Ibid., Art. 450.
76. Lallande v. Bonny, 7 La. 292.
77. C. P. Art. 450; Penny v. Carl, 10 La. Ann. 202; Hunt v. Zunts, 28 La. Ann. 502; Dreyfous v. Hart, 36 La. Ann. 932; Loeck v. Dakin, 15 La. 424.

the suit is pending, and failure on the part of a witness to appear after being summoned will subject him to punishment by the court upon motion of the party complaining of his disobedience.[78]

If the arbitrators fail to execute their functions within the delays granted them by the court, the court may sentence them to pay all the costs which their neglect may have occasioned, together with whatever damages the parties may have suffered from the delay.[79]

As soon as the arbitrators shall have accomplished their duties, they must draw up their award and direct it to the clerk of the court which nominated them, in order that either of the parties might have it homologated.[80] The award must be signed by the arbitrators and if any of them refuse to sign, it must be so stated at the foot of the award.[81] After their award has been sent to the clerk of court, either party may call upon the other within ten days after the notice of the motion is served upon him, to show cause why the award should not be homologated,[82] and the adverse party may, within ten days after such notification, oppose the homologation by filing with the clerk a written statement of the grounds on which his opposition rests.[83]

The court may review the award of arbitrators and rectify the errors contained therein, even though the parties had agreed that such award should be made the judgment of the court,[84] unless it appears that the parties intended to submit the matter to amicable compounders, in which case the court cannot revise the award. It must be homologated as it stands.[85]

The only source of statutory law on arbitration in Louisiana is Act No. 262 of 1928. This act in general is a restate-

78. C. P. Art. 451; 135; C. C. Art. 3115.
79. C. P .Art. 452.
80. C. P. Art. 453.
81. Ibid., Art. 454.
82. Ibid., Art. 456.
83. Ibid., Art. 457.
84. Ibid., Art. 459.
85. Ibid., Art. 460; Hart v. Stewart, 13 La. Ann. 37.

ment of the law as contained in the Civil Code, Code of Practice, and the decisions under these articles with a few changes. Because of this fact and because the Act should be of interest to engineers, it is reprinted in this paper in its entirely.[86]

86.

ACT NO. 262 OF 1928.

To make valid and enforceable written provisions or agreements for the arbitration of disputes, and to repeal all Acts or parts of Acts on the same subject or inconsistent herewith.

Be it enacted by the Legislature of the State of Louisiana, that:

Section 1. Validity of Arbitration Agreements.

A provision in any written contract to settle by arbitration a controversy thereafter arising out of such contract, or out of the refusal to perform the whole or any part thereof, or an agreement in writing between two or more persons to submit to arbitration any controversy existing between them at the time of the agreement to submit, shall be valid, irrevocable and enforceable, save upon such grounds as exist at law or in equity for the revocation of any contract.

Section 2. Stay of proceedings brought in violation of arbitration agreement. If any suit or proceeding be brought upon any issue referable to arbitration under an agreement in writing for such arbitration, the court in which such suit is pending, upon being satisfied that the issue involved in such suit or proceeding is referable to arbitration under an agreement, shall on application of one of the parties stay the trial of the action until such arbitration has been had in accordance with the terms of the agreement, providing the applicant for the stay is not in default in proceeding with such arbitration.

Section 3. Remedy in case of default—Jurisdiction—Petition and notice—Hearing and proceedings. The party aggrieved by the alleged failure, neglect or refusal of another to perform under a written agreement for arbitration, may petition any court of record having jurisdiction of the parties, or of the property, for an order directing that such arbitration proceed in the manner provided for in such agreement. Five days' notice in writing of such application shall be served upon the party in default. Service thereof shall be made in the manner provided by law for the service of a summons. The court shall hear the parties, and upon being satisfied that the making of the agreement for arbitration or the failure to comply therewtih is not in issue, the court shall make an order directing the parties to proceed to arbitration in accordance with the terms of the agreement. If the making of the arbitration agreement or the failure, neglect, or refusal to perform the same be in issue, the court shall proceed summarily to the trial thereof. If no jury trial be demanded, the court shall hear and determine such issue. Where such an issue is raised, either party may, on or before the return day of the notice of application, demand a jury trial of such issue, and upon such demand the court shall make an order, referring the issue or issues to a jury, called and empannellel in the manner provided for the trial of equity actions. If the jury find that no agreement in writing for arbitration was made or that there is no default in proceeding thereunder, the proceeding shall be dismissed. If the jury find that an agreement for arbitration was made in writing and that there is a default in proceeding thereunder, the court shall make an order summarily directing the parties to proceed with the arbitration in accordance with the terms thereof.

Section 4. Appointment of Arbitrators. If, in the agreement, provision be made for a method of naming or appointing an arbitrator or arbitrators or an umpire, such method shall be followed; but if no method be provided therein, or if a method be provided and any party thereto shall fail to avail himself of such method, or if for any other reason there shall be a lapse in the naming of an arbitrator or arbitrators or an umpire, or in filling a vacancy, then, upon the application of either party to the controversy, the court aforesaid or the court in and for the parish in which the arbitration is to be held shall designate and appoint an arbitrator or arbitrators or umpire, as the case may require, who shall act under the said agreement with the same force and effect as if he or they had been specially named therein; and, unless otherwise provided in the agreement, the arbitration shall be by a single arbitrator.

Section 5. Application heard as motions. Any application to the court hereunder shall be made and heard in the manner provided by law for the making and hearing of motions, except as otherwise herein expressly provided.

Section 6. Witnesses—Summoning—Compelling attendance. When more than one arbitrator is agreed to, all the arbitrators shall sit at the hearing of the case, unless, by consent in writing, all parties shall agree to proceed with the hearing with a less number. The arbitrators selected either as prescribed in this act or otherwise, or a majority of them, may summon in writing any person to attend before them or any of them as a witness and in a proper case to bring with him or them any book, record, document, or paper which may be deemed material as evidence in the case. The fees for such attendance shall be the same as the fees of witnesses in courts of general jurisdiction. The summons shall issue in the name of the arbitrator or arbitrators, or a majority of them, and shall be signed by the arbitrator, arbitrators or a majority of them, and shall be directed to the said person and shall be served in the same manner as subpoenas to appear and testify before the court; if any person or persons so summoned to testify shall refuse or neglect to obey said summons, upon petition the court in and for the parish in which such arbitrators, or a majority of them, are sitting, may compel the attendance of such person or persons before said arbitrator or arbitrators, or punish said person or persons for contempt in the same manner now provided for securing the attendance of witnesses or their punishment for neglect or refusal to attend in the courts of this State.

Section 7. Depositions. Upon petition, approved by the arbitrators or by a majority of them, any court of record in and for the parish in which such arbitrators, or a majority of them, are sitting, may direct the taking of depositions to be used as evidence before the arbitrators, in the same manner and for the same reasons as provided by law for the taking of depositions in suits or proceedings pending in the courts of record of this State.

Section 8. Award. The award must be in writing and must be signed by the arbitrators or by a majority of them.

Section 9. Motion to confirm award—Jurisdiction—Notice. At any time within one year after the award is made any party to the arbitration may apply to the court in and for the parish within which such award was made, for an order confirming the award, and thereupon the court must grant such an order unless the award is vacated, modified, or corrected as prescribed in the next two sections. Notice in writing of the application shall be served upon the adverse party or his attorney five days before the hearing thereof.

Section 10. Motion to vacate award—Grounds—Rehearing. In either of the following cases the court in and for the parish wherein the award was made must make an order vacating the award upon the application of any party to the arbitration.

(a) Where the award was procured by corruption, fraud or undue means.

(b) Where there was evident partiality or corruption on the part of the arbitrators, or either of them.

(c) Where the arbitrators were guilty of misconduct in refusing to postpone the hearing, upon sufficient cause shown, or in refusing to hear evidence pertinent and material to the controversy; or any other misbehavior by which the rights of any party have been prejudiced.

(d) Where the arbitrators exceeded their powers, or so imperfectly executed them that a mutual, final and definite award upon the subject matter submitted was not made.

Where an award is vacated and the time within which the agreement required the award to be made has not expired, the court may, in its discretion, direct a rehearing by the arbitrators.

Section 11. Motion to modify or correct award—Grounds. In either of the following cases the court in and for the parish wherein the award was made must make an order modifying or correcting the award upon the application of any party to the arbitration.

(a) Where there was an evident material miscalculation of figures or an evident material mistake in the description of any person, thing, or property referred to in the award.

(b) Where the arbitrators have awarded upon a matter not submitted to them unless it is a matter not affecting the merits of the decision upon the matters submitted.

(c) Where the award is imperfect in matter of form not affecting the merits of the controversy.

The order must modify and correct the award, so as to effect the intent thereof and promote justice between the parties.

Section 12. Judgment upon award. Upon the granting of an order confirming, modifying or correcting an award, judgment may be entered in conformity therewith in the court wherein the order was granted.

Section 13. Notice of motions—When made—Service—Stay of Proceedings.

Notice of a motion to vacate, modify or correct an award must be served upon the adverse party or his attorney within three months after the award is filed or delivered, as prescribed by law for service of notice of a motion in an action. For the purposes of the motion any judge, who might make an order to stay the proceedings in an action brought in the same court, may make an order, to be served with the notice of motion, staying the proceedings of the adverse party to enforce the award.

Section 14. Record—Filing—Judgment—Effect and enforcement. Any party to a proceeding for an order confirming, modifying or correcting an award shall, at the time such order is filed with the clerk for the entry of judgment thereon, also file the following papers with the clerk:

(a) The agreement, the selection or appointment, if any, of an additional arbitrator or umpire, and each written extension of the time, if any, within which to make the award.

(b) The award.

(c) Each notice, affidavit, or other paper used upon an application to confirm, modify, or correct the award, and a copy of each order of the court upon such an application.

The judgment shall be docketed as if it was rendered in the action.

The judgment so entered shall have the same force and effect, in all respects, as, and be subject to, all the provisions of law relating to, a judgment in an action; and it may be enforced as if it had been rendered in an action in the court in which it is entered.

Section 15. Appeals. An appeal may be taken from an order confirming, modifying, correcting or vacating an award, or from a judgment entered upon an award, as from an order or judgment in an action.

Section 16. Limitation of application of provisions. That nothing herein contained shall apply to contracts of employment of labor, or to contracts for arbitration which are controlled by valid legislation of the United States.

Section 17. Title of Act. This act may be referred to as "The Louisiana Arbitration Act."

CHAPTER VI

PATENTS AND PATENT RIGHTS.

Engineers often encounter the necessity or the desire to use methods of design or construction which they believe, from observation of its common use in different places, to be free from any patent restrictions. It may be that the idea, so far as they are concerned, is entirely original and is the result of independent work and study on their part. After they have made use of the method, machine, design, etc., they are confronted with a demand for compensation from parties who claim to hold, and often do hold, letters patent for the particular thing used by the engineer. It may be that the party claiming the patent has a perfectly good patent on a subject which is patentable. In that case compensation is undoubtedly due him, but in other cases the subject patented will be of such nature, due to either the subject itself or its previous general use, that no patent should have been issued for it in the first place, assuming that the party claiming compensation actually holds valid letters patent; and consequently such claims may be successfully attacked by the engineer. It is the writer's purpose to point out only some of the more general grounds on which patents may or may not be obtained, as to attempt to cover the entire law of patents would be a subject of far too great a magnitude to be attempted in this paper.

First of all, what is a patent? It is not a grant of a monopoly, as has often been supposed. It is a grant by a government to the discoverer of a new and useful invention, of the exclusive right to use or sell that invention for a period of years. The consideration for this grant which is received by the public is twofold: first, the immediate use of the invention under the patent, and secondly, the use of the invention, or the opportunity to use it, after the expiration of the patent period. It is a grant of a right to exclude all others from making, using or selling the invention covered by it without the authority of the owner.[1] It is a written contract between an

1. Standard Sanitary Mfg. Co. v. United States, 226 U. S. 20.

inventor and the government, whereby the inventor discloses his invention in such plain terms that anyone skilled in the art pertaining to it may practice it, and the government grants to the patentee a monopoly for seventeen years of the invention, to the extent of the claims allowed in the patent.[2]

The rights granted to a patentee cannot be interferred with by a state statute.[3] The patent is granted by the Federal Government and if it comes within the limit of things patentable, the monopoly period of seventeen years cannot be set aside by municipal or state governments. There is nothing to prevent the individual states from passing laws which would authorize the issuance of patents by the state. Such patents, however, would be valid only within the boundary of the state issuing it and would be invalid if it conflicted with a previous patent issued by the Federal Government.

Certain ideas are not patentable. A principle is not patentable, although a valid patent may be issued for means or methods for putting the principles into operation so as to produce useful results. A mere operative idea or principle cannot be patented,[4] and a mechanical device designed to accomplish certain practical results in the packing of explosives will be confined to the specific method for doing this.[5] Nor can a patent cover generally, any and every means or methods for producing a given result.[6] Nor is the mere function or operation of a machine or other device, as distinguished from the machine itself, patentable.[7]

The term "manufacture" as used in the patent law[8] has a very comprehensive use, as it embraces whatever is made by the art or industry of man, excepting a machine, a composition of matter or a design, all of which are covered elsewhere in the law. Thus, an arch of a bridge or like structure,[9] a

2. Fried, Krupp, Aktien—Gesellashaft v. Medvale Steel Co., 191 F. 588.
3. Ball v. Coker, 168 F. 304.
4. Cameron Septic Tank Co. v. Village of Saratoga Springs, 159 F. 453.
5. Eastern Dynamite Co. v. Keystone Powder Mfg. Co., 164 F. 47.
6. American Steel and Wire Co. of New Jersey v. Denning Wire and Fence Co., 160 F. 108.
7. Ball v. Coker, 210 F. 278.
8. Rev. St. 4886.
9. Thacher v. City of Baltimore, 219 F. 909.

street railroad transfer ticket,[10] an advertising device made of cardboard if novel and involving inventions,[11] a roof structure for a building,[12] the various parts of a railroad car where such parts are improved,[13] have all been held to be manufactures; and as such, valid patents may be issued provided they are useful and novel.

The mere carrying forward of a process or a new and more extended application of the original thought, a change only in form, degree or proportions, or the substitution of equivalents doing substantially the same thing, in the same way, by substantially the same means with better results, is not such an invention as would be patentable.[14] The transferring of an idea or process from one industry to a similar industry, as from photography to blue printing, is not patentable.[15] Nor can a valid patent be issued for an improvement which is simply a new application of knowledge already familiar to those skilled in the art.[16]

A device is not patentable when it differs from the prior methods or machines, etc., only in degree. It was held that the discovery that a smaller amount of a given mineral is required in a process than was before deemed necessary, is merely a change in degree and not of kind and consequently is not patentable.[17] Nor is the mere changing of the proportions of the constituents of an alloy, where the result was reached gradually through the experimentation of the patentees and others in the industry and the final proportions differed from those formerly used only in degree.[18]

The engineer is probably more generally interested in devices which are claimed to be patented, but which he desires to use without the necessity of paying a royalty, due to the

---

10. Cincinnati Traction Co. v. Pope, 210 F. 443.
11. Mitchell v. International Tailoring Co., 170 F. 91.
12. Aiken v. Peter & Conley Mfg. Co., 205 F. 531.
13. McKeen v. Jerdone, 34 Opp. D. C. 163.
14. Neureuther v. Mineral Point Zinc Co., 179 F. 850; Yost Electric Mfg. Co. v. Perkins Electric Switch Mfg. Co., 179 F. 511; Torrey v. Hancock, 184 F. 61.
15. Elliott & Co. v. Youngstown Car Mfg. Co., 181 F. 345.
16. In re Faber, 31 App. D. C. 531.
17. Hyde v. Mineral Separation, 214 F. 100.
18. Ajax Metal Co. v. Brady Brass Co., 155 F. 409.

fact that such patents were issued for ideas, structures, etc., which are not patentable. (The mere issuance of a patent by the patent office does not mean that the device is patentable. This can only be determined in many cases, after the matter has gone before the Supreme Court of the United States.) Where an idea or device is patented and the patent is invalid, the engineering profession is justified in using such devices without compensating the would-be patentee.

The application of an old idea to a new use, as a general rule, where the old is so closely related to the new that the application of the old device or idea to the new use would occur to a person of ordinary mechanical skill, is only a case of double use, does not constitute invention, and is not patentable.[19] The device is not patentable if the person applying for the patent has not actually reduced the idea to a practical basis before applying for the patent[20] The party who, by his own thought, makes an article or material, and first perfects and adapts his discovery to actual use, is deemed the inventor under the patent act, although someone may have previously made a similar article without putting it to practical use or giving his discovery to the public.[21] In order to be patentable a device must be novel; that is, it must be original and display inventive genius. Novelty may be evidenced by merely a simple change in construction, if such change is productive of a marked advancement in utility.[22]

If the device has been known and used prior to the time of the issuance of the patent, the patent is void and its general use by the public would be justified. The courts have held that patentable novelty is sometimes found in discovering what is wrong with an existing structure and what change in its

19. Warren Webster & Co. v. C. A. Dunham & Co., 181 F. 104; Lewis Blind Switch Mach. Co. v. Premium Mfg. Co., 163 F. 950; Wayne Mfg. Co. v. Benbow-Brammer Mfg. Co., 168 F. 271.

20. Computing Scale Co. v. Standard Computing Scale Co., 195 F. 508.

21. Warren Bros. Co. v. City of Owosso, 166 F. 309.

22. Bliss v. Spangler, 217 F. 394.

parts will correct these defects[23] It was also held that to adjust a rod to reinforce the points of greatest tension in an arched concrete structure would not be a patentable novelty, as it amounts merely to putting together by the exercise of the simplest mechanical skill, things old in engineering science, to perform functions which have long been known.[24]

It must be remembered that in the cases cited above and in countless others in which the courts have held a device not to be patentable, that the decision was handed down in a case brought for infringement of a patent already issued. It will be readily seen, therefore, that the existence of a patent covering a certain device is not conclusive, but is merely prima facie evidence that the device is a novelty, and as such is the subject of a valid patent. The burden of proof to establish a defense of prior use to invalidate a patent rests upon the defendant—the party who is claimed to have infringed it.[25] If the defendant can show this, then the burden is upon the patentee to show that his invention antedates the use claimed by defendant.[26] It must also be remembered that the description in a patent must cover the device or process used, although other parties will not be permitted to make minor changes in an idea, and thereby claim not to have infringed upon the original patent. If the operation is substantially the same, then it comes under the patent.

It was pointed out at the beginning of this chapter that an attempt would be made to point out in the scope of a brief discussion of the subject some of the rules governing patents and their validity which might be of interest to engineers wishing to use such ideas or devices but who refrain from doing so because of letters patent in existance or to those engineers who have used designs not knowing that patents exist on

---

23. Miehle Printing Press & Mfg. Co. v. Whitlock Printing Press & Mfg. Co., 223 F. 647.

24. In re Luten, 37 App. D. C. 379.

25. Parker v. Stebler, 177 F. 210; T. B. Woods' Sons Co. v. Valley Iron Works, 191 F. 196.

26 Torrey v. Hancock, 184 F. 61; New England Motor Co. v. B. F. Sturtevant Co., 150 F. 131.

them and only when this discovery when a claim is made upon them by the patentee. It would always be well for the engineer to ascertain, if possible, when the idea or device was first publicly used in this country by persons other than the patentee or parties operating under his patent, and the date of the patent. If he finds that the former antedates the latter, he will probably find that the patent is a nullity, but if the latter date is the earliest he will have to seek other grounds to defend his infringement of the patent.

CHAPTER VII.

THE ENGINEER'S LICENSE LAW

The subject of the Civil Engineer's License Law is one which is very broad in its possibilities, yet at the same time is very narrow in its present form and application.

Perhaps the time is not yet ripe when the law will require that all buildings, structures, roads, sewers, etc., be designed and built by registered engineers. (In regard to buildings it is meant that engineers should handle the structural design and erection). When this is done it will be required that everyone in connection with the work in such a capacity as to demand of him the knowledge and skill which the engineer should have will be required to register. If a corporation doing engineering work in the State of Louisiana is composed of men who are not licensed, or possibly of men who are not entitled to registration, they could design and supervise the construction of work in Louisiana, provided the men in responsible charge of the work were licensed under the Laws of Louisiana.

It should be obligatory upon municipalities and agencies of the state and other public bodies that their engineers be registered. There should also be a penalty placed upon anyone who designs or supervises the construction of a structure without being registered as well as upon the owner who has such design or structure executed by an unqualified man.

The present law provides for a penalty to be imposed upon any person who shall practice the profession of Civil Engineering or Surveying without a license, but it does not and cannot in the same act provide for a penalty upon anyone who shall employ such a person to do engineering or surveying.

While there have probably been convictions under the law as it stands today, no one who is at all conversant with the situation can doubt that there are probably as many, if not more, unlicensed engineers in the state, than there are licensed engineers. Why is the law not enforced? Is it a function of the district attorney of the various parishes to enforce this law

by prosecuting those who violate it? Or is it merely his duty to prosecute upon affidavits filed by someone else? Who is to file such affidavits—is it left to the general public, to the engineering profession, to the engineering societies or to the Board of Engineering Examiners? The law does not say. It simply provides a penalty and trusts to the good offices of someone (not named) to enforce it.

It seems to the writer that the law as it stands today, while possibly a step in the right direction, is very weak and leaves much to be desired. It provides for a board, their compensation, the fees to be paid, and other points which are mainly concerned with the details of carrying out the purpose of the law, and while these things are necessary and would have to be provided for, it seems that the result to be obtained was never provided for, which is to make it compulsory that all engineering and surveying work in the State of Louisiana be done by men qualified to perform such functions and that the evidence of this qualification be their registration.

The writer also disagrees with the present law in allowing registration on the basis of a diploma from a recognized college alone, although he was registered by this means shortly after he finished his engineering course. It is his belief that every one should be required to take an examination which would only be given to those who had graduated from an accredited engineering school or had had a certain amount of experience. It will be recalled that both the medical and legal professions at one time admitted graduates to practice without an examination, but both of these professions now require an examination from graduates of approved colleges. And it must be admitted that while the men composing the engineering profession are comparable with the members of the medical and legal profession, the engineering profession as a profession does not enjoy the same standing and dignity in the eyes of the public as do the others. Might not this attitude be attributable to the feeling on the part of the public that any "Tom, Dick or Harry" is qualified to be an engineer, and the feeling so often encountered in the layman by the engineer that he, the layman, knows more about engineering design,

location, or construction, than does the engineer? (The writer is not denying that in some cases they do, and he is ready to admit that he has learned from others, in some cases even from common laborers, but these cases are the exception and not the rule. For every case where a helpful suggestion is made, there are countless others which are worthless, made by self-appointed critics, who consider that they know more than the engineer.)

The writer is also opposed to the renewal fee in the present law. The law is supposed to be for the purpose of insuring that only qualified men be permitted to do engineering and surveying in Louisiana. When an engineer has qualified once, it is reasonable to suppose that he remains qualified until by some act on his part or some disability which may overtake him, he disqualifies himself from performing these functions. Is not the renewal fee more in the nature of an additional tax upon the engineer than a condition precedent to qualification? Is it not an absurdity to say that a man is qualified one year but is not qualified the next because he has not paid his renewal fee? It might be pointed out that the other professions, law, medicine and accounting, do not have this renewal feature to their licenses, nor do the licenses issued by the United States Steamboat Inspectors to Master Mariners, Marine Engineers and other ship officers. It is all right to impose a tax upon an individual, the non-payment of which in any year would subject him to a penalty, but it does not seem consistent to put it in the form of a license renewal. This accounts for many engineers not being enrolled as licensed engineers today. An examination of the rolls will disclose many names of engineers who have qualified in the past but who are not upon the 1930 list of registered engineers and surveyors.

MINUTES OF MEETINGS AND BUSINESS OF THE SOCIETY

Minutes of the Board of Direction, June 8, 1931

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

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

The report of the Golf Tournament Committee was submitted and on motion, duly seconded, it was voted that the Secretary be instructed to write to the Chairman and members of the committee, thanking them for their work in organizing and conducting so successful a tournament.

The resignation of Mr. O. P. Adams was accepted with regret.

Classification of Mr. E. D. Sandoz was changed to Non-Resident Member.

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

Resident Members

M. F. Canning
H. McL. Cotton
W. Laidlaw Raymond
F. J. Schwab
W. O. Turner

Non-Resident Member

Charles V. Baker

Associate Members

Robert P. Lockett
S. V. Massimini
W. A. Northington
A. J. Sarré
L. T. Stevens
Julius Szodomka
C. A. Williams

Transfer from Student to Associate Member

Charles Lob

Transfer from Student to Junior Member

J. C. Baehr

Junior Member

A. L. Black, Jr.

Non-Resident Junior Member

L. Blumer, Jr.

There being no further business, the meeting adjourned.

F. A. MUTH, Secretary.

Minutes of the Society, June 8, 1931

The meeting was called to order about 8:10 P. M., Mr. Frank G. Frost, President, in the chair, F. A. Muth, Secretary ,and 61 members and guests present.

The minutes of the previous meeting were read and approved.

The report of the Golf Tournament Committee was read and the tournament was favorably commented upon by the members present, a number of them expressing their hope that the tournament would become an annual function of the Society.

On motion, duly seconded, it was voted to recess during July and August, as has been customary.

The editorial in the April issue of the "Proceedings," relative to more papers being presented by the members, was discussed, and on motion, duly seconded, it was voted that the Secretary write to the membership of the Society, requesting suggestions as to names of members who would be in a position to present papers, and to have each member suggest the title of the paper that he can and will present and to secure other information from members relative to their preference as to the type of papers, whether technical or of human interest, which they would like to have on the program.

The Chairman of the Technical Papers Committee was present and referred to the difficulty he had in securing speakers who could be depended upon to give their addresses, without fail. He also spoke of the plan which had been carried out in the past in having a variety of subjects, whether the speakers were members of the Society or not. It was also pointed out that on three occasions during the past year members of the Society who were scheduled to speak were unable to be present, and outside speakers were called upon. Statement was also made as to the program for September and October meetings.

The address of the evening was on "Numerically Speaking," by Dr. C. G. Jaeger. The address was most interesting and was followed by some lively discussion. The speaker was then tendered a rising vote of thanks and 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.

JAMES M. ROBERT, 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
JAMES M. ROBERT, 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.

LOUISIANA ENGINEERING SOCIETY

OFFICERS FOR 1931

President, FRANK G. FROST, 317 Baronne Street.
Vice-President, FRED. N. BILLINGSLEY, 702 Interstate Bank Bldg.
Secretary, FRANK A. MUTH, 7705 Willow Street.
Treasurer, WALTER B. MOSES, 425 S. Peters Street.

DIRECTORS

J. H. O'NEILL, 637 Lowerline Street.
A. L. DUNLAP, 5524 Prytania Street.
E. S. BRES, 311 Maritime Building.
JAMES M. TODD, 818 Maritime Building.

STANDING COMMITTEES

On Technical Papers
C. C. Wiggins, Jr., Chairman
J. M. Robert
George P. Rice
R. J. Kuhn

Motivating Committee
James M. Robert, Chairman
W. B. Gregory
George R. Hammett
Charles M. Kerr
James M. Todd

On Library
Ralph Earl, Chairman
C. W. Ricker
A. J. Harris
P. F. Hoots

On Publications—Division "A"
James M. Robert, Chairman
Frank A. Muth

On Publications—Division "B"
John T. Eastwood, Chairman
D. W. Stewart, Vice Chairman
F. N. Billingsley

On Entertainments and Outings
Ole K. Olsen
Walter B. Moses

On Finance
F. N. Billingsley, Chairman
Walter B. Moses
James M. Todd

On Membership—Division "A"
D. W. Stewart, Chairman
A. L. Dunlap
E. S. Bres
H. B. Henderlite
J. L. Henning
O. O. Melancon
W. I. Neel
Ira W. Sylvester
Bryson Vallas
B. W. Pegues

On Membership—Division "B"
J. S. Barelli, Chairman
E. S. Lanphier
C. J. Wyler

On Employment
R. H. Baumbach, Chairman
R. Bassich

On Civic and Industrial Affairs
A. M. Lockett, Chairman
D. Derickson
J. F. Coleman
James M. Todd
A. T. Dusenbury
John H. O'Neill
J. D. McNiven

The headquarters of the Society are in the State Museum Building, Jackson Square.

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

PROCEEDINGS
OF THE
LOUISIANA ENGINEERING SOCIETY

VOL. XVII. OCTOBER, 1931 NO. 5

CONTENTS

EDITORIAL NOTES AND COMMENT: PAGE
The Engineer and the Depression 229
Numerically Speaking 230
An Inquiry into the Causes of and Remedies for Unemployment 231

PAPERS AND DISCUSSIONS:

An Inquiry into the Causes of and Remedies for Unemployment. *By Carl Schneider* 232
Discussion 253
"Numerically Speaking." *By Chester G. Jaeger* 259

MINUTES OF MEETINGS AND BUSINESS OF THE SOCIETY 267

EDITORIAL NOTES AND COMMENT

The Engineer and the Depression. Every disagreeable situation and every untoward circumstance must have its "goat." Too often have we seen statements to the effect that the present worldwide misery and want are caused by—whom do you suppose? None other than the engineers and inventors of machines which have thrown men out of work. This statement is usually made by labor. Can anything be more ridiculous? If we should suddenly obliterate from the face of the earth all machinery, all machine using factories, all powerhouses, all railroads, steamships, automobile transportation, what would become of the millions of workers still employed therein, even during the depression. There are more workers now making shoes in shoe factories with the aid of machinery than there ever were making shoes by hand. And the shoes are better and cheaper to boot. So it is with almost any other commodity that you can name. A world census will show that in almost every case more people are now employed in the pro-

duction of a given commodity with the aid of machinery than were ever employed in the production of the same commodity before the introduction of machinery. And in addition labor is working shorter hours for better pay.

No, the trouble is not mechanization. The engineer has gone on in his quiet way showing the world how to increase production so that there is enough for all. But the banker, the economist, and the business man have not kept pace with the engineer. They have not yet been able to show the world how to distribute the commodities so bountifully brought into existence by the engineer. So far they have made a sorry mess of it. The banks are full of money, the fields are full of rotting food, the manufacturers' shelves are full of all sorts of commodities, and yet the great mass of people are without money, food and clothes.

The waters are continually muddied by the cry that the engineer is responsible for this condition through having *produced too much*. Rot, rot, pure rot! The engineer hasn't produced too much. What he has produced just hasn't been distributed. Why cannot the banker, the economist and the business man show the world how to satisfactorily distribute these goods?

Going off the gold standard is acknowledged by some elements to be a measure which would remedy the situation. It would probably be at the expense of creditors, however. Apparently an attempt is being made to sidetrack this particular remedy. Why?

Unemployment relief just now is not only commendable but necessary. But the effort is being made to obtain this relief in driblets from the public at large. Why? Is this only another attempt to direct attention away from the immense accumulation of wealth from which the relief should properly come? We wonder!

Numerically Speaking. The intriguing fascination of numbers has occupied the mind of man from the earliest ages.

Professor Jaeger's paper on this subject gives us a glimpse into some of the mysteries of numbers, both large and small.

Particularly interesting is his demonstration of the fact that there must be a number of persons in the world with the same number of hairs in their heads. Interesting too is the statement that if in a town of two thousand all played bridge once a week, it would take 4350 years of such playing to deal all the possible "hands" in a deck of cards.

An Inquiry Into the Causes of and Remedies for Unemployment. The paper with the above title and printed in this issue is a masterly discussion of the subject. Mr. Schneider is to be congratulated, indeed, for the keen power of analysis he has shown. The labor of writing this paper was considerable and has won him recognition afield. Mr. Schneider is a very busy man.

The paper stands as its own answer to those of our members who can write papers but excuse their nonperformance with the plea that they "haven't time." Let's have more papers of this quality from our members.

Incidentally, any member who fails to read Mr. Schneider's paper has missed a real treat. His excursion into the field of economics, showing the engineer's viewpoint, is a truly clear treatment.

PAPERS AND DISCUSSIONS

AN INQUIRY INTO THE CAUSES OF AND REMEDIES FOR UNEMPLOYMENT

By CARL SCHNEIDER.*

Read before the meeting of the Society, September 14, 1931.

Introduction

It is with a great deal of misgiving that I face this audience to-night. I fear not only my lack of training as a public speaker, but even more so the subject which is chosen to discuss. I make no claims to be an economist. One might say that I have no business, therefore, to select a subject so obviously the field of political economy. I had good reasons for doing so. My first object was to help to interest the members in their responsibility to contribute papers; secondly, I wanted to demonstrate that the engineer has a deep interest in social matters, which he has, unfortunately, not been in the habit of analyzing and discussing with the same earnestness that he has devoted to technical matters, and, lastly, I wanted to test my own mettle, to see whether I was capable of working up a subject on which I was so little informed, and do it while I was very busy—in a word, to puncture the member's alibi that he is too busy to prepare a paper.

I have said that I feared the subject. No doubt all of us have our ideas on unemployment causes and remedies. To have ideas is one thing—to preach them as gospel is quite another. So, let me make myself clear. This paper has no political significance; I preach no new economies; as the title implies, it is an inquiry, a big question to myself, an experimental venture into a field related to but quite apart from engineering. I have not the background of training to permit me to offer answers or solutions to the problem. I simply try to express ideas of my own as well as others borrowed for this occasion. Reversing the usual order of our technical exercises, I shall ask numerous

*Member. Mechanical Engineer, Department of Public Property, Division of Public Works, City of New Orleans.

questions as I go along. Maybe you will be able to answer them—I don't propose to; I am too little informed.

The preparation of this address has cost me a great deal of time and effort—I know I am the chief beneficiary, but I want to thank you now for your indulgence in coming to hear what I have to say. I hope that others who prepare papers for future meetings will have as much genuine pleasure in their work as I have had in mine.

Let me acknowledge ideas and material that I have gathered from various sources.

"The Problem of Unemployment" by Professor Paul H. Douglas and Mr. Aaron Director has been my constant companion for over a month. "Business Cycles and Business Measurements" by Mr. Carl Snyder has also furnished a good deal of material. The courtesy of the Macmillin Company in permitting the use of such material for this paper is gratefully acknowledged. I am also indebted for ideas to Mr. Stuart Chase and that grand old Scotchman, Ramsay MacDonald, Prime Minister of England. His book on Socialism held me spellbound time and again as I read it. Besides other works, I have perused numerous articles in periodical literature, all of which are gratefully acknowledged. I have tried to observe the problem from various view-points.

Now, let's begin at the beginning.

The economic purpose of society should be to provide a "plentiful subsistence for all the people". The wisdom and truth of this statement, which was first expressed by Adam Smith over 150 years ago, should stand unchallenged. The purpose is probably just as far from fulfillment to-day as it ever has been. Who knows whether it ever will be fulfilled? The problem of wresting the "plentiful subsistence" from nature has been solved. (At least as far as the United States is concerned). Witness the reports on every hand of enormous crops, and large stocks of consumer's goods of every description. The country is overstocked not only with the necessities of life, but also with most luxuries;—but, the "plentiful subsistence" is not distributed among "all the people". The surpluses exist, to some extent, because the purchasing power of the masses has become greatly

lessened through lack of employment. This should not be. As long as there are "wants" to supply there is work to be done, and as one cannot conceive of every individual's "wants" being fulfilled, there should never be a time when the world has worked itself out of a job.

The problem of unemployment and business depression that confronts the United States to-day, (and a large part of the world, forsooth), is believed the most serious that has ever beset us. Wars and depressions of the past have left their imprint on American history, and, we all feel that, in one way or other, we will come out of the present depression. Its lesson should not be forgotten but used as a starting point for a better future. It is our duty to posterity.

Since the advent of mechanical and electrical power into the world's work, business depressions have occurred at varying intervals and with increasing intensity. Mr. Stuart Chase outlines five great periods of prosperity during the period of American independence, that are related in time to wars, discoveries of gold and mechanical inventions.

Employment, simply for the sake of employment, is not a social object. Nature's legacy to man in exchange for living is that he must have food, clothing, shelter and heat (fuel). Unless he produces them all for his own needs, he is forced to sell his labor, or service, for something he can give in exchange for them. The greater the degree of civilization in which he lives, the more specialized his services become, and the greater the necessity for such exchanges.

Unemployment has been characterized as a social disease—its effects are not only visited on those afflicted, but on society as a whole. The economic losses due to unemployment may be stated as

(1) Wages lost by individuals, resulting in reduced purchasing power.

(2) Markets lost to producers and sellers of goods due to restricted purchasing power.

(3) Capital's loss due to idle plant investment.

(4) Restriction of output through fear of unemployment by those still at work.

(5) Diminishing wealth by consumption without replacement, and
(6) Potential loss due to lack of production by those unemployed.

Such economic losses are replaceable. It has been said that the entire wealth of the nation could be reproduced in a period of ten years. What seems to be a loss of far more seriousness is of a social nature. Unemployment has a tendency to shatter the belief of the individual that he, himself, is important in the scheme of life.

There are three general classes of unemployment: (1) Seasonal. (2) Technological, and (3) Cyclical.

SEASONAL UNEMPLOYMENT, as its name implies, is due to weather conditions, either directly or indirectly. Styles, habits and crop management have large influences on the use of certain kinds of products and manufactured goods and consequently their production is often timed to meet the consumers' or nature's demands. Great seasonal fluctuations are found in the demand for fertilizer, millinery, sugar production, stoves, coal, confectionery, and women's clothing, while fluctuations in demand for foodstuffs are small or moderate. In cold climates, building trades and many outdoor occupations are necessarily subject to large fluctuations.

In order to stabilize employment conditions as well as plant operation, various measures have been put into effect by manufacturers to offset seasonal fluctuations in demand for their products. These may be summarized as follows:

1. Sales and market policies to obtain more even rate of orders. Special inducements to retailers, such as discounts, are offered to stimulate buying during slack seasons.

2. Planned programs of Sales and Production—and storing surpluses during slack seasons. This method has been practiced for years by Proctor and Gamble, Packard Motor Car Co., and Gorham Silver Co.

3. Manufacture of side lines and fillers for slack season or for better balance. Winchester Arms Co. now manufacture hardware and sporting goods and sell through the same retailers. The Denison Mfg. Co., originally manufacturing jewelry boxes for Christmas trade, have added lines of wrappers and labels.

4. The elastic day or swapping hours. This scheme is followed by certain railroads which in order not to lay off men in dull seasons or add more in heavy, have, through cooperation of employees, balanced their work by having men work a greater number of hours per week during the heavy season with corresponding reduction of hours during slack periods.

Regularizing employment by such means helps both manufacturers and labor. Consideration must be given, when debating as to whether regularization should be followed, as to whether the gains to the manufacturer will offset the added costs. The gains will include: (1) Cheap production with less labor turnover, (2) less average working capital required, (3) less fixed capital in plant per unit of product, and (4), possible lower average wages due to steady employment offered. The costs will include: (1) storage space for finished product, (2) advertising costs to promote side line, (3) price discounts to dealers, and (4), capital tied up in finished goods stored.

Further factors to consider are possibility of style changes affecting demand, the degree of monopoly on the finished goods enjoyed by the manufacturer, and the skill necessary for the workers engaged in the business.

TECHNOLOGICAL UNEMPLOYMENT is the offspring of engineering, scientific and administrative causes. Under this classification appear:

Mechanization, when machines replace men;

Substitution, as a result of scientific invention, the advance in the use of the new product involving a decline in those replaced;

Time study, wherein greater output per operator is secured through elimination of waste motion and effort;

Mergers or consolidations, affecting the white-collared fraternity by reducing overhead and labor as well through closing inefficient plants;

Chain store merchandizing, resulting in reduction in number of independent retail stores; and

Employment policies that affect older workers. In many corporations the minimum age of new employees is 45, 40 or even 35 years. Many years of useful service are still to be had from these unfortunate outcasts.

One might say the basic cause of this type is free, unregulated competition—or even more so, the quest and race for larger profits. As a result of competition, commodity costs come down and in this respect national economy is bettered—but the guiding star is not lower costs or better welfare of the people—it is bigger and better profits.

Economists say that workmen displaced by technologic methods are only temporarily unemployed. The shifting of workmen from an old industry to a new one or to other branches of the same industry takes time, especially when changes of residence become necessary. Shifts in industry through mechanization or substitution sometimes occasion drastic results to old established industries, destroying old capital while creating new capital.

The reduced costs of commodities resulting from technologic changes enable the consumers of such commodities to either spend the difference on other commodities or to save and invest the difference. Those who receive the profits of industry are enabled to spend more for luxuries, thus creating demand and employment, or to invest the capital created in new expanding industries. It is therefore argued that the purchasing power of wealth created by technologic means is indestructible and that eventually all displaced workers will be reengaged.

The placing of labor suffering technological unemployment may be expedited or the losses to labor reduced in several ways. Professor Douglas mentions:

1. Forecasting by business authorities of changes about to take place and warning workers of impending necessity for change of employment;

(2) Planning and scheduling in the industry where the changes take place so that they would be gradual and not spasmodic;

3. Requiring corporations of public interest (such as railroads) to provide for older workers when mergers take place;

4. A system of public employment offices for gathering statistics and assisting in the finding of jobs for displaced workers;

5. Expanding vocational training in factories and schools to promote versatility of workmen;

6. Granting a dismissal wage to tide over a period pending securing other employment.

7. Unemployment insurance, involving contributions by workers, employers and state to pay benefits to workers involuntarily out of employment, pending their reengagement.

One of the most forceful movements at present in defense against technologic unemployment is to reduce the number of hours worked per week, either by the shortened day or the four or five day week. Arguments are centered about the fact that a generation ago, the ten or twelve-hour day was not uncommon, and that the eight-hour day, so general to-day, is an outgrowth of mechanized industry. The scheme has a great deal of merit, particularly in times of depression to tide over the emergency. It does not, however, tend to increase national wealth or purchasing power, but rather to spread it. The lack of training or fitness of the unemployed when placed in jobs so created may even have a tendency to increase costs of production, and so injure national economy.

Other measures deserving favorable consideration deal with old age and widows' pensions and raising the age limit for child labor. In many cases only stark necessity keeps old people or children at work, not the desire of those dependent on their incomes. In certain types of employment youths and old men are not only suitable but even desirable—and their well-being is in no sense retarded.

The tremendous increase in our national wealth and the raising of our living standards—for the masses as well as the classes—has been due to scientific, engineering and administrative accomplishment. The reversion to older systems of industry, less efficient in creation of wealth, simply to create more jobs, is unthinkable. The problem is resolved into one of better use and control of technologic development.

The prosperity of the past generation and the increase of our national wealth have been exemplified in increasing production and consumption of what were once considered luxuries but are now often considered as necessities. The automobile alone has brought wealth and prosperity undreamed of before 1900, and has placed 4,000,000 workers, it is estimated. Motion pic-

tures, radio, modern plumbing, electric lights and appliances in the homes, silk and a host of lesser articles, swell the total. Has saturation been reached in the consumption of such goods? How near is it? Is production to continue to climb as it has in the past? Can any one conceive a consumption capacity able to digest the pyramiding increase in the manufacture of such articles? What is there to take their place? Where will the capital produced find an outlet? Mr. Adolph Ochs, publisher of the New York Times, says that idle capital presents a greater problem than idle labor.

Herein lies the seriousness of the present depression, which makes it appear different from others that have gone before.

Plant capacity for production of shoes is nearly three times the rate of consumption; sugar refining capacity is 70% greater than the country's requirements. It has been said that the radio industry can produce 15 million units per year in a market that will only absorb 3 million. I have been told that one manufacturer alone is capable of producing as many locomotive cranes as are sold in the entire country. Automobile production capacity is now on the order of 7,000,000 cars per year—only 3,500,000 were sold last year, only one out of every six going to the owner of his first car. Not only does it appear that commodities and raw materials have been overproduced; *the machines to produce the commodities are far in excess of the demand.* That is partly why the banks are filling up with idle cash.

The new competition of substitute articles only means scrapping old plants, often very efficient, to be replaced by others catering to new styles. It is as much destructive as constructive. For quite some time, installment plan merchandizing, high pressure selling and advertising, had operated to stimulate demand and thus defer the inevitable crash. These devices, meritorious in that they helped to keep up profits, were not really creative of wealth, nor did they improve the *purchasing power* of the masses, *the only solid foundation for prosperity.* Not only that —they have increased the cost of goods so that in some cases fifty per cent of the selling price represents selling and promotion expense—the tail almost wags the dog! Advertising and high-pressure selling are the children of competition, a burden to the

cost of goods, and they give no assurance that quality is delivered to the consumer—business still means "caveat emptor".

If we have approached the saturation point in the consumption of the automobile, what is there to take its place? Are we like Alexander the Great with "no more worlds to conquer" or are we just "all dressed up with no place to go"? The airplane does not seem to have the same popular appeal nor anything resembling an equivalent market.

Does not the most promising opportunity for expansion of activity and the creation of wealth appear in improving what we now possess rather than in finding something new to take up where the auto leaves off?

One of our finest opportunities rests in the creation of greater public wealth, public works which all can enjoy—parks, roads, art galleries, playgrounds where every child may exercise its birthright in safety, separation of grade crossings and so on.

The steady increase of city population with much smaller increase of rural has brought the necessity of extensive city planning. Side by side with the need for public works stands the need for slum-razing and better housing facilities for the poor. Not as charitable institutions, but as sound business propositions these needs will be met. Life must be made more enjoyable as well as livable.

We now come to—

Cyclical Unemployment, which goes hand in hand with business depression. It is the outgrowth of technologic production, large scale enterprise, division of labor and extensive markets. It seems inherent in the capitalistic system of economy and its ultimate solution will only be possible through planned production on a national and international scale. Business depressions and periods of rapid expansion and prosperity that receive their impetus from such causes as war, gold discoveries, and large crop failures do not permit of forecasting or planning to offset their influence. Independent of such causes, business cycles occur as normal results of supply and demand, price variations, psychological and monetary causes. It is thought that proper planning, may, to some extent, modify the effects of cycles of the latter type.

Stripped to its fundamentals, it appears that the normal business cycle may be characterized as a race between producers and consumers, motivated by psychological causes, especially the primitive law of self-preservation or, to be more blunt, *selfishness.* "Everybody for himself and the devil take the hind most!" Let me explain. Consider the period of prosperity when prices are advancing. The ultimate consumer has optimistic views and exercises no restrains in buying. Anticipating rises in prices, he takes on obligations for time payment probably in excess of his real purchasing power. Such practices in turn lead to larger orders by retailers on wholesalers and they on manufacturers. All along the line, orders are placed far in excess of what normal consumption rates would dictate, the basic reason being "saving" or increasing anticipated profits. Sooner or later, prices advance to the point where the ultimate buyer "goes on strike". Back through the economic structure the consumer's message travels. Retailers, wholesalers and manufacturers are stocked with goods and orders are curtailed. The general slump in business is accompanied by wage reductions, factory closing and general layoffs of employees. The deflation process proceeds —surplus stocks are sold off at reduced prices to meet financial obligations and even to maintain solvency—often at less cost than their production. During ascending and descending periods technologic development is going on. It helps to increase profits on the uptrend and to avoid losses as trade recedes.

Who shall bear the responsibility of these business gyrations? Shall it be the ultimate consumer who rushes to buy as prices advance, because he fears they will go higher, and refuse to buy as prcies go lower expecting to save more by waiting? Why not the retailers, the wholesalers, the manufacturers or the producer of the raw material? Are not all motivated by the same identical feeling? What is it—Service or selfishness?

It is believed that the length and intensity of business depressions are greatly magnified by curtailed expenditures on the part of those who can well afford to spend. It is almost an economic law that people will not buy while prices are declining. The aggregate amount of trade lost from hand-to-mouth buying, by consumers, retailers, wholesalers and manufacturers, is hardly measurable but must reach tremendous proportions for the na-

tion as a whole. The watchword "economy" seems to be out of place during depressions—and yet it is the order all through the economic structure.

Closely affecting the variation in prices, and, consequently the trend of business, is the world's supply of gold, and its rate of production for monetary purposes. To maintain a constant price level and therefore stability of trade, the gold produced for monetary purposes must proceed at a fixed ratio with the production of goods. Due to the use of gold in the arts and its hoarding in India, the gold available for monetary purposes has not been keeping pace with the accelerating rate of the production of goods. Furthermore, the leanness of the ores being mined indicates a decreasing rate of production for years to come. Prof. Douglas, in his book in the "Problem of Unemployment", discusses the situation very fully. Admitting that such prophecies are dangerous, he states that the probabilities seem to indicate a slow secular decline in the price level with consequent increase in the average amount of unemployment during the next ten years. This is a very sorry outlook indeed, and unless some departure from the present gold standard, which is practically universal, be adopted, the only hope of better times would seem to be new discoveries of rich gold mines.

As a remedy for cyclical unemployment, the first line of defense seems to be the spreading of what employment is available. The curtailed hours of work, however, mean curtailed earnings for the individual worker, and on the whole business is not assisted to recovery. Many companies "make work" for their employees and others during periods of depression by carrying on extensive maintenance and repairs, replacing obsolete equipment, new construction of plant, buildings and facilities, producing goods for stock, etc. Analyses of payrolls to determine which employee should be retained on account of dependents, ante-dating pensions, limiting the number of wage-earners from single families, etc., are means intended to minimize the social effect of unemployment.

Finally, direct means of assistance to persons laid off become necessary. These include: Finding temporary employment; loans through cooperative workmen's associations or by the employers;

granting a dismissal wage where no assurance can be given of re-engagement; and direct relief from community welfare agencies.

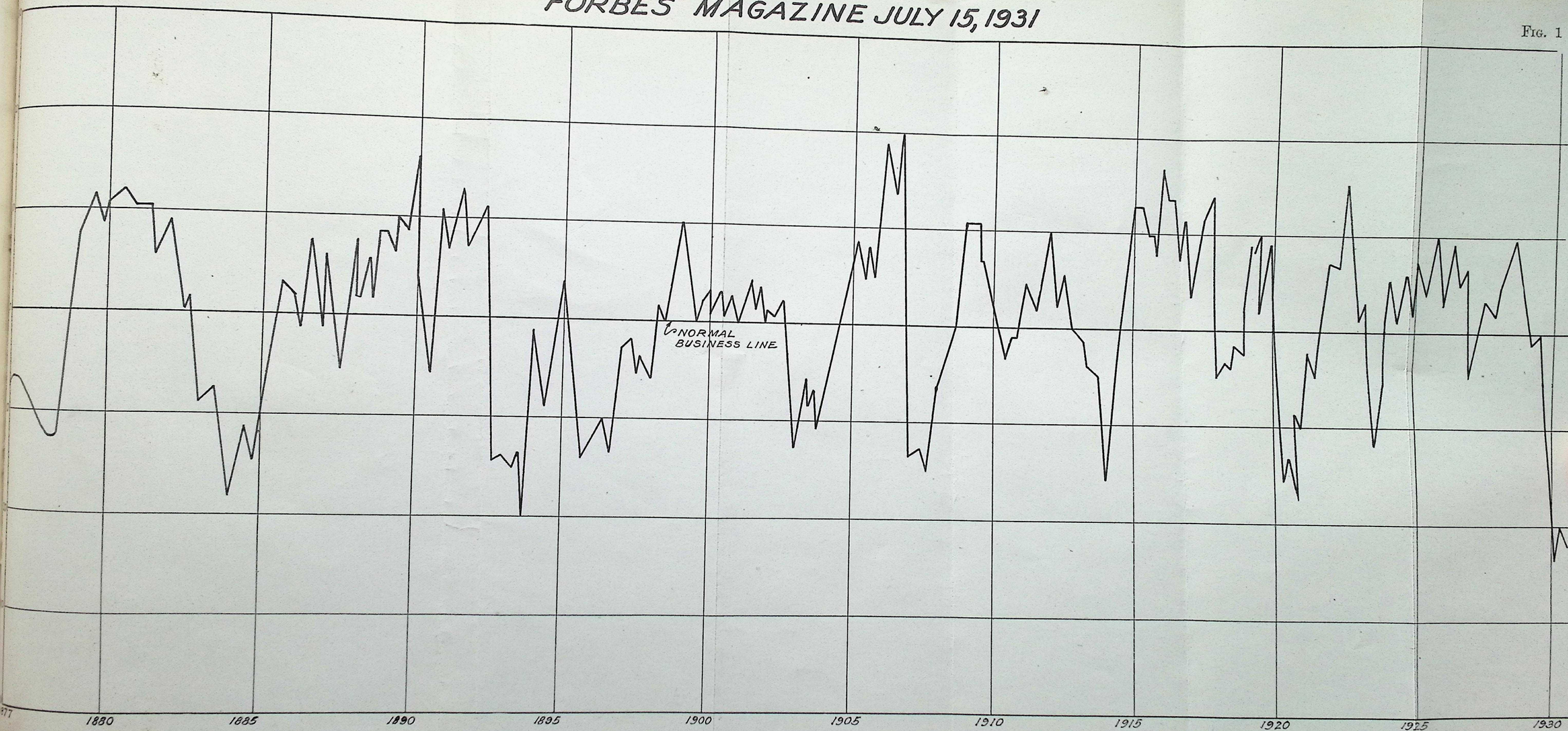
The long range planning of public works and their accelerated execution during depression periods has been advocated as a counter force to cyclical unemployment. Public works, federal, state and county or municipal amount to 35% or 40% of the entire nation's construction work. By far the greater portion is by municipalities. It is believed that the expansion of such work during business depressions will help to stimulate other activity and will, in the aggregate, create much more business than the sum total cost of the works in the program.

Too much optimism should not be placed on the effectiveness of a public works program. Theoretical and practical difficulties are numerous. It is argued that the government would be in the position of competing for labor in dull times and would hence cause a shrinkage of private construction. Only the construction trades, supply dealers and the handlers and producers of the commodities used would be helped directly. The help to factory workers in unrelated lines would be negligible. The location of the works to be undertaken and the greatest need for employment would not always coincide. Centralized control of the program is quite impracticable. Political considerations interfere—the spending of public funds has been considered as part of the fruits of victory. In certain classes of work, such as levee construction, special expensive equipment is necessary—the extra equipment that would have to be constructed to carry on an enlarged program would mean heavy carrying charges when normal rate of construction would be resumed.

Until some far-reaching plan can be carried out that will balance production and consumption, stabilizing business, price levels and employment, some form of unemployment insurance through national legislation seems inevitable. The experiences of England and Germany during the past few years with this remedy for unemployment have proved little short of disastrous, and yet, what constructive measure has been offered to take its place? Who knows what the consequences to these nations would have been without the dole? It were better by far that every individual be able to draw on his own reserves in time of depression—but the reserves of the poor have never been adequate for cover-

INDEX TO BUSINESS
"FORBES" MAGAZINE JULY 15, 1931

FIG. 1



ing extended periods of unemployment. Their trouble has been less a lack of thrift than a lack of income to build up reserves.

Many are the arguments for and against the dole. It is said to encourage laziness and a lack of thrift and will eventually lead to impoverishment of the nation that practices it. Opposed to these arguments, it is claimed in its defense that it maintains self-respect of the recipient in that he has the satisfaction of knowing that he has contributed to the funds that he receives to tide him over, it spreads the burden on labor, industry and society as a whole and takes the place of huge scale charity. Stuart Chase says charity is an insult. Furthermore, it is charged that the employment of labor is the duty of industry and that charity for the unemployed is the most pernicious form of the dole, the dole to industry.

A very necessary measure in connection with unemployment insurance is a system of public employment offices or exchanges. They would be clearing houses for statistics and would operate expedite re-engagement of labor and thus minimize the payment of benefits.

Most measures resorted to in times of business depression, such as shortened hours, spreading employment, plant repairs, made work, dismissal wages and unemployment insurance are only palliatives and represent a "defeatist" attitude. To solve the problem is to remove the causes and prevent recurrences of business depressions. The only cure or real remedy for unemployment is work.

Fig. 1 is a chart representing the index figures of business in the United States from 1877 to date. It appeared in "Forbes" magazine July 15, 1931, in conjunction with an article by Mr. C. W. F. Hubner, entitled "Is This Depression Different?"

With such a complex subject to represent, no chart can satisfy all possible arguments. The general impression from it is that business has been running along without either governor or flywheel. The unemployment problem would be greatly diminished if not altogether removed by (to use an engineering expression) "straightening out the load curve of business". "Laissez-faire", individualism, or capitalism, whichever you will, has wrought the chart of the past, and seems incapable of

solving its own problem. It can hardly be entrusted or expected to furnish the governor or the flywheel. Socialism holds many hopes, but in its broad sense is not felt applicable to American people. We are not cut to a standard pattern. Does it not seem practicable in seeking the golden mean between individualism and socialism, that the state must eventually solve the problem, if it will ever be solved?

A great many plans have been offered as solutions of the problem of unemployment, some only concerned with the needs of the present, some with a view toward permanent remedy.

The U. S. Employment Stabilization Board, effected through Senator Wagner's bill, proposes to help through expansion of public works anticipating times of depression, and contracting expenditures of this nature in times of prosperity. Its shortcomings have already been pointed out.

Mr. Hearst proposes a $5,000,000,000 loan to be spent on public works at once—amending the Volstead Act—and paying off the loan through taxes on liquor.

Professor Ely of Northwestern University proposes a "peacetime army" engaged on such work as reforestation, road construction and embellishment, park improvement, etc.,—to be financed through luxury taxes.

The Liberty magazine has advocated a "back to the farm" plan, where the individual will be better able to be self-supporting.

Mr. Stuart Chase believes our salvation rests with the "philosopher engineer", as a controller of production.

In the "Forum" for July appeared the "5 Year Plan for America" by Mr. Chas. A. Board, an eminent economist. It is a far-reaching ambitious plan to stabalize industry, reduce commodity costs and increase wages. It is based on the trend in recent years towards huge scale enterprise. It provides for a National Economic Council to guide its destinies; industries of high concentration to be syndicated as national public service corporations; repeal of the Sherman and Clayton Anti-Trust Acts; a bureau of Strategy and Planning, with similar boards in the industries syndicated; syndicates for Agriculture, Marketing and Foreign trade; it contemplates harmonious contacts through

diplomatic relations and the use of economic pressure where necessary; provides for expansion of activities of U. S. Bureau of Standards for care of research of industries affiliated; the industries affiliated to be absorbed through 3 per cent bonds; watered stock to be squeezed out through inheritance taxes; gradual elimination of the public at large from ownership and eventual ownership by the government and the employees. Employment reserves will be set up to take care of depressions if any should arise. On the whole the plan demonstrates Mr. Beard's unusual comprehension of a tremendous problem. He says himself that he has set it up as a target which may bring forth more and better ideas. Some of his critics wonder "Who is there that can put the plan into effect?"

From the Monthly Labor Review—(U. S. Dept. of Labor), March, 1931.

"A conference on permanent preventions of unemployment was held in Washington on January 20, 1931, under the auspices of the social action department of the National Catholic Welfare Conference, the social justice commission of the Central Conference of American Rabbis, and the social service commission of the Federal Council of the Churches of Christ in America . . . . . Three main causes of the present unemployment situation were advanced by different speakers; too restricted bank credit, an uneconomic division of the national income between capital and labor, and a faulty organization, or, rather, lack of organization of the business and social order.

Mr. William Trufant Foster of Cincinnati pointed out that since we live in a monetary economy, the volume of bank credit determines the volume of business possible. In 1929 the volume of bank credit was reduced by several billion dollars (Mr. Stuart Chase says "thrifty billions went whistling out of Wall Street") and inevitably business and employment slumped. At the present moment, business needs nothing but money spent by consumers. Consumers are eager to buy but they cannot do so until there is more money in circulation. The necessary money must go into circulation through bank credit, now potentially ample, or it will not go at all.

Speaking on the relation of wages and hours to unemployment, John P. Frey, secretary-treasurer of the metal trades de-

partment, American Federation of Labor, maintained that the effect of modern machinery and improved methods of production has been to decrease the proportion of the national income going to labor, thereby diminishing the purchasing power of the general public and causing such crises as the present. This process has been especially rapid in recent years. Quoting from the Census of Manufactures, he showed that in 1927 wages in all manufacturing industries, exclusive of salaries, amounted to $10,848,802,532, and in 1929 to $11,421,631,054, an increase of $572,828,522. In 1927 the value of manufactured products was $62,718,347,289, and in 1929 it was $69,417,515,929, an increase of $6,699,168,640. In other words, while the purchasing power of the wage earners had increased by not far from $600,000,000, the value of manufactured products had increased by something over $6,500,000,000. Obviously, the increase in productive capacity far outran the increase in capacity for consumption. The gap between the two is no new thing, but it has widened rapidly since 1923, and especially since 1927.

Another evidence of the changing proportion in which the national income is divided is found in Federal figures which give the proportion wages form of the value added by manufacture. In 1849 the wage earner received in wages 23.3 per cent of the value of the finished product and 51.1 per cent of the value added to the raw material through manufacture; in 1929 he received 16.5 per cent of the value of the finished product and but 36.2 per cent of the value added by manufacture.

As the home market is the principal outlet for manufactured goods, the great increase in the value of products as compared with the increase in the volume of wages paid, resulted in a collapse of the consumer's market, and this more than any other cause, is responsible for the present industrial and commercial stagnation.

Shortening hours will not meet the needs of the situation. The increasing productivity of labor makes a reduction of hours possible and desirable, but such a reduction, by itself, would merely result in spreading work more widely without any increase in the general purchasing power. What is needed is a readjustment of wages, and until this has been made, it is difficult to see how unemployment can be prevented. It is not only

a question of what labor may be entitled to; it is largely a question of the volume of wages which must be paid unless industry and commerce are to suffer.

Speaking on the topic, "Are Business Cycles Avoidable?" George Soule, of the New Republic, advanced the view that depressions are a natural result of the lack of organization of the business body, which, indeed, can hardly be spoken of as a body at all; it is rather an aggregation of separate cells or units, loosely held together, each acting in response to the stimulus of its own environment without common plan or purpose. Industry staggers along without plan and without direction, and depressions are a natural accompaniment of its chaotic condition. If they are to be avoided, the business body must supply itself with a brain and act under its direction. As a means toward this end Mr. Soule suggested four steps:

"First, we need an economic general council, composed of delegates from both management and labor groups in the important industries and occupations, with representatives of public administrative bodies and experts in the various lines covered, whose function should be to give continuous consideration to economic policy and to make recommendations to both government and industry.

"Second, there should be an economic general staff, which should consist of a permanent body of independent professional experts. This should function as an agency for presenting information and proposals to the national economic council. It should correlate current statistical information and try to fill the gaps in existing statistics. It should follow the changes in our economic conditions, think out problems, foresee changes, formulate plans, and present proposals for action.

"Third, there should be a national planning board concerned chiefly with planning national development on the basis of economic geography. This should carry out on a national scale the sort of thing done by the city and regional planners. Such a body would be of inestimable value in preparing the way for any large program of public works to relieve depression.

"And, fourth, there should be a national board of investment, which should have oversight over the savings and investment of capital, both by private concerns and by government,

much in the same way as the Federal Reserve System is now supposed to regulate commercial banking."

These three causes go right to the root of the problem and their removal or correction should be the aim not only of the nation, but even of the entire world. It is a job for big men and big minds, indeed.

In regard to the first of these causes, it is believed that bank credit is responsive to general business conditions and restricted bank credit is an effect of business depression, rather than a cause. Those who need funds most are without adequate security to borrow and the banks could not be expected to make loans without security. Extra precautions and wariness of bank officials in making loans during periods of depression are a natural psychological reaction which is further illustrated by the reluctance of the general public to buy up to its normal capacity while prices are receding.

The uneconomic division of the national income has long been advanced by labor as the source of our economic ills. In payment for its hire labor receives wages; capital receives interest, rents, profits and dividends. It has been estimated that 86% of the nation's goods are consumed by labor. Labor's capacity as a consumer depends on its purchasing power or wages. To improve labor's purchasing power added income must be derived from the income of capital or from increased costs of commodities. Increasing productivity of labor resulting in reduced costs of commodities has raised living standards of labor and purchasing power but has not of itself brought about an equitable distribution of the national issue. Increasing the cost of commodities will in turn decrease labor's purchasing power so that the only practical way of increasing labor's purchasing power is to transfer part of capital's income to labor. How can it be done?

Capitalists and economists say that the price of money, i. e., interest, obeys the law of supply and demand the same as any commodity. When money is in great demand, interest is high; when the supply greatly exceeds demand, interest rates decrease. This appears to be only partly true. The law is undoubtedly in effect in the case of "Call money," which, however, amounts to less than 2% of money loaned in business transactions. It is

probably also much in evidence on other short loans. Interest rates on bonds and mortgages fluctuate very little and the same applies to a great deal of money loaned by banks. Possibly 60% to 80% of borrowed money is loaned at stable interest rates.

Will Rogers says: "It isn't supply and demand, it's old man interest that's got the world by the ears."

Fig. 2 is a chart from "Business Cycles and Business Measurements," by Mr. Carl Snyder of the New York Federal Reserve Bank, illustrative of customer's interest rates in selected cities.

Consider now the large amounts borrowed from building and loan associations and various types of financing companies —most of which charge higher rates of interest than banks. It is easy to conceive that the "interest" income of capital might generally exceed 6% and even approach 7% on the average.

Just get these figures:

One dollar invested at	3%	6%	7%
is worth in 25 years	2.09	4.29	5.43
" 50 years	4.38	18.43	29.46
" 100 years	19.22	339.30	867.76

with interest compounded annually.

Need there be any more emphatic picture of the onus that capital places on the income and wealth of the nation than compound interest? Does it not appear that the most salutary way to increase wages is to lower interest rates by legislation if possible? Interest legislation, to be effective, must be on a national and international scale. If foreign interest rates cannot be affected, would it not be possible to equalize the income from foreign investments by taxation, in order to keep a sufficient supply of capital within the nation? Jeremy Bentham in his "Defense of Usury" is said to have shown that legislation setting limits on interest will have no effect. If the allowed rate be greater than the actual, the law is unnecessary; if the allowed rate be lower than the holder of money wants, he will not lend except at his price plus an insurance premium for protection from legal punishment. Still, it seems that a low interest law would be a popular law and its enforcement would

CUSTOMERS RATES OF INTEREST IN SELECTED CITIES

FIG. 2

From - "Business Cycles and Business Measurements"
Snyder.

not present the obstacles of unpopular laws. This should at least be so in the instance of large financing operations. The loan shark and the pawnbroker could probably find ways of exacting higher tolls, but not banks or investment institutions subject to investigation by bank examiners.

The income of capital from rents, profits, and dividends might indirectly be used to augment the income of labor. Due to the risk of the undertaking, it should be recognized that capital's income from these sources should be greater than pure interest income. Excessive profits, dividends and rents might be subjected to the leveling effect of taxation. Income should bear the greater burden of taxation and the property tax might accordingly be reduced. Questions in this regard which are presented are "Would the fixation of dividend rates through governmental regulation or taxation have a beneficial effect on business in general, should such fixation minimize stock market speculation?" Is not the pulse of the stock market sympathetic with dividends and anticipated dividends? In seeking to avoid heavy taxation, would not capital be compelled to pay more for materials or labor or both in order to show lower dividends or profits? It has often been said, with a great deal of truth, that taxation has a deadening or braking effect on business, but, as not the effect of free competition between huge enterprise and the small producer been to crowd the latter to the wall? Which has been more noticeable in the conduct of big business—avarice or generosity?

With reference to the correction of the third cause brought out at the Washington conference, the lack of organization or faulty organization of the business and social order, can this correction be left to business to handle without governmental regulation? Certainly not with free competition. Regulated monopolies, as public service corporations, as outlined by Mr. Beard, offer the beginning of a solution. Just how much concentration will necessitate an industry's being affiliated with the National Economic Council is still a matter of conjecture.

Is not the police power of a nation becoming to mean more than control of public health and safety? Does it not seem that

our very well-being, our material welfare, will sooner or later have to be upheld by the nation's police power? Socialism is still anathema to most of our people and to our governmental institutions. Business doesn't want government as a competitor nor as an interferer, or regulator. And yet in certain classes of monopolies, the government has been in business for many years. Socialism is with us and we think nothing of it. The United States Post Office Department, public school education by state or parish or county, and water departments and garbage collection by municipalities are all socialistic activities; they are conducted by the government without profit. It is generally conceded that these activities are conducted on a high plane of service.

The conservation of our natural resources is another factor that will tend to favor greater governmental control over industry.

As long as free competition and unrestrained profit-taking hold sway, we can probably expect business cycles.

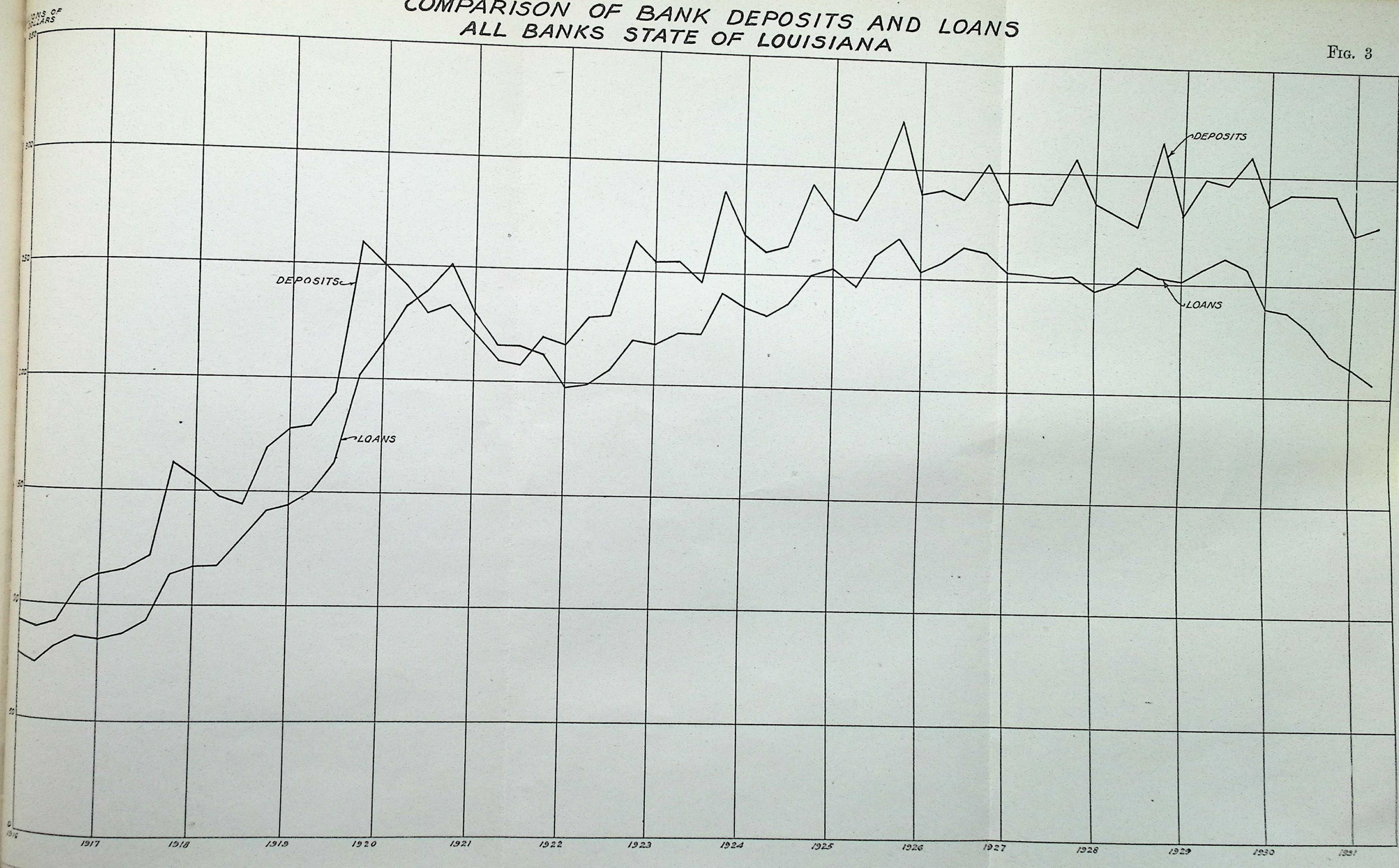
THE SOCIAL ASPECT. What good can come of theories and ans as long as nothing be done to improve moral standards? n we expect better economic conditions before we have bet- social conditions? Which shall come first? Consider the oughts in the Papal Encyclicol on Labor which appeared several months ago. Our economic life must be inspired by Christian principles—charity and justice. Charity cannot make amends for justice but has a real field if justice is to be realized in human relations.

The mechanization of industry has very probably aggravated certain reprehensible qualities in our behavior as human beings. Dishonesty, laziness and super-selfishness have always existed in human relations, but have probably been multiplied in their spread and intensity in highly mechanized civilization.

Is there any answer to all these troubles? I can think of no words more fitting to use than I heard over twenty years ago, when I was a youngster leaving grammar school to enter high school. Our class was addressed by Rev. J. C. Barr on three words which may well stand for the rule and guide of one's life.

COMPARISON OF BANK DEPOSITS AND LOANS
ALL BANKS STATE OF LOUISIANA

FIG. 3



Here they are—"High Ideals, Hard Work, and Loving Kindness." They encompass all of our troubles and problems.

You will probably think that I have gone off on a tangent and am preaching a sermon, and should you regard me a better preacher than engineer, I shall feel more honored than chagrined. I want to repeat one solemn thought and then I am through.

The most touching article that I read in my research on this subject appeared in the "New Republic" of May 6, entitled "My Brother Commits Suicide". It was written by a Texas college professor, whose brother, without funds and without a job, had taken his own life rather than beg or starve. The author thought that his brother's death—and others like him—may cause a realization that human life, human happiness, human souls are of more value than profits or dollars; that it may cause a realization that business should exist not to create more goods, but to create for all men the opportunity to live, and that more abundantly.

And so, we wind up with the expression of the same thought with which we started.

DISCUSSION

PRESIDENT FROST: Mr. Schneider, we thank you for that paper. Mr. Schneider is the man who made the statement that more papers should be presented by members of the organization. He had the courage of his convictions to present this paper and he spent considerable time and burned a great deal of midnight oil to get all of his subject matter together. It is now open to discussion. Has anyone any questions to ask Mr. Schneider or any thought to add to this? We will be glad to hear from you.

PROFESSOR GREGORY: Mr. President, I want to express my appreciation of this paper. It seems to be a sum up of the whole problem. I remember receiving a letter from Mr. Wallace, Secretary of the American Engineering Council, which is about to consider that problem of unemployment, and they are looking around through the various cities and states for men who can

contribute to that work and who have ideas and are willing to put some time on the problem. It seems to me Mr. Schneider would be a very valuable worker for the American Engineering Council, and with his permission I shall write tomorrow and tell them about this most excellent paper.

PRESIDENT FROST: Does anyone else have a thought to add? This is a very deep question and in order to comment on it, you should have the paper before you. Just from hearing it, it is hard to get your thoughts together and concentrate on any question to ask.

MR. WIGGINS: I believe Mr. Schneider is more or less familiar with something closer to us. Can you tell me something about the accomplishments of the New Orleans Welfare Committee? I believe you are more familiar with how they work and what they have accomplished. How do they go about it and what is it?

MR. SCHNEIDER: With reference to what the New Orleans Welfare Committee is doing, I can only answer for the contact we have had through the Division of Public Works. I cannot say how many are receiving benefits, but it has been the practice of the New Orleans Welfare Committee to try to place people in work so that they will have some satisfaction in knowing they are not exactly subjects of charity. We have about three hundred men engaged in cutting grass, and similar tasks,. work which we would ordinarily be carrying on our payroll, but cannot now because of restricted budgets. These men work three days a week for $2.50 each day. It is just enough for a bare existence, and it has been a rule that only those with dependents will be engaged. Single men are uot of luck to receive relief of any kind through the New Orleans Welfare Committee.

The original funds of the Welfare Committee came from public subscription, benefits, etc. The relief is now being financed by five per cent of wages and salaries of state and city employees. I think about $40,000 a month is being raised now and being spent.

PRESIDENT FROST: Has anyone else a thought to offer?

MR. SCHNEIDER: A thought just occurred to me. I had in mind working it into this paper and yet fear of my subject running away with me caused me to omit it. I cannot help saying that this depression has brought home to me a kind of charity that does not find its way into the head lines of newspapers. It is the charity going on among the poor, that you men who come in contact with it appreciate. It is the charity of helping out poor relations. It is brought home to me by the people selling this or that article or food through house to house and office to office canvass. A great many could not possibly have been at work before and it is simply because their poor relations cannot carry on their help any more that they are trying to make their own.

PROFESSOR ANDERSON: It always seems to me in investigations of unemployment they have not gone into the matter deep enough to find out how much of the present depression is due to real unemployment and how much due to a lack of desire for employment. I know there have been a number of instances to my notice and others of individual effort to give employment to men and it has met with so little reception from the recipient that it is surprising. If they come to your home, if it is not just what they want to do or the amount of money they think they should receive for the work, they turn it down. So, in investigation, loal and national, we have not paid enough attention to how great the need is.

Another point Mr. Schneider brought out, clearly involves the moral side of the issue: selfishness. The British people go after these things in a more straight forward manner. We have read how they have tried to solve the depression with the dole and with a tremendous tax on income. We know the result of breaking down labor government and the new government trying to solve the problem in a different way. I do not think in this country we have tried the income tax. I think capital can stand a much heavier income tax than it does at the present time. It

seems to be one of the solutions. I would personally hate to see the dole, because it looks like real charity, but it seems to me with the tremendous amount of capital in the hands of individuals, that the government could well put on a heavier income tax.

QUESTION: How would you use that income tax money?

PROFESSOR ANDERSON: By doing government work and giving employment.

MR. SCHWAB: Mr. Schneider brought out the technical improvements. We have invented machinery whereby a man with a machine can produce in a lesser time what it would take many men to produce in a great many hours. But now we have reached the point where our inventors have not kept pace with improvements. If we could invent something else like the automobile we could go ten years lnoger. But now what will we do? Our inventors must invent something revolutionary that will give employment to those men who have been replaced by machines.

MR. SCHNEIDER: There seems to be no substitute for the automobile on the horizon of industry. Expansion of public works is undoubtedly a pressing need, not only to take up the slack in industry but also for better conditions of health and safety among our cities. The problem of taxation will be greatly magnified, especially as additional sources will have to be tapped to meet governmental obligations.

MR. SCALES: During the administration of President Harding, the coal industry was in dire straits and a survey was made to study and make recommendations for alleviation of conditions then existing. The report of the Government Committee or Board was, in effect, that employment in the coal mining industry was in a bad way; because primarily there were about six hundred thousand coal miners in the United States to fill four hundred thousand jobs. In commenting on that condition, President Harding made the remark that apparently the miners themselves were willing to suffer the discomfort of two or three days employment against a full week's employment because the

rate of wages they were receiving was sufficient to give them income enough to satisfy them at a living wage. They did not care to go out and seek employment in other lines. It was said the Building Trade and other allied organizations were similarly effected, but it did not work out that way. Some went into industries, but not many. I wonder if Mr. Schneider in his research, ran across any of those figures and got any specific data together which could be used, for instance in the coal industry or the oil or lumber industries? The situation is parallel in both those industries and I wonder if the studies made a few years back have any bearing on the present day's situation and if they were taken into consideration.

Another thing if you can expand on it, would be the effect of the United States holding more than one-half of the gold supply of the world. We have over five billion dollars in gold in the Treasury today. And of course, the gold question, that is the supply of gold, has been one of great importance to international bankers.

MR. SCHNEIDER: I undoubtedly came across the figures but cannot recall them off hand. For a long time the coal industry has had more men working in it than were required. Another thing that affects this condition is the economy practiced in fuel consumption and households. One of the important things about the coal business is, that in over production, if any mine is abandoned, all of the coal in the ground is lost. The natural resources are lost in addition to the capital invested. I do not recall the figures off hand about how many miners are engaged and what would be the necessary number to keep the coal industry operating. Europe has the same problem and it is due mostly to oil propulsion of ships and economy in fuel use. England also has been confronted with a reluctance of miners and other tradesmen to leave one locality for another. The question of gold supply and reserves in the United States is one which I am unable to discuss satisfactorily.

PROFESSOR DERICKSON: It was pointed out that in the coal industry there are so many small mines operating on a shoe string that can pay $2.00 a day when markets are good and when prices are bad they go out of business and the miners with them.

Mr. Schneider said he was a better engineer than preacher. An engineer doesn't plot curves; he tries to judge the future by performances of the past. He has charted some curves there and I venture to say he could predict our problems ten years from now.

"NUMERICALLY SPEAKING"

By Prof. Chester G. Jaeger.

Read before the meeting of the Society, Monday, June 8, 1931.

I do not suppose that there is anyone who goes through a day in his life without using numbers in one way or another. It may be in some simple way, such as finding the page of a book, or making change in a filling station. But everyone uses numbers.

If one were going to study numbers, just as numbers themselves, from the outset he would say that he had a very dry outlook. This is entirely untrue, I think. There are things about numbers that are very interesting, but most people do not know them. I shall discuss a few of those things about numbers that ordinarily do not come up in the affairs of life. There are several things that can be said in this connection. One could spend the whole evening on why we use certain symbols or number systems. But rather than dwell upon any one phase, I shall say a little about several different phases. First, a few things about how we came to use the decimal system; why a system based on ten rather than another number? Surely there was no divine power that said the number ten was the thing! The reason undoubtedly was because we have ten fingers, and that originally people counted on their fingers. Counting was the first mathematical operation. If we had been born with six fingers on each hand, we undoubtedly would have the duodecimal system. It would have been a better system, because twelve is divisible by 2, 3, 4 and 6, whereas ten is divisible only by 2 and 5. If we speak of one-quarter of ten, we have to say two and one-half tenths.

As a matter of fact, there are tribes that count to high numbers, but still with their fingers. They will have one man who will be counting cocoanuts (it may not be, but can just as well be). The first fellow will put up ten fingers(one at a time, when he reaches ten he puts his down and the next fel-

low puts up one, and then another, until they have enough men in a row to count as high as they want to. 2-5-8 would mean 258.

The Esquimo used a system based on five, rather than ten. The Romans had something like this system, too. They have simply strokes for 1 (I), 2 (II), 3 (III), and 4 (IIII), while 5 is a V. The five was indicative of the open hand, V. And they used the V and started over again and added I, etc., until they reached ten, which was originally two fives or $\overset{V}{\underset{\Lambda}{}}$ For the purpose of making it rapidly they made an X instead. However, that is somewhat a matter of conjecture. For example, one is guessing when explaining the other Roman symbols. No one knows what L stands for. The C is supposed to stand for centum, and M for mil, for 1000.

The Greeks used the alphabet for their number system instead of having separate symbols for numbers. From one to nine they used the first nine letters, and for tens they used the next nine, and for hundreds they used the next nine. I know you will tell me they had only twenty-four letters in the alphabet, but they arbitrarily added three to get twenty-seven. For higher numbers they used accent marks and other combinations which gave a very complicated appearance.

It was the Hindus and not the Arabs, as ordinarily thought, who invented our present number system. They not only invented that, but introduced the symbol zero (0). Up until the 5th century none of the previous systems of counting had a symbol for zero.

One of the principal parts of our discussion this evening is more in line with the title, "Numerically Speaking." I will say a few things about large and small numbers.

You hear people saying every day they saw a million this or that, and speak of a million very indiscriminately. If you stop to realize how much a million is, you are usually very much surprised. For example, a person sees a very old man, and he has lived hour after hour, day after day, week after

week, year after year, decade after decade, and yet to live a million hours, he would have to be 113 years old.

It takes nearly two years for the second hand of your watch to go around one million times, moving day and night without stopping.

And you certainly think you have seen one million ants at one time here in New Orleans. Consider one of those lines of ants—(I caught an ant and measured it, and it was one-eighth inch long). As they travel along they keep a space between them, but even if they are crowded and only one-eighth inch apart, one million ants would stretch from Audubon Park to Canal street.

Imagine one million automobiles traveling bumper to bumper at the rate of 30 miles an hour. It would take four days for them to pass.

If a person had one million hairs in his head, he would have to have a head 14 inches in diameter. Speaking of the number of hairs one has on his head, it says in the Good Book that even the hairs on our heads are numbered. If you asked the average person, "Do you think there is someone in the world who has exactly the same number of hairs in his head as you?" he would immediately say "no." Yet there are many people in the world with exactly the same number of hairs in their heads, and I can prove it.

Now there are almost two billion people in the world—one billion eight hundred million. It would be impossible for anyone to have this number of hairs in his head. It would have to be solid hair and then some. Suppose you assembled all of the people in the world and found one without any hair at all, and put him first; and then found a fellow with one hair, and put him second, and found one with every successive number of hairs on his head. Finally we would have the fellow with most hair (which would not be nearly one billion, eight hundred million), and there would be some people left over. These would have to stand beside the people with the same number of hairs in their head. (Laughter).

We read some months ago of the Englishman, Campbell, who drove his automobile at the rate of 240 miles an hour. Most of us say he went 240 miles on hour, and think no more of it. That means going from the entrance of Audubon Park to Canal street in a minute. Or another way to think of that speed—suppose Captain Campbell was going along a road at that rate of speed, and a man in a balloon wanted to drop a bomb on him. The balloon is 1000 feet up in the air. He knows he must start the bomb a good bit sooner, and decides since he is 1000 feet up in the air, about 1000 feet ahead of his automobile would be about the place. But Campbell would be one-third of a mile past that spot before the bomb hit the ground.

One more thing about this speed. Suppose the track suddenly curved up 45 degrees, and assuming he didn't spill over, but was projected out into space, he would have sufficient velocity to easily clear the Eiffel Tower.

The sun is 93 million miles away. There again we say 93 million miles and think nothing more about it. Light travels 186,000 miles a second, or about seven times around the world per second, and it takes 8.7 minutes for light to get here from the sun. A medical man who knows the velocity of nerve reactions told me if you could reach your hand up and touch the sun, it would be 273 years before you knew you were burned.

Speaking of this great distance of the sun, an astronomer was trying to impress a layman, and looking through his telescope, said: "Just think, that sun is 93 million miles away." And his friend, taking a look, said: "It doesn't look over ten million miles to me."

But the sun is closest, except for the moon, of all heavenly bodies. Some of these bodies are so far away they have ceased putting distance down in miles, but in light years—the number of years it takes light to travel to the earth. Some are several thousand light years away. For example, Sirius is called a close star, and it is 8.8 light years away from the earth.

Nowadays it is a great pastime for everybody to say his city has the biggest grapefruit or biggest building, but none

can brag about finding the biggest number; all you have to do is double it, and you have a bigger one.

I had an old professor when I was a freshman, and we would talk about a big number and say seventy-five billion, billion, billion, and he would say, "If you want to talk about about big numbers, talk about a million to millionth power." Suppose you wrote that down on paper, and you allowed one-eighth of an inch for each figure, that number would take fourteen and one-half ($14\frac{1}{2}$) miles of paper to write. However, that is still a fairly small number compared to this number, which is the biggest that can be written with only three figures. nine to the ninth power to the ninth power, $(99)^9$. That number has 370,000,000 figures in it, and takes 87 miles of paper to write it down.

Let us consider a few problems where you get big numbers of that sort. Suppose we have ten books and decide to arrange them on a shelf in various positions. How many different ways can they be arranged? Ten books can be arranged on a shelf in 3,628,000 odd ways. For any other number it can be easily seen how big the figure gets. If we had only A, B and C, we could write it

A B C
A C B
B C A
B A C
C B A
C A B

There are six different ways you can arrange them. Suppose I have three spaces to fill and three objects. I can put any of the three in the first space. As soon as I fill the first space there are two objects left, and the second space can be filled in two different ways, .and then have one left. 3x2x1 is hte number of ways. It is a matter of extension with 4,—4x3x2x1. For 9,—9x8x7, etc. If you do that with 10 and multiply by all the integers, you get 3,628,800.

Suppose there was a murder committed at midnight and one person saw it, and within fifteen minutes he told two people, and within the next fifteen minutes (and mind you, fifteen minutes is a good period of time between each conversation) each of those two people told two other people, with no duplications, etc., until everybody in the world knew it, how long would it take? Before six hours, every one of the two billion people in the world would know it.

Suppose you had an organization or town of 2000 people and they all played bridge once a week, and each time they played, each person dealt fifty times, or four hands each time. With 2000 people you have 400,000 hands dealt every week. This problem is to emphasize the possible number of bridge hands in a deck. Suppose we dealt these bridge hands at the rate of 400,000 hands a week, with no duplicates—how long would it take to deal out all the hands in a deck of cards? It would take 4350 years. If you do not believe any of these figures, then figure them yourself.

Here is another old problem. Start saving 1c, then the second day 2c, etc. Instead, suppose you put away 1c the first week, 2c the second week, 4c the third week, and so on. What would you have at the end of the year? A number in dollars with thirteen figures before the decimal point, in the trillions of dollars.

If 1c was invested at compound interest at the birth of Christ, what would it be worth now? Instead of putting it in dollars, I translated it into a chunk of gold. One cent, invested at 6 per cent compound interest, translated into a solid sphere of gold, would be much larger than the earth.

Those are big numbers, of course. How about little numbers?

An atom expressed in centimeters is written .00000001, and it is 50,000 times as big as an electron.

Suppose we want to express a number bigger than any of those we spoke of. We have a symbol called infinity. If you double and double forever, what number are you approaching?

No number. But as this gets infinitely larger, we say it approaches infinity. For example, there are an infinite number of numbers. You can get in danger by treating infinity as a number. Suppose one person would write all of the integers and another only the even ones. The second person is leaving all of the odd integers out—just one-half as many as in the first, yet for every integer there is an even integer. There are just as many in one-half of the thing as in the whole thing. That is because you are treating infinity as a number. Speaking of infinity, there is a little poem:

There was a professor at Trinity,
Who took the square root of infinity.
But in counting the digits,
He broke out with the fidgets,
Now he teaches in the school of divinity.

So much for these big and little numbers.

There are a few interesting relations between numbers that I shall speak of. Certain numbers are called perfect numbers. By that we mean one such that the sum of its divisors is its total. 28 is such a number. 28 has the divisors 1, 2, 4, 7 and 14. These add up to 28. The next perfect number is 496, and then they are spread out sparsely. After 496 comes 8128, and the next is 33,550,326. There is a formula for computing perfect numbers, so there is no doubt about their distribution. The ninth perfect number has 37 figures in it.

Another class of numbers is called friendly numbers. Friendly numbers are two numbers which bear certain relation to each other. For example, consider 284 and 220. If you should write all the divisors of 284 and add them up, they would give you 220; and should you add the divisors of 220, they would total 284. It is a very rare combination.

I just want, in closing, to quote one more little poem to illustrate how a modern young lady makes use of mathematics also. This conversation takes place between father and daughter:

"My daughter," (and his voice was stern),
"We must set this matter right.
What time did that young chap leave,
Who sent in his card last night?"

"His work was pressing, father dear,
And his love for it was great.
He was in his car and gone
Before a quarter of eight."

Then a twinkle came in her bright eyes,
And her dimple deeper grew.
"'Tis surely no sin to tell him that,
For a quarter of eight is two."

MINUTES OF MEETINGS AND BUSINESS OF THE SOCIETY

Minutes of Special Meeting of the Board of Direction, July 17, 1931

The Board held a special meeting at 12:15 P. M., July 17th, at Kolb's restaurant, and the following members were present: Messrs. Frost, Todd, O'Neill, Moses, Bres, Dunlap and Muth.

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

Ballots for members were canvassed as follows, there being 96 formal ballots and one informal ballot. Therefore, the following members were declared elected:

Resident Members

M. F. Canning	W. Laidlow Raymond	F. J. Schwab
H. McL. Cotton		W. O. Turner

Non-Resident Member

Charles V. Baker

Associate Members

Robert P. Lockett	W. A. Northington	L. T. Stevens
S. V. Massimini	A. J. Sarre	Julius Szodomka

Non-Resident Associate Member

Chester A. Williams

Transfer from Student to Associate Member

Charles Lob

Transfer from Student to Junior Member

Jerome C. Baehr

Junior Members

Lienard Blumer, Jr.	A. L. Black, Jr.

Communication of June 17th from the American Engineering Council relative to the Temple Act, for completion of a topographic survey of the United States, was considered, and, on motion, duly seconded, the following resolution was recommended to the Society for its endorsement:

> Resolved, That the Louisiana Engineering Society go on record as endorsing the immediate carrying out of the Temple Act, (Public Law No. 498, 68th Congress, February 27, 1925)

which provides for the completion of a standard topographic map of the United States in twenty years;

Be It Further Resolved, That the entire Congressional Delegation from Louisiana be urged to secure sufficient appropriations to carry out the intent of the Temple Act and that any restrictions denying the immediate execution of the surveys be removed in order to expedite the completion of the topographic survey of the United States.

There being no further business, the meeting adjourned.

F. A. MUTH, Secretary.

Meeting of the Board of Direction, September 14, 1931

No meeting of the Board was held this month.

F. A. MUTH, Secretary.

Minutes of the Regular Meeting of the Society, September 14, 1931

The meeting was called to order about 8:15 p. m., Mr. Frank G. Frost, President, in the chair, F. A. Muth, Secretary, and 56 members and guests present.

On motion, duly seconded, it was voted to dispense with the reading of the minutes of the previous meeting of June 8th.

Several committees made verbal reports.

Announcements were made of the death of two of our members—Mr. J. W. Billingsley of New Orleans, and Mr. E. G. Sandoz of Slidell.

On motion, duly seconded, the President was authorized to appoint two committees of three members each to draft suitable resolutions or memorials, as the case may be, in the passing of the two members referred to.

A most interesting address was given by Mr. Carl Schneider on "An Inquiry Into the Causes of, and the Remedies for Unemployment."

This address was followed by considerable discussion. A rising vote of thanks was then tendered the speaker and the meeting adjourned to the usual collation.

F. A. MUTH, Secretary.

PROCEEDINGS
OF THE
LOUISIANA ENGINEERING SOCIETY

VOL. XVII. DECEMBER, 1931 NO. 6

CONTENTS

EDITORIAL NOTES AND COMMENT: PAGE
The Old New Orleans Mint Building ... 269
Engineers and Employment ... 270
The November Meeting at Tulane University ... 271

OBITUARY:
James Wartelle Billingsley ... 274
Elbert G. Sandoz ... 276

PAPERS AND DISCUSSIONS:
The Old New Orleans Mint Building. *By Allison Owen* ... 278
Discussion ... 292
Report of the Committee on Relief from Unemployment of American Engineering Council ... 297

MINUTES OF MEETINGS AND BUSINESS OF THE SOCIETY ... 304

EDITORIAL NOTES AND COMMENT

The Old New Orleans Mint Building. In this issue will be found a history and description of a notable old building—the old Mint as it is most commonly known.

The history of the building is interesting indeed, but certainly not less so than its construction.

Most interesting was the information that the main vaulting was supported on piers and pilasters without being tied into the walls. This showed a wise provision for settlement under heavy loading without affecting the walls.

Remarkable too is the statement that the galvanized 20 gage roofing which must have been installed in 1856 is still sound!

The building is now being remodelled as a Federal prison in support of our great national "noble experiment." Experiment? Yes. Noble? Who knows?

General Owen has shown considerable patience and labor in assembling here for permanent record so much of history and technical fact. But for his effort what is now of record must soon have become tradition.

Engineers and Employment. Just at this moment we are not interested in the factors which were the causes of our present depression, but we are all immediately and vitally concerned with any vigorous campaign to end it.

In the last analysis business depression means just one thing—unemployment. Therefore, any scheme to end depression must perforce concern itself with the problem of employment; both unemployment insurance and, to a much greater degree, employment stabilization.

The engineer must do his part to bring about better times. Strange to relate the general public is beginning to believe that he can bring to the problem at least the same measure of intelligence as can a member of any other group.

The Chairman of President Hoover's organization on employment is himself an engineer.

The American Engineering Council, as the mouthpiece of the engineering profession, has also entered the fray. To this end the Council has appointed a Committee on Relief from Unemployment. This committee has rendered a report entitled "Engineers and Employment."

This report is printed elsewhere in this issue and is commended to your careful perusal.

In addition to this, the Council has formed committees in each state to represent the engineering interests of their respective states on the subject of relief from unemployment. This committee from Louisiana is composed of members of the Louisiana Engineering Society and is as follows:

Carl Schneider, Chairman, City Hall, New Orleans.

J. T. Bullen, Parish Engineer, Court House, Shreveport.

John Klorer, Chief Engineer, Orleans Levee Board, New Orleans.

D. S. Anderson, Dean of Engineering, Tulane Universtiy, New Orleans.

W. B. Gregory, Tulane University, New Orleans.

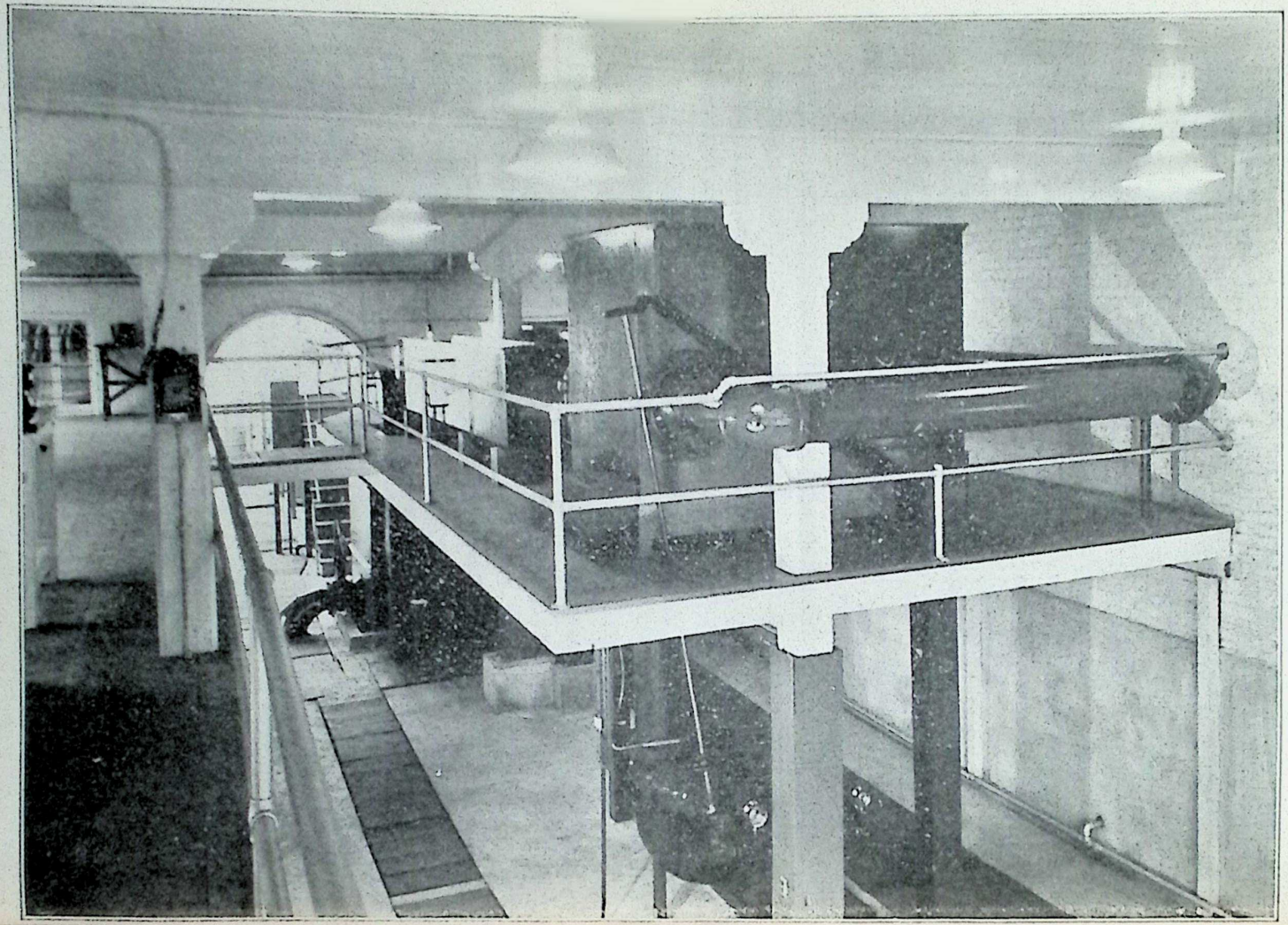
John L. Henning, Consulting Engineer, Lake Charles.

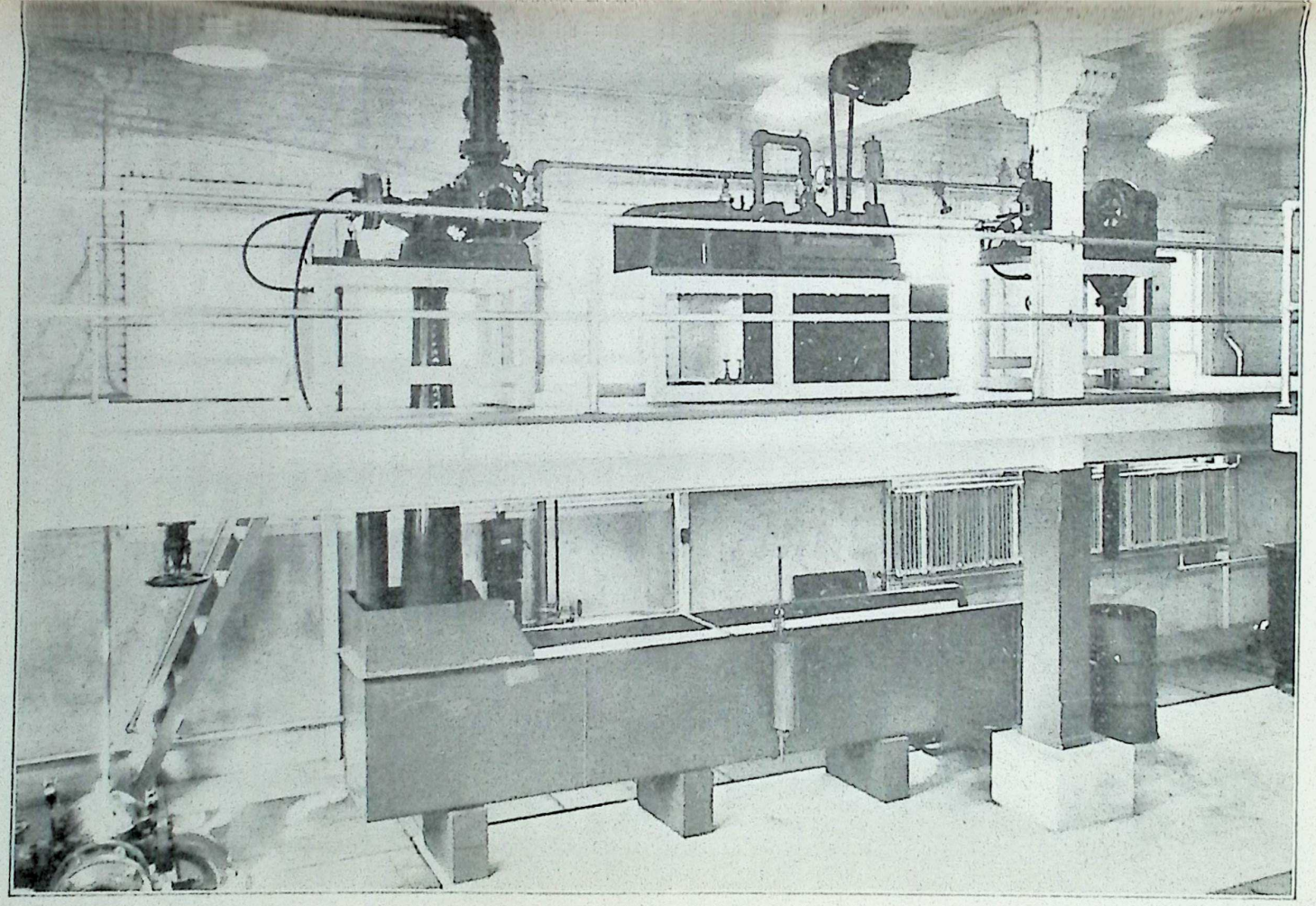
It behooves each and every one of us to put our shoulder to the wheel. In behalf of those of our profession and all others who are unemployed, let's help. To those of our profession who are still fortunate enough to be employed, let's work, work, work!

The November Meeting at Tulane University. As a variation of the character of our regular meetings, the November meeting was held at Tulane University. The technical exercises were turned into an inspection of the engineering laboratories. The members were first assembled in Stanley Thomas Hall, where they were given a short talk by Dean Anderson on the plan of inspection.

The members were then broken up into groups and each group was conducted in turn through the Electrical, Hydraulics, Steam, Materials and Gas Engine Laboratories, the Blacksmith Shop, Boiler Room and Engineering Mechanician's Shop. All of these shops and laboratories were being operated by students so that the members were given a good idea of the work being carried on in them.

Some of the laboratories have recently been made over. The Hydraulic Laboratory has been completely rebuilt under the direction of Professor W. B. Gregory, and was a source of considerable interest. We reproduce herewith two photographs of this laboratory.





Partial View of West Side of Hydraulic Laboratory—Tulane University.

OBITUARY

JAMES WARTELLE BILLINGSLEY

James Wartelle Billingsley, consulting engineer and capitalist, died on August 17, 1931, in Chicago, Illinois, after a brief illness.

Mr. Billingsley was born in Arcadia, La., January 29, 1880, the son of James J. Billingsley and Georgine Wartelle. His collegiate education was secured at Rensselaer Polytechnic Institute, Troy, New York, where as an outstanding student he was elected to Sigma Xi, honorary technical fraternity. He graduated in 1902 with the degree of Civil Engineer.

He immediately began moulding an engineering experience which was to serve him so well in his future work as a consulting engineer in extensive industrial and economic developments. In 1903 he entered the employ of Sanderson & Porter on public utility construction in Connecticut, and the following year was employed in the testing and fabricating department of the Westinghouse Electric Company at East Pittsburg, Pa. In 1905 he returned to the South with Sanderson & Porter on public utility work in New Orleans, and was later associated with the Fred A. Jones Company, Consulting Engineers, of Texas, as the New Orleans Manager. It is of interest to learn that it was at this time that Mr. Billingeley was in charge of the preliminary location and reconnaissance surveys of the pioneer modern highway between New Orleans and Chef Menteur, which is now one of the finest highways in the South. As a member of a board of Engineers with John W. Alvord, President of the American Water Works Association, and Hiram Phillips, President of the Board of Public Works, St. Louis, in 1912, he planned and designed the new water works system for Oklahoma City. Mr. Billingsley returned to New Orleans in 1914 and with his brother, Fred M. Billingsley, engaged in private engineering practice. While this work covered all engineering branches, the greater part was devoted to public utilities, irrigation and reclamation. His wide experi-

ence thus gained made him valuable to capitalists and investment companies in making appraisals and engineering reports for industrial developments. During the World War he was in charge of the engineering work of the United States Housing Corporation in New Orleans. With the inception of the good roads movement he developed the program entailing the expenditure of several million dollars in the parishes of Richland, Claiborne, Catahoula and Ouachita.

In 1927 Mr. Billingsley was appointed one of the committee of eight hydraulic engineers of the American Society of Civil Engineers acting as consultants to the House Flood Control Committee on the engineering phases of the Mississippi Flood Legislation. He was local representative of the firm of Modjeski, Masters & Chase, Consulting Engineers and Designers of the Public Belt Bridge across the Mississippi River at New Orleans, actual work upon which will begin within a few weeks.

With the activity and development of real estate in the South following the World War Mr. Billingsley devoted his energies to the development of the Mississippi Gulf Coast, and was responsible for the promotion and construction of the Edgewater Gulf Hotel at Biloxi and the Hotel Markham at Gulfport.

Mr. Billingsley, always closely in touch with technical activities and advancements, was a member of the American Society of Civil Engineers, American Society of Municipal Engineers and the Louisiana Engineering Society. To the latter during the past few years he donated several hundred engineering text and other books which have proved a most valuable addition to the library. Prominent in the civic and social life of New Orleans, he was a member of the Boston, Pickwick, Louisiana, New Orleans Country, Metairie Golf and Delta Duck clubs.

Mr. Billingsley was a striking example of the economic engineer of to-day, with the ability to visualize in such manner as to prove practicable of execution. His judgment was sound and his wide knowledge of business methods, together with his insight of financial operating of industrial, economic

and engineering problems, made him a most valuable asset to the community. To his social and personal charm he added the personality of his blithe and optimistic spirit and in his passing the engineering profession and New Orleans loses one of its ablest leaders and a genuinely constructive force for sound community upbuilding.

He is survived by his widow, the former Miss Irene Rice, of New Orleans, whom he married in 1919.

NOW WHEREAS, James Wartelle Billingsley, was recognized by his fellow members as a true friend, as a man of unswerving integrity in personal and professional relations, and as an outstanding engineer of attainment and ability,

BE IT RESOLVED, That in his death the Louisiana Engineering Society has lost one of its most zealous and conscientious members, this State and City a good and useful citizen, and his many associates a true and loyal friend.

BE IT FURTHER RESOLVED, That a copy of this obituary and these resolutions be spread upon the minutes of the Society and published in the Proceedings, and that a copy be sent to the family of Mr. Billingsley.

Respectfully submitted,

E. S. Bres,
A. T. Dusenbury,
E. S. Lanphier.

ELBERT G. SANDOZ

It is our sad duty to record the death of the late lamented Elbert G. Sandoz, who died in Slidell, Louisiana, August 25th, 1931.

He was born in Opelousas, Louisiana, on August 23rd, 1884, son of Walter A. and Marie Adeline Sandoz.

After receiving his high school education in Opelousas, he attended college at the Central Normal College at Danville, Indiana, taking a special course in higher mathematics; thus provided, he followed a course of civil engineering with the International Correspondence School. In 1914 he qualified as civil engineer, under the existing State laws, by passing

the required examinations before the State Board of Engineering Examiners.

His first work in his chosen profession was as Assistant Engineer of New Iberia. Moving to Colorado for six years, he was engaged in varied engineering undertakings, in land surveys, municipal works, and irrigation, returning to Louisiana in 1912, where he followed his profession and formed many connections with engineering firms and in private practice.

In 1927 he became connected with the Board of State Engineers as assistant in triangulation work, and later assigned as cartographer on the Louisiana State Map.

He was a member of the Association of Commerce of New Orleans, the Louisiana Engineering Society and other organizations.

The Louisiana Engineering Society herein records its full appreciation of Mr. Elbert G. Sandoz's worth and standing in the profession, and his premature passing is a loss both to the profession and the Society.

O. O. Melancon,
T. M. McCarroll,
Harry Jacobs, *Chairman.*

PAPERS AND DISCUSSIONS

THE OLD NEW ORLEANS MINT BUILDING

By Allison Owen.*

Read Before the Society, Monday, October 12, 1931.

Permit me to express appreciation of your invitation to address you this evening. If what I bring you serves any useful purpose I shall feel well repaid for the digging that was necessary—but in truth I have obtained quite a bit of sport out of the quest and you may get some amusement as well.

I have selected the Mint, but not because the name has any connection with a long cherished beverage whose delightful aroma still lingers in our memory along with lavender and old lace, a libation when life had its compensations. I have selected it because having recently been employed to tear this venerable antique limb from limp in support of "a noble experiment," I have little by little enearthed quite a number of musty documents and facts. These interesting facts may help us beguile the tedium of these days and nights of depression.

First let us discuss the significance of the site. Late one winter some two hundred and thirteen years ago, after several days spent navigating Mississippi Sound, Lakes Borgne and Pontchartrain, Bienville finally tied up his boat near where today stands the Dumaine Street Bridge on Bayou St. John. He and his forty hardy associates hiked through the jungle and mosquitoes over the Indian portage which we know now as Grand Route St. John, Bayou Road and Gov. Nicholls Street. They emerged on the bank of the Mississippi, the Fleuve St. Louis of that day, and selected a spot a little up stream where a good view could be had up and down and where the current was such as to afford easy landing for vessels.

We will not go into the details of the scene which so many like to paint of his drawing his sword, marking a cross, etc. etc. Suffice it to say that it was the most important act of his

* Diboll and Owen, Architects.

rather colorful life and he probably knew it. He had not fought his predecessor Governor Cadillac, the Chevalier du Veau D'or, as they called him at Dauphin Island, for nothing. His whole life had led up to placing a controlling port near the mouth of the great river. I think we can agree that he did a good job. We can't hold him for overlooking automobile traffic. His streets are too narrow as they are of all contemporaneous cities up to Stanislaus at Nancy and L'Enfant at Washington, but he did lay out the Place d'Armes in a grand manner. It has blessed his memory ever since. Would that our later authorities had had his vision. Of course he had no knowledge of the ultimate city, no more have we, and his early streets faded away into the wilderness hardly four city blocks from his civic center. It is true there were three trails; one up stream to the village of the Tchoupitoulas Indians, one down and one which was the portage back to the Indian village at what now is Dorgenois Street. The reason for this latter is plain after a glance at the contour map. (By the way, is it not time to revise our contour map of 1919? This is one place where contours and curb stones don't stay put.)

The city ,however, did not long get on without bounds. You are familiar with the tradition that there was a fort on the Mint site, but what do we know of the lines or the structure? As a matter of fact New Orleans was fortified twice, first by the French under the Governor the Baron de Kerlerec in 1760 to protect not only from the Indians, but from the English. The latter besides taking Canada from the French had taken Florida and Havana from the Spaniards and had built forts at Manchac and Baton Rouge. Kerlerec was a naval officer as were Bienville and Iberville, and he realized that the time might come, as it did fifty-five years later, when New Orleans would have to defend itself. The old stumps of the stockade we now occasionally dig up are undoubtedly part of these early works. These defenses which included the Mint site must have rotted out and fallen into decay, for the next we know is the building of the Spanish defenses by the Baron de Carondelet, born in Belgium, a most active administrator, and a man who believed in doing things. He started the first police force by hiring thirteen night watchmen. He started street

lighting at night with oil lanterns hung diagonally over street crossings. He offered a bonus for building slate or tile roofs. He dug with slave hand labor volunteered by their owners the Carondelet Canal and the Old Basin, and he rebuilt the defenses, it is said, as much to overawe the rebellious French as for external defense. Be that as it may, Fort St. Louis stood where the Customhouse stands, Fort Bourgoyne at Iberville and Rampart, Fort St. Ferdinand at Beauregard Square, Fort St. John at Barracks and Rampart, and Fort St. Charles where the Mint now stands. What these forts and connecting ramparts were like it is hard to say. The only description I have found is of Fort St. Charles, which speaks of a broad deep moat outside with a sally port and drawbridge in the middle of the Barracks Street side. By the way, the name of that street in French was Rue du Quartier. The barracks was a long low building along the Decatur Street side and General Jackson doubtless housed some troops there while waiting for the development of the British plans. The descriptions state he reviewed the troops from this point on the evening of the 23rd of December, 1814, as they marched down the river road or embarked on boats on their way to meet the British. A description of the Mint speaks of its having been built on the foundations of the fort. What that means is hard to tell. We have found a brick footing at the rear which seems to run diagonally toward Decatur Street with no relation to the Mint building. Possibly it is part of the Fort—Who knows.

After the memorable victory of Jan. 8th, 1815, the area was named Jackson Square and bore that name until the unveiling of the Clark Mills statue of Jackson on the spot of his triumphant pageant in the Place d'Armes, which from thence was to bear his name. By a strange coincidence it was in the last year of his administration as President that the Mint was built.

The Act of Congress became a law on March 3rd, 1835, and William Strickland was engaged as architect and began the preparation of plans. On June 19th, 1835, the City of New Orleans, through Mayor Denis Prieur, gave the site to the Federal Government with the proviso "if the U. S. Government should hereafter remove the Mint or cease to occupy it for such purposes, then the cession is to be null and void". This

condition remained in force until July 8th, 1878, when the city, through Mayor Pilsbury, transferred the property to the Government without qualification. The building was begun in September, 1835, and completed in 1938. It is, as you know, three stories with wings giving the plan the shape of a letter E. The walls and partitions are of soft red river mud brick stuccoed on the outside and trimmed with belt courses, coins, etc., of Quincy granite. The Ionic Portico is without a pediment. In some places fire brick are used evidently where greater hardness was desired. The walls are three feet thick in the ground floor, twenty-seven inches thick in the second floor and eighteen inches thick in the upper floor. The two lower floors are groined brick vaulting, the attic floor and roof were of wood with a slate roof. The walls offset both inside and out to keep the load centered over the foundation.

James Gallier, Sr., the second outstanding architect of New Orleans, in his autobiography has this to say of the construction of the building. "Several years before I reached New Orleans, plans and instructions had been sent from Washington to build a branch mint, and the construction of the building was confided to a carpenter and a bricklayer of the city. The floors were sustained upon groined brick arches, supported by square brick pillars; but the thrust of the arches having caused the abutments to give way, the arches began to sink at the crown, and the whole structure threatened to become soon a mass of ruin. I was called on in a great hurry to devise some method of averting the danger. I caused to be inserted strong iron rods from outside to outside of the building in each direction; by shoring up the crowns of the arches and tightening up the rods, they having screw nuts and outside plates, the building was rendered perfectly secure and has remained so to the present time."

These groined vaults and tie rods are still in place and carry the floors of the second and third stories. On May 13th, 1845, James H. Dakin, the architect of St. Patrick's Church and the old university group that once stood on Common Street, between Baronne Street and University Place, writes: "Having been requested to examine the arches of the first story

under the melting room I have done so and find said arches in a dangerous condition and they are very unsafe and are liable to fall at any moment. I have sketched such a form as said arches should have, that is they should be segments of circles and the mortar should be made of the best cement.''

The ceiling of the upper floor and all the floors of the rear wings and the roof construction were of timber and the roof covered with slate. The building was completed in 1838 at a cost of $182,000 with $118,000 more for paving, fence and machinery, or $300,000 in all.

The groined vaults of which Mr. Dakin speaks appear to have been rebuilt and in 1856 a general overhauling and repair of the building was undertaken.

In the course of the present work an old leather bound letter book was found in the rubbish which turned out to be the book in which the letters and reports of the superintendent, Capt. G. W. Smith, to the Secretary of the Treasury, James Guthrie, were laboriously copied by hand. The first thirty pages evidently covering the first twenty-four letters are missing and of course the other side of the correspondence can only be conjectured. The method of handling the work was not by contract but on the first of each month the superintendent submitted to the Federal disbursing agent, Mr. A. G. Penn, an estimate of the funds needed to carry through the following month, at the same time reporting to the Secretary of the Treasury in considerable detail the number of men employed in each trade, and wages paid, and the amount of work accomplished during the previous month. The first report is for the month of February, 1856.

The work appears to have contemplated only general repairs and renewal of the slate roof, but before it got fairly started a misunderstanding arose as to the scope of the work as indicated in the following letter of March 10th, 1856: ''The Department letter of the 9th of February received on the 16th approves the plan of operations recommended in my letter of the 30th of January, 1856, viz:—'A system of repairs based upon the estimates of Major Beauregard dated May 29th, 1854.' The amount of this estimate is $25,000.00. This

system of repairs was at once commenced and is at present in full operation. The floors are taken up in various parts of the building, the roof is being reslated, the roof frame strengthened, new garret floor almost finished. The work of the Mint proper is temporarily suspended; in short, we are fully committed to a certain system of operations. The letter this day received without referring in any manner to the previous instructions under which this work is being executed directs an entirely different plan to be followed. The latter being one discussed in my communications and disapproved by the Department. Hence the doubt which has arisen here."

(Signed) G. W. Smith.

It seems that Washington persisted in its position to make the building fire proof. It is of interest to note that the iron beams used had to be brought from Trenton, New Jersey. In the bill the beams spoken of as "Cooper beams" are what we would call deck beams with sections similar to railroad rails but of varying depths, depending on the spans and loads and were used to support segmental brick arches. The whole attic floor and the central wing is of this construction. I-beams are spoken of as "Roy double T's" and fifteen inches appears to have been the limit of the depth they could be rolled, as where deep sections were needed one I was superimposed on another the flanges being riveted together. Box girders were made with two vertical plates forming sides riveted to two channels on the flat looking up one at bottom and one at top. One very heavy box girder in the river side rear wing was made of plates and angles just as we would do it to-day. The execution of the order was under the supervision at the rolling mills of Major Anderson, and the accompanying letter states "In Anderson's report of Experiment No. 8 we took the weight which caused twenty-five one-hundredths of an inch deflection." Evidently there were no available standard tables at that time.

The Major Beauregard referred to was Capt. P. G. T. Beauregard, Brevet Major for his service in the Mexican War, later General Beauregard of the Confederate Army. He was at that time the engineer officer in charge of the building of the Customhouse. Another Federal building about to be begun

at this time was the Marine Hospital, which was built on the site of the new Criminal Court Building. By a strange fluke the reports of soundings on that site and the recommendations for a pile foundation for the Marine Hospital are also copied by mistake in this old letter book (Page 53).

On June 19th Capt. Smith resigned and his assistant, Capt. Johnson K. Duncan, was appointed by letter signed by the Secretary of the Treasury.

Capt. Johnson K. Duncan was rather a remarkable man. He was a West Pointer who had resigned the army in 1853 and during the "Know nothing" rioting at the time of the municipal elections of 1858 when General Beauregard was a defeated candidate for Mayor, Capt. Duncan headed a Vigilance Committee of armed volunteers, who took possession of the Vieux Carré, with headquarters at Jackson Square, the Cabildo and old arsenal, and though disclaiming any political affiliation, seems to have been partial to Gen. Beauregard's candidacy. The accounts of the occurrence indicate a very wild time which, when we realize it was complicated with one of our virilant yellow fever epidemics, must have been a time of high tension and strong feeling, in which Duncan played a rather inflexible role. When Louisiana seceded three years later and was for a time an independent republic, he was commissioned Colonel of Artillery, later a Brigadier General in command of the coast defenses, including all the forts in the New Orleans district. He was personally in command of Forts St. Philip and Jackson in the memorable struggle with Farragut, when the latter took New Orleans.

On the 20th of August, 1856, Capt. Duncan writes the Superintendent, Mr. Chas. Bienvenue, asking for any suggestions relative to the manner of carrying on the work so as to minimize the suspension of coining and other inconvenience. In his first report of August 8th, 1856, Captain Duncan says: "As the building was found to be much out of repair, originally badly put up with indifferent materials and worse workmanship, and erected on insecure foundations, thorough fire proof repairs were deemed inadvisable. Accordingly a project of operations based on the project of Major G. T. Beauregard

of May 9th, 1854, inconsiderable in amount but as large as the character of the edifice and nature of the facts would justify, was forwarded to the Department and recommended for approval. Accordingly operations not contemplating fire proof repairs were commenced. It was found, however, by Department letter of March 17th, that a misapprehension had arisen in regard to the instructions. The result of all this was a delay in the repairs, the stoppage of the operations of the Mint proper for about a week, etc. The main stack is very defective. From its position it interferes with the foundations of two of the interior walls upon which beams will rest and causes unequal settlement. Furthermore, in consequence of its distance from the boilers the smoke is cooled by being carried underground to it with but little draught, and hence there is an unnecessary waste of fuel." This report resulted in the order to build the stack which was such an interesting land mark. Unfortunately the present work requires its removal. The top had become very unsafe. An interesting matter connected with its building is that piles were used in its foundation and the report of the driving may be worth reviewing.

Sept. 3rd, 1856. "I have the honor to forward the following report on driving of 1st pile foundation for the new chimney stack branch mint. Pile 34 ft.—butt 12½"x11½"—tip 11"x10½", hence volumes of pile 30.606 cu. ft. A cubic foot of same timber weighs 49.548 lbs., hence weight of pile 1516.473 lbs., say 1516 lbs. Penetration last blow is ¼" at 5 foot fall; weight of hammer 1050 lbs. Hence we have (Masons data).

$$\text{Resistance} = \frac{1050 \times 1050}{1050 + 1516} \text{X} \frac{60''}{\frac{1}{4}''} = 103{,}118.40 \text{ lbs. weight}$$

of stack on each pile 20.250. Hence the resistance is five times that required."

The duties of the Superintendent, Capt. Duncan, in looking after the work on the Mint as well as the New Marine Hospital, seems to have weighed very heavily, so on August 18th he writes: "In view of the continued operations on the Mint and Marine Hospital and the distance apart of these works (over three miles) which requires careful and constant super-

vision, I have the honor to request to hire or purchase a horse or a horse and buggy for the use of the superintendent. As it is more economical to purchase than to hire, I respectfully and earnestly request that authority be granted either to purchase a horse and carriage or a horse alone.'' On Sept. 1st he got his horse and buggy. On Sept. 8th, 1856, he was authorized to advertise for sixty days for bids to be addressed to Mr. H. S. Stuart, Galveston, for the erection of the Customhouse in that city.

The fireproof repairs involved replacing the wooden roof with the iron trusses now in place and the roof covering of 20 gage galvanized iron corrugated. This roof covering is now in place and sound. The most remarkable galvanized iron roof I have ever heard of. The design of the roof is queer, in that the end wings are trussed the long way instead of the short way so as to show dignified pediments on the two street ends. These undoubtedly give scale and architectural effect to the building. The work developed many thrilling adventures, for instance, on Nov. 30th, 1856, Capt. Duncan advises ''at almost every step which is taken on this work something is discovered requiring repair and which was not contemplated nor estimated for in my project of operations for completing the repairs dated August 8th, 1856. Although these incidental repairs are small in extent, they are yet very important and involve more or less expense which consumes the estimate for contingencies. In view of the facts, I have found it necessary to transfer the pay of the superintendent and his clerk to the Contingent Hospital roll, which I hope will meet with the Department's approval.''

It may be interesting to say here that the coiner, melter and several officers, had their living quarters in the wings of the building. The iron veranda on the river end served the coiner's suite. There are accounts of balls and parties given by them in the building in the early days to which time has added a glamor which makes them quite romantic. The last to live in the building were ordered out in 1888.

It was not all smooth sailing. In January, 1857, the money gave out and the work was not half done. An appeal was made for $17,311.73 to do certain things and other new esti-

mates were submitted, bringing the total to $110,661. On the last day of February work was suspended. James Guthrie went out of office and Howard Cobb succeeded him as Secretary of the Treasury. Work was resumed on March 18th. Duncan had to go to Trenton to straighten out kinks in the roof truss work which were being made by the Trenton Locomotive and Machine Manufacturing Co., of which A. H. Vancleve was the president. The work of putting on the roof caused no end of trouble. The work strung out through the winter of 1857-58. Bad weather added to the troubles, and on Feb. 4th, 1858, Capt. Duncan writes to Logan McKnight, Superintendent of the Mint: "I have and will continue to make every possible effort to keep out or catch in tubs, etc., as much of the rain as possible." He discharged his principal foreman and appointed Mr. S. L. James in his place, and he protests Mint officials interfering with his work, but the climax was reached on March 5th. Mr. McKnight preferred charges against Capt. Duncan to the Secretary of the Treasury, on which Duncan writes him: "If you had paid a little more attention to the duties of your own office and less to mine, you would have seen that this authority so vested is among the written instructions from the head of your special department on file among your office records, and you would consequently have saved yourself the mortification of having transmitted to the Secretary a batch of letters only showing in their most charitable construction lamentable ignorance of the subject matter treated of" (Page 230). Capt. Duncan's answer to the charges occupies thirteen pages and must have satisfied the Washington authorities, as he was not removed nor was the suggested "Commission of Architects, men of Experience and Scientific skill," appointed to direct the completion of the work. It was brought to an end in August, 1858, the last letters are signed by General Beauregard winding up the loose ends and disposing of the leftover materials.

We have found some queer things about the building. For instance, there are four cast iron columns in the upper story of the main building carrying the ceiling of that story and the attic fireproof masonry floor which rest eccentrically on the arches of the floor below. In the yards we find four under-

ground tanks lined with soapstone, which we are told cost $5,000.00 each, into which all wash water delivered for the purpose of recovering gold and silver filing. These are said never to have justified their cost, as only a very few dollars of metal was ever recovered. Beside the seven or eight vaults in the building for bullion and money the whole of the ground floor of the river end wing was a very large vault with the door opening into yard. It was in this vault that some six or seven million silver dollars were until recently stored. It took several days to remove this huge quantity of money, which had been in storage so long that the lower sacks fell to pieces when handled. On account of all that the foregoing describes we have very carefully checked every part of the structure, particularly levels of floors and plumbness of walls. We find the exterior walls to set back at each story, the second story being 3 inches back of the ground floor and the upper floor 1½ inches back of the second. The worst place we have thus far found is the fourth pier of the front near the river end. Here we find the ground floor wall hangs forward ⅝ of an inch, the second floor hangs in 1⅛ inch and the top story ¾ inch in—or 1¼ inch inward from the vertical. When you consider the thickness of the walls this is negligible.

Up to the opening of the war between the states the Mint at New Orleans had coined

$40,381,615 of gold and
$29,890,037 of silver.

The gold came from North and South Carolina, Georgia, Tennessee and Alabama, but after the discovery of gold in California in '48 and in Colorado, the bulk of gold came from the West.

On the day, January 26th, 1861, that the secession convention assembled, the State of Louisiana took possession of the Mint and appointed a committee to take charge and to continue it in operation for the benefit of the state using the Federal dies until they were ordered destroyed. How much bullion and money was on hand is not stated. Four half dollar pieces of new design were struck, and in 1862 some counterfeit quarters with the O used on coins from this Mint appeared.

The bullion remained in possession of the Treasurer of the Mint until the investment of the city by the national forces in April, 1862, when the "bulk of the bullion, amounting with the money of the Subtreasury to nearly a million dollars, was carried up the river on the steamer Star of the West, accompanied by the Treasurer and many other officials, who thought it was time to leave."

The new design of Confederate coins referred to was as follows: "The obverse represents a liberty cap above the American shield, the union of the latter containing seven stars representing the seven seceding states, the whole being surrounded with a wreath of sugar cane and cotton in bloom, and the motto 'Confederate States of America Half Dol'. The reverse has the Goddess of Liberty with the thirteen stars representing the states from which the Confederacy sprang and the date 1861".

One half dollar was sent to the Confederate Government, one to Dr. Riddell, one to Mr. Ames and one kept by Dr. Taylor, the coiner.

And now the Mumford tragedy. Of course, most people know that he was hanged by Butler in front of the Mint for hauling down the American Flag, but comparatively few know the details of the story. After bombarding Forts Jackson and St. Philip for seven days Farragut's fleet moved up the river, and next day, April 25th, 1862, appear in front of the city and five days later the State flag was removed by Federal forces from the City Hall and the next day General Ben Butler arrived and took possession. Two days after the arrival of the fleet and four days before formal occupation, Capt. Morris of the Pensacola, of his own initiative, sent a landing party ashore and hoisted the Stars and Stripes on the Mint and left no guard to protect it. There was nothing to indicate to late comers by what authority the flag had been raised, as the city had not surrendered and the State flag still flew at the City Hall. A crowd soon collected and several men climbed to the roof and hauled the flag down, and it was brought to the street by W. B. Mumford, Lieut. Holmes, Sergt. Burns and James Peccel, all of the Confederate Army. Followed by a

mob they took it to Lafayette Square while the Federal officers were in conference with the Mayor, and tore it to bits as souvenirs. Farragut took no action but reported it later to Butler, who declared he would hang the offenders. Mayor Monroe protested that the raising of the flag during the negotiations was a violation of the rights of belligerents. The next day Farragut notified the Mayor in advance of his intention to raise the U. S. Flag on the customhouse.

Butler was in command for eight months, and it is safe to say no military commander ever made himself so sincerely hated than he in so short a time, his women's order and the hanging of Mumford being the outstanding offences.

Mumford was tried by Court Martial and condemned. Butler's later attempt to justify the act was that Mumford was a gambler and an undesirable citizen; that it was freely said the execution would be prevented by force; that he (Butler) had been menaced with assassination if the sentence were carried out; that mercy would be construed as weakness and that the mob would get the upper hand. On the morning of June 7th Mumford, dressed in white, was brought from the Customhouse in a cab or ambulance. Federal infantry with fixed bayonets formed a hollow square about the scaffold in front of the Mint. Mumford, a handsome man of 42, ascended the scaffold with a firm step. Capt. Stafford of a negro regiment read the sentence with a loud voice. Mumford made a short address acknowledging and justifying his act. Stafford ordered the drums to beat and the trap was sprung.

The operation of the Mint was resumed under the Blair Act of 1878. From an old book lent by Mr. Leonard Magruder, the present asseyer, who on the first of this October celebrated his fifty-first year of continuous service, a few notes of interest may be gleaned. For instance, in April or May, 1844, a notice was served on the officers for the recovery by the city of the square of ground occupied by the Mint. And again on July 28, 1876, U. S. Marshal Packard proposed to seize the property for the State, as it was not at that time in use as a Mint. Nothing ever came of either effort.

In February, 1844, it was proposed to put gas in the building, but the director, R. M. Patterson, opposed it as too expensive, $6.00 per 1,000 ft., and also he did not approve of night work.

On June 25th, 1845, the following notice was posted: "Tomorrow being the day appointed for the funeral of the late General Andrew Jackson, as a tribute of respect to his memory, all business will be suspended in the Mint and the doors thereof will be closed." (Signed) J. M. Kennedy, Supt. And again Dec. 1st, 1847, it was ordered closed on the following Friday in honor of the celebration of the arrival of General Zachary Taylor in the city. On March 2nd, 1852, the walls of the melting room bulged out and caused serious apprehension of the safety of remaining in the building, and the walls were condemned by Geo. Purvis and Reynolds on March 5th. The walls spoken of were at once repaired and rods and anchors installed. This some eighty years ago. I wonder how many of our modern buildings will be as sound after 93 years of service? In the same year women were employed in the adjusting room,—one of the early instances of the employment of women in the Federal service.

On July 2nd, 1852, it was closed in respect for the day of general mourning for the death of Henry Clay. On Feb. 8th, 1856, it was closed so that all could take part in the inauguration of the monument to Gen. Andrew Jackson, and on April 12th of the next year it closed at noon, as all the officers had been invited to participate in the laying of the cornerstone of the monument to Henry Clay. On Feb. 21st, 1857, the National fiscal year ending June 30th was established.

On April 12th, 1860, the Mint was closed to attend the inauguration of the Clay statue.

In 1862 General Butler stored all confiscated dies and plates of Confederate notes and bank notes claimed by Amide Contouré, Consul of the Netherlands, as his private property. During the riots of 1874 five companies of the 3rd Infantry were quartered in the building and in 1910 the Mint closed for good.

The later day history is brief. For three years, 1927 to 1930, following the World War, it was used by the Veterans' Bureau. The Assayer's office and laboratory which, after 95 years of continuous occupancy, moved to the Customhouse on July 1st of this year, and the work of converting the building into a Federal prison was begun by Gervais Favrot, under the direction of Diboll & Owen, Architects. The appearance of the building will be changed as little as possible. Large dormitories will be used for prisoners and two cell blocks will be installed in the rear end wings. The picturesque old stack has been removed and the two rear courts have been enclosed with high walls for exercise yards—and so this venerable old land mark will start on a new career of usefulness adjusted to the new conditions of our modern national life.

DISCUSSION

PRESIDENT FROST: General, that has been very instructive and interesting. I have a silver dollar made in that mint, but I was not there when the bags fell apart. This dollar was made in 1901. Something that impressed me was their ability to make estimates and run out of money. Most engineers have had experience on that line.

Have you any comments or questions? The meeting is open to discussion.

MR. TODD: I think there is another very important idea that General Owen brought out,—the cost of gas. Also I wonder if you recall the cost of transferring that many bags of sliver dollars?

GENERAL OWEN: I am frank to say that was a huge amount of money. The vault was almost as large as this section of this room and it was stored, sack on sack, up to the ceiling. I asked about the weight and they said each sack weighed about 64 pounds, containing $1,000 each, and when the vault was built they put piles under the bottom to support the load. How they drove piles within the building I don't know.

MR. SCALES: Answering the question about moving that money. The O. K. Storage & Transfer Company of this city did

the moving, under the foremanship of Mr. Crabtree. I happen to live near Mr. Crabtree and I saw a letter of commendation from the government to him for the splendid way of handling it. I don't recall the number of men and attendants, but quite a number were used, and if it is of any interest, I will get these figures. It took a little over two days and was carried down the street and put in the customhouse vault. I wonder if General Owen has anything on the design of the trusses. I crawled up in there to see them and found them pin connected but very shallow. I wonder if you have any information on their size?

GENERAL OWEN: The construction of the trusses is very interesting. The ties are round rods and the struts are of the deck bar pattern. The connections are made with plates, most of them being discs with holes drilled in and the tie rods fastened with single bolts.

Of course, the galvanized roof is very light and perhaps because of being built so far south, you would not expect the snow load as in other parts of the country. Before we get through I expect to measure some of them. I do not remember about the purlins.

MR. SCALES: Some I saw were reinforced, but I could not get close to them.

GENERAL OWEN: The purlins are of rather long span and they are very light. I would not attempt to change the roof or put in any material weighing more than the roof is now carrying.

A MEMBER: Are the girders corroded?

GENERAL OWEN: No, they have seen no depreciation. Of course, there is superficial rust, but the material is a pretty good quality of open hearth iron.

A MEMBER: If they were steel, I suppose they would be gone?

GENERAL OWEN: Yes. The big girder we had to take out had to be burned into pieces to get it out, and I will send a small section up here to the Cabildo for future interest of the people. It is built of ordinary plates and angles just as we

build box girders to-day. I was interested to find these Roy double T's put together and a few rivets to hold them.

MR. TODD: In regard to the rust. There were some electrical conduits put in two years ago—black iron instead of galvanized. They were all rusted and had to be removed.

MR. BILLINGSLEY: What type of foundation do the walls rest on?

GENERAL OWEN: We have not uncovered the foundations except in a few spots. I expect to find spread foundation on planking. I presume because of being so far from the street lines and neighboring pipes, there has been no recent settlement in the building. Nothing that I could find occurred in the last decade, as we find in most old buildings in the city. The building is significantly free from that.

Another interesting thing is that this main vaulting is supported on 3'x3' piers and pilaster on the walls, but has no tie to the side walls. Another thing, there is one or one and a half inch free space between wall and vaulting so they can move without affecting the wall.

The partitions were built on top of the vaulting. We found one place on the third floor built on the floor without any support under them. The flooring was not fire proof. That is the wood floors were laid on joists, the under side being cut out to fit the vaulting, thus freeing the top of the vault. We found that the floors were of varying levels and it was difficult to get a level floor through the big dormitories. We filled the space over the vaults with cheap concrete and then a reinforced concrete floor slab over that. The vaults could be removed and the slabs will carry the load.

PROF. ANDERSON: I was interested in the statement about the old marine hospital. Was it ever actually built?

GENERAL OWEN: The Marine Hospital was probably begun in '58 and it was completed before the Civil War began. General Beauregard presented a fair picture of it in his testimony in a very famous case, Heiny vs. Merrick, in which he refers to his experiences at the Marine Hospital. The building was one

of the cast iron period,—almost completely cast iron. I remember it as a boy. It stood as an abandoned building. You could not get up to it without considerable trouble, so we always saw it from a distance. It was three stories, with columns surrounding the entire building, with a cupola which could be seen from Canal Street.

It was probably never occupied as a marine hospital. During the Civli War it was undoubtedly a military store house, because when excavating for the new Criminal Court Building we found sixty odd 10″ shells. We rolled them up on the neutral ground on Broad Street to make a pile of them when the building was completed. When we went to find them, we found we had but six left,—the rest evidently had been carried away for souvenirs. It was amazing, because it was all I could do to lift one. After the Civil War the building was apparently abandoned and occupied by negro squatters. I have been told that when it was torn down to build the House of Detention, some thirty years ago, quite a few arms, rifles, sword blades and other things were found still stored in the building.

PROF. ROBERT: Where was the site of the Marine Hospital?

GENERAL OWEN: Tulane Avenue and S. Broad Street.

PRESIDENT FROST: You said you found this old letter book in the rubbish?

GENERAL OWEN: We went to the building to commence work and it was filled with rubbish. The assayer occupied a small part of the building and there was quite a lot of bullion in the building when they turned it over to us for work. The foreman found this book among the rubbish. We reported it to the assayer, who said he knew it was there but of no importance. We found a book shownig the amount of coins turned back to the beginning. I suggested these be turned over to Mr. Glenk for the museum.

MR. SCALES: I think the membership would be interested to know what an examination of the old wood work in the building showed.

GENERAL OWEN: The old cypress sash there are in excellent condition.

MR. SCALES: I wish to call attention to that fact because there has been recent propaganda about all woods in this country. That seems to prove that properly cared for wood is indefinitely good. The joists that were taken out were used again, and I talked to one of the carpenters, who said he had a time cutting them with a hand saw. They complain about using it because of its great density.

PROF. GREGORY: I have been interested in the site of the Criminal Court Building because it is the lowest spot in New Orleans. I think the level of the land was shown by the survey of '94 as 2½ feet below mean Gulf level. It was in a cypress swamp before we had drainage in New Orleans and I wonder what the conditions were back there about the time of the Civil war or later, because it was certainly a low spot.

ENGINEERS AND EMPLOYMENT*

A Program

The grave problem of unemployment is commanding the serious attention of many thoughtful people. This is due to the amount of unemployment existing and to the belief on the part of some that there will be a relatively large amount of unemployment next winter. The situation calls for very active, concerted and well-considered efforts to provide employment for as large a number as possible now, and especially to the development of plans which will forestall any large increase in unemployment next winter. Of course it is earnestly hoped and anticipated that business conditions will so improve as to avoid any serious situation next winter. However hopeful one may be, it is the part of wisdom to be prepared for any eventuality. It is gratifying that those who have been most effective during the last year in developing ways and means of relieving unemployment are still energetically working to relieve the present situation and are perfecting plans to meet any increased unemployment which may arise later.

An Emergency Employment Suggestion

The President's Emergnecy Committee for Employment has found that the most satisfactory means to spread employment and earnings as far as possible when a reduction of operation is necessary, is to shorten the working time of individual employees in the departments or plants affected. This is an emergency procedure which has met with widespread acceptance by both employers and employees.

In most cases the hourly rates of the employees have been maintained and overtime work has been eliminated. The lower limit of work afforded each employee kept on the pay roll is usually half-time. Operating conditions, of course, affect the particular combination of hourly and daily schedules used. To the extent necessary, some companies have suspend-

* Report of the Committee on Relief from Unemployment of American Engineering Council.

ed deductions from pay for savings, home purchases, stock, or similar plans to afford employees on part time the immediate use of all pay earned.

American Engineering Council feels most emphatically that the immediate answer for unemployment is jobs; that the spreading of man-hours is the most essential expedient for stabilizing employment that can be suggested at the present time; that plans should be started immediately, if not already in operation, along the lines suggested looking towards lightening the consequences of any further or future unemployment.

In periods like the present the attitude of mind plays a very important part. Undoubtedly the attitude of mind accounts for the sharp decline in purchases being made by those who have not suffered material, if any, reduction in income and whose continued income is as safe as anything in life. Today many who have employment are not spending because of fear of what may happen. They are fearful that they may lose their jobs or have their income sharply curtailed. It would be exceedingly helpful to restore a sense of security. Therefore, employers are urged to at once notify all employees whom they (the employers) know they are going to keep on the payroll, that their income will not be reduced for some definite period of time. This alone would be very effective in restoring confidence and stimulating business.

Permanent Stabilization of Employment

One of the most encouraging products of this business depression is the amount of thoughtful consideration being given to:

a. Plans whereby employers may satisfactorily care for any unemployment arising among their own employees regardless of the cause.

b. Plans for permanently stabilizing employment.

There is a very pronounced feeling prevailing that industry and commence are largely responsible for the perplexities which have arisen and that they should provide a satisfactory solution. This thought is not confined to any so-called radical group but it also prevails among fair-minded, far-seeing men

and women. They realize that unless industrial and commercial leaders successfully and satisfactorily deal with the problem of unemployment in a permanent fashion that very likely there will be enacted both by the Federal and State governments unemployment insurance laws. That such laws would be detrimental to the economic and social well-being of the nation is generally acknowledged. Whether this country escapes such consequences will depend entirely upon the constructive leadership manifested by American industry and commerce.

A concerted movement has been inaugurated to bring about the enactment of Federal and State unemployment insurance laws. This movement is under the leadership of a national organization of good standing and a record of achievement.

American Engineering Council emphatically believes that such legislation is neither the only nor the best solution. It feels that there is sufficient forward looking, constructive and public spirited leadership in American industry and commerce to seriously study the issues and on the basis thereof to develop plans for permanently dealing with unemployment, however caused, and further, so to stabilize employment as to hold unemployment to the irreducible minimum. Council also recognizes that engineers compose an important fraction of the industrial and commercial leadership of the nation, consequently they are in a position to make an essential contribution to developing measures looking towards stabilization of employment throughout the economic fabric of the nation. The engineers have a very direct responsibility to do what they may as industrialists and as citizens. It is believed that they will gladly undertake such a task because of their direct personal interests and because they believe in constructive citizenship. Having this faith in the engineering profession and recognizing the imperative necessity for prompt action, the Council with confidence is submitting to a large number of engineering and allied technical societies of the United States a proposed program of action. It is recognized that this problem will not fit every situation, but it does contain the essentials. This program is suggested because the nation is confronting a grave

problem, one which may well terminate in repercussion of a serious economic and political nature.

Mr. Jas. W. Hook of the New England Council has forcibly stated the situation in these words: "* * * * * the country can well be alarmed over the enormous amount of propaganda that is going about on behalf of unemployment insurance and the small amount of talk and attention that is being given to the subject of employment stabilization * * * * * and to ways and means of avoiding or at least lightening seasonal variations and cyclical depressions in business in the future."

American Engineering Council believes that engineers, individually and collectively, by carefully studying the problem in their respective areas of employment, can develop helpful measures of correction. Therefore it submits the following program of action with the earnest request that it be seriously and aggressively undertaken:

Program

Each engineering and allied technical society is urged to orm immediately the necessary committee or committees to ndertake the following program:

1. Bring forcibly to the attention of each engineer within the sphere of its influence the constructive assistance he may render by carefully studying the business with which he is associated from the point of view of what may be done to spread employment during this period of depression and particularly towards developing a sound, practicable plan for permanently stabilizing employment in the business with which he is connected.

2. Stimulate the individual engineers to confer with and endeavor to get their respective employers to inaugurate a line of endeavor as indicated in item 1 above.

3. Have the individual engineer join with his associates in a given enterprise to collect data regarding any methods used in their company for stabilizing employment, both as to:

a. Emergency employment.
b. Permanent stabilization of employment.

4. The Society, through committees, assemble the information produced through the activities suggested in item 1 to 3 inclusive above, and when properly analyzed, disseminate the information as broadly as possible. It is important to acquaint the public with the fact that some industrial and commercial leaders are aggressively active, that they recognize the problem and are endeavoring to solve it. Publicity is also important as a means of stimulating those industrial and commercial leaders who have done nothing to do something, and furthermore, by example suggest what they may do.

The public educational work contemplated may be made very beneficial. Especially will it be needed to encourage and stimulate the small plant or business. The small industrial and commercial units are the ones which will need and require the greatest assistance and stimulation. The large units, such as Proctor and Gamble, General Electric, and others, have and will develop plans of stabilizing employment. Therefore the real crux of the situation is to energize the mass in a large measure composed of small industrial and business establishments. With these the engineering profession can be most effective.

Some employers will hesitate to permit publicity about their activities. They should be persuaded to permit publicity for the good of the community and the economic well-being of the nation.

5. Devote the necessary number of meetings of the Society to the subject so as to secure a thorough discussion of successful plans for stabilizing employment. Such meetings will afford local employers an opportunity to present to the public their respective plans and the results.

6. At all times endeavor to secure adequate local publicity for the discussions, plans in operation, and any resolutions passed by the Society on the subject. Demonstrate to the community the value of stabilized employment and the part the

engineer can and is playing in bringing about a sounder economic structure.

7. Investigate and extend aid to worthy employment relief plans. Co-operate fully with all local agencies concerned. Co-ordinate in so far as possible all activities relating to employment. By all means co-ordinate the activity of the engineering and allied technical groups of your area.

8. Since the entire program is largely one of sane education, the educational institutions should be enlisted in every practicable manner. It may be advisable to have some general conferences which could be held under the auspices of the local educational institutions. Addresses by professors and others as to what has been accomplished in stabilizing employment would be beneficial.

9. Carefully study and take some positive position on any proposed state legislation or city ordinance relating to employment.

10. While this program is designed for local application, it is desired that the net results be national in scope. It is earnestly desired that the engineering profession, working through local units, may give direction to a line of thinking and action which will result in a national solution of the grave problem of unemployment. For this reason it is earnestly requested that each organization keep American Engineering Council informed of the progress of its work and especially of any unusual results effected or plans revealed.

The engineering profession by following aggressively a general program, such as outlined, can during the months immediately ahead, make a tremendous impress upon national economic and political thought. The values at stake justify every possible effort; justify making this the one, if not the major, objective of each society for the next year or more. The personal interests involved should be sufficient to enlist all engineers, for they have been sufferers from the unbalanced eco-

nomic situation; but they can be enlisted from an even higher motive, and that is, to contribute to the permanent well-being of the economic and political structures of the nation.

COMMITTEE ON RELIEF FROM UNEMPLOYMENT.

F. J. CHESTERMAN, *Chairman*,
R. C. MARSGALL, JR.,
E. K. RUTH,
W. R. WEBSTER.

Approved by Executive Committee
of American Engineering Council,
August 1, 1931.

MINUTES OF MEETINGS AND BUSINESS OF THE SOCIETY

Minutes of the Board of Direction, October 12th, 1931.

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

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

Communication from the Louisiana State University, inviting the Society to be represented at the inauguration of the President of the University on November 12th was read and considered. On motion, duly seconded, it was voted that the invitation be accepted with thanks and that Mr. James M. Todd, who expects to be in Baton Rouge at that time, be authorized to represent the Society.

Communication from Mr. H. L. McLean, Mechanical Engineer, requesting that the Society appoint a committee to make recommendation as to the necessity of formulating regulations and rules concerning ethical relations, was very carefully considered. Mr. McLean was present to amplify his letter. On motion, duly seconded, the President was authorized to appoint a committee to investigate the necessity for amending the Constitution and By-Laws, especially with reference to Section 10 of the By-Laws, and to submit written report with recommendations at the November meeting of the Board of Direction.

The matter of registration of professional engineers was brought up with special reference to legislation which should be introduced at the next session of the Legislature. On motion, duly seconded, the President was authorized to appoint a standing committee to be known as the Legislative Committee, the function of which committee will be to make a study of proposed legislation from time to time which will effect the status of the engineer and the engineering profession, and at this time to prepare and endeavor to see through to a successful conclusion the bill for the registration of professional engineers.

Communication from the American Engineering Council relative to the report of the joint committee on Oil Pollution of Navigable Waters was given careful consideration. It was noted that the report indicated that oil pollution of navigable waters in the New Orleans harbor is being taken care of by local authorities satisfactorily, therefore the following motion was carried: "Moved that it be the sense of this meeting that the legislation in question in the opinion of the individual members of this Board is unnecessary and that no action should be taken toward the indorsement of said bill by the Society. The Secretary was instructed to conduct necessary correspondence.

Communication from the American Society of Civil Engineers relative to proposed Recommended uniform Registration Law for Professional Engineers was considered and, on motion, duly seconded, it was voted to refer the matter to the Legislative Committee.

Communication from the Community Chest was considered and the Secretary was instructed in regard to reply to be made thereto.

It was brought out that a number of members who have not been in regular attendance at the meetings recently should be especially urged to attend some particular meeting if they cannot avail themselves of all our meetings. On motion, duly seconded, the December meeting was set as the Homecoming Meeting and the Secretary was instructed to take

care of the necessary correspondence in connection with the work of the Motivating Committee.

There being no further business, the meeting adjourned.

F. A. MUTH, Secretary.

Minutes of the Society, October 12th, 1931.

The meeting was called to order about 8:15 p. m., with President Frost in the chair, F. A. Muth, Secretary, and 72 members and guests present.

The minutes of the previous meeting were read and approved. Chairmen of several committees submitted reports.

Mr. Carl Schneider submitted report as to the work which is being accomplished by the American Engineering Council in the matter of unemployment relief, and he requested that a portion of his report be printed in the "Proceedings" for the information of the members.

Announcement was made that the November meeting would be held at Tulane University for the purpose of inspecting the splendid laboratory equipment as the guests of the University.

The following resolution was put to ballot and was unanimously carried on first reading:

> "RESOLVED, That the Louisiana Engineering Society go on record as endorsing the immediate carrying out of the Temple Act, (Public Law No. 498, 68th Congress, February 27, 1925), which provides for the completion of a standard topographic may of the United States in twenty years:
>
> "BE IT FURTHER RESOLVED, That the entire Congressional Delegation from Louisiana be urged to secure sufficient appropriations to carry out the intent of the Temple Act and that any restrictions delaying the immediate execution of the surveys be removed in order to expedite the completion of the topographic survey of the United States."

It was also announced that the December meeting will be the Homecoming Meeting, at which time it is hoped that a number of the "Old Timers" who have not been in regular attendance will make a special effort to be present at that meeting. The President remarked that it was gratifying to see how many "Old Timers" were present to hear General Owen speak.

General Allison Owen delivered a most interesting address on "The Old New Orleans Mint Building." This was followed by considerable discussion. A rising vote of thanks was tendered the speaker and the meeting adjourned to the usual collation.

F. A. MUTH, Secretary.

Minutes of the Board of Direction, November 9th, 1931.

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

The meeting was held at Tulane University.

The minutes of the previous meetings were read and approved and bills on hand were ordered paid. The matter of Student Membership was again brought up for discussion with reference to the length of time Student Members should be carried on the rolls as such. The matter was also discussed as to the co-operation of the Louisiana Engineering Society in connection with the organization of Student Chapters of

the A. S. M. E. and A. S. C. E. On motion, duly seconded, the President was authorized to appoint a committee to look into the matter and submit report.

The matter of delinquent dues was again discussed and the Secretary was instructed to remove from the rolls the following: Messrs. P. Bonham, A. A. Fraaser, P. Gilbert, F. Hoight, E. Kelly.

The Secretary was instructed in regard to answering correspondence relative to members in arrears for dues.

In accordance with the Constitution, the following were elected Life Members: Messrs. John T. Eastwood, W. J. Gibbons, Sr., Ernest Lee Jahncke, Ira W. Sylvester.

There being no furhter business the meeting adjourned.

F. A. MUTH, Secretary.

Minutes of the Society, November 9th, 1931.

The meeting was called to order about 8:15 p. m. with President Frost in the chair, F. A. Muth, Secretary, and 95 members and guests present. The meeting was held in Stanley Thomas Hall, at Tulane University, as the Society was the guest of the College of Engineering, Tulane University.

On motion, duly seconded, the reading of the minutes of the previous meeting was dispensed with.

Professor James M. Robert made a brief talk on the Community Chest.

Reports were received from several committees. Announcement was made that the Annual Smoker would be held the third Saturday in January and the February meeting would be held February 15th.

On motion, duly seconded, the following resolution was carried, it being the second reading it carried the endorsement of the Society:

> "RESOLVED, That the Louisiana Engineering Society go on record as endorsing the immediate carrying out of the Temple Act, (Public Law No. 498, 68th Congress, February 27, 1925), which provides for the completion of a standard topographic may of the United States in twenty years:
>
> "BE IT FURTHER RESOLVED, That the entire Congressional Delegation from Louisiana be urged to secure sufficient appropriations to carry out the intent of the Temple Act and that any restrictions delaying the immediate execution of the surveys be removed in order to expedite the completion of the topographic survey of the United States."

Professor Douglas Anderson made a short address of welcome and explained the method of visiting the laboratories with guides in charge of small groups of guests. Mr. James M. Todd then responded, expressing the appreciation of the Society for the invitation to be guests of Tulane University.

The meeting then adjourned for the purpose of making the trip through the laboratories and other interesting features of the Engineering College of Tulane University. The guests then assembled at the close of the inspection trip, where refreshments were served in the Library.

F. A. MUTH, Secretary.