

PROCEEDINGS
OF THE
LOUISIANA
ENGINEERING SOCIETY

VOL. XX, 1934

PUBLISHED BI-MONTHLY
BY THE
LOUISIANA ENGINEERING SOCIETY
NEW ORLEANS

PROCEEDINGS OF THE LOUISIANA ENGINEERING SOCIETY

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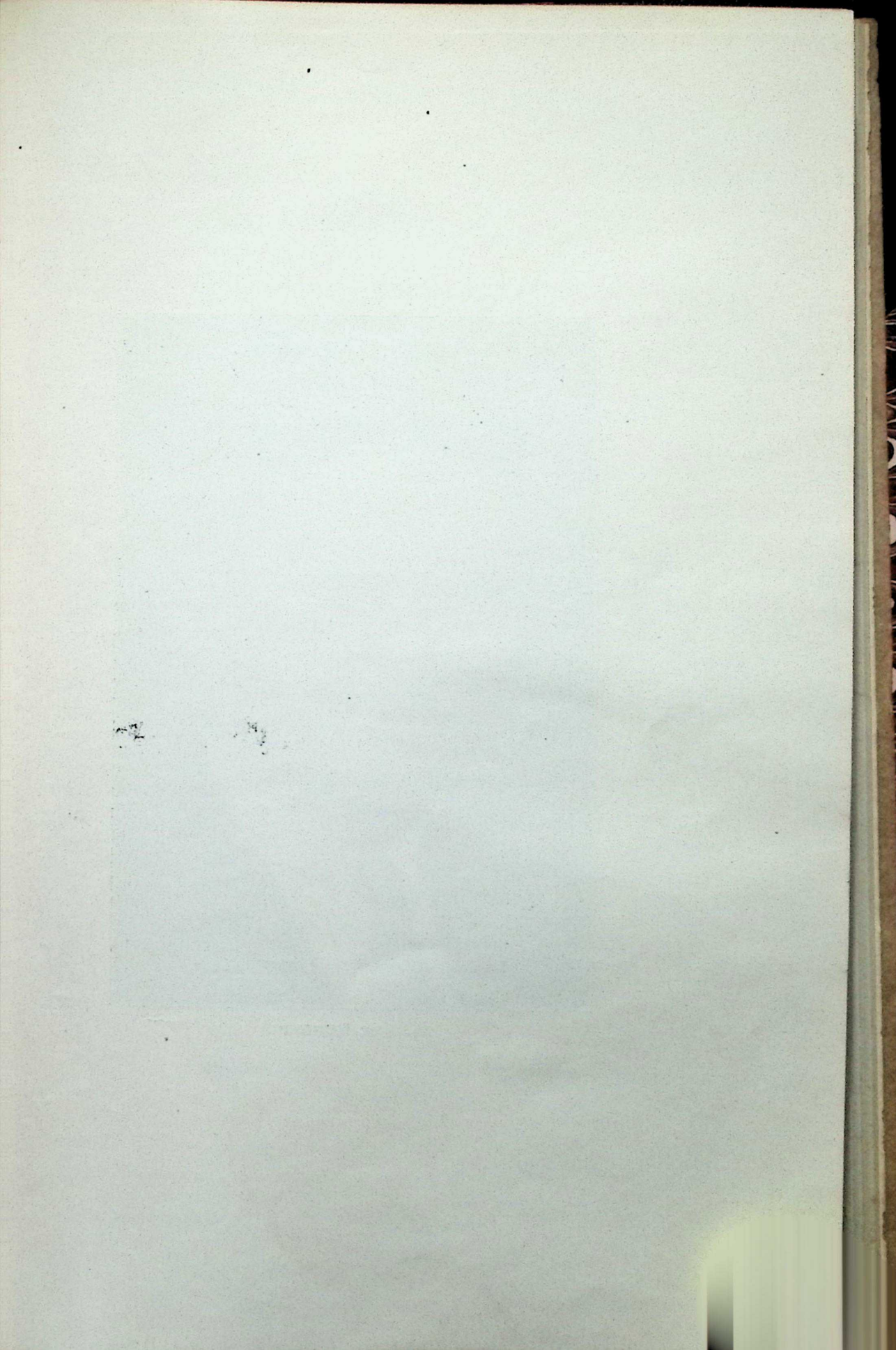
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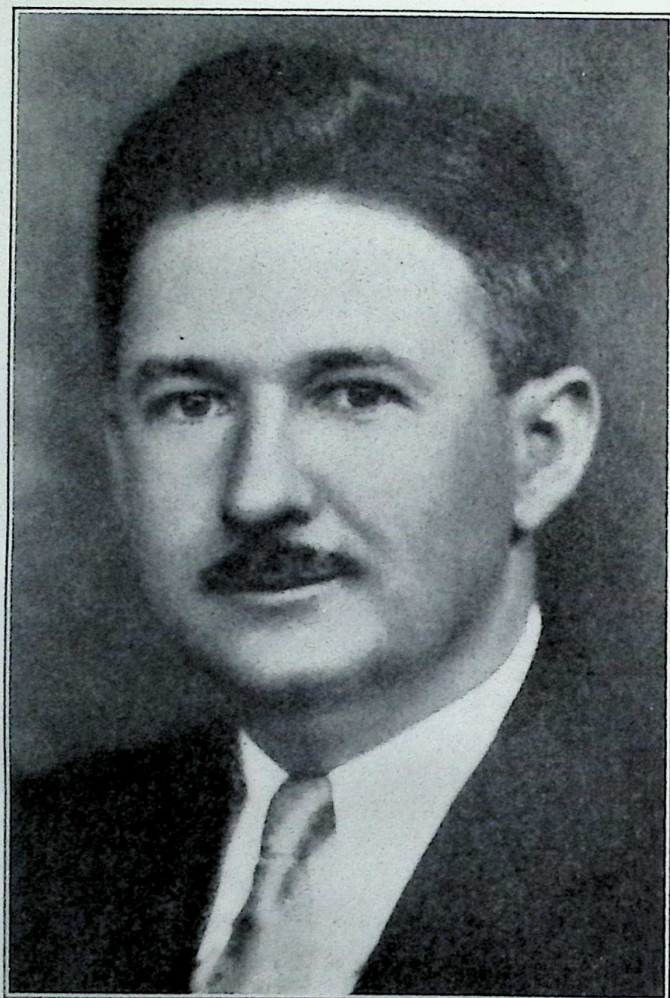
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A. LEE DUNLAP

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EDITORIAL NOTES AND COMMENT

Our New President. Professor Archibald Lee Dunlap was born in Philadelphia, Pa., May 2, 1895.

After receiving his early education in the schools of that city he entered the University of Pennsylvania, from which university he was graduated in 1917 with the degree of B. S. in M. E. He received the advanced degree of Mechanical Engineer in 1927 from the same institution.

After graduation he spent the years from 1917 to 1920 with the Goodyear Tire and Rubber Company, working specifically on dirigible development. This period also included work on plant construction with the American Industrial Corporation.

In 1920 he was called to the service of his Alma Mater as instructor in mechanical engineering. He remained with that institution until 1924, when he joined the faculty of Tulane University. He is now Associate Professor of Mechanical Engineering at the latter institution.

The Annual Reports. You will find printed in this issue the annual report of the Board of Direction. The Treasurer's report has been consolidated into a financial statement in the interest of printing economy. It is a summary of the Treasurer's report and clearly shows the financial condition of the Society without including the items in detail.

The original report is on file with the Secretary, and, of course, is available to members.

Members are urged to read the report of the Board and financial statement carefully. Such a perusal will give a good idea of the many problems which face the Board and the meager funds available for their solution. If the Society is to continue its good work an increase in membership is imperative.

It is hoped that each member will constitute himself a committee of one to bring in a new member during the coming year.

The Annual Meeting and Dinner Dance. Once again business and pleasure combined to make the evening delightful.

The business part of the evening commenced by calling the meeting together at 8:30 in the Convention Hall of the St. Charles Hotel with 133 members and guests present. The routine business of the annual meeting having been dispensed with, the new president, Professor Dunlap, was inducted into the chair.

The meeting was then adjourned and turned over to Mr. James M. Todd, who acted as toastmaster for the evening. And a good toastmaster he was, too.

The affair was a dinner and dance and was greatly enjoyed by all present. Mr. Walter Parker was the guest speaker of the evening and his illuminating discussion of the present

economic crisis was greatly appreciated by those who were permitted to hear him above the noise that occasionally existed in the hall.

Among the delightful features of the evening was the entertainment provided by the Ladies' Auxiliary headed by Mrs. W. B. Gregory. The ladies went to no end of trouble to make the evening pleasurable and a great success they made of it.

In addition to the guest speaker, Mr. Parker, the Society had as its guest, Dr. Robert Glenk, Curator of the State Museum.

Program of P.W.A. The work being done by the P.W.A. in this section must of needs be interesting to the engineering profession.

We are glad to report that in the next issue we shall be able to give a list of projects which have been approved, together with their estimated costs.

Other Officers for 1934. Colonel Bres was elected Vice-President for 1934 and Professor C. W. Ricker was elected on the Board of Direction to serve three years. Mr. Frank A. Muth and Mr. Walter B. Moses were re-elected as Secretary and Treasurer, respectively.

Mr. Charles Wiggin, Jr., and Mr. Paul F. Hoots are the other elective members of the Board who hold over for one and two years, respectively. Mr. John H. O'Neill, as retiring President, automatically becomes a member of the Board, taking thereon the place of the preceding retiring President, Mr. F. N. Billingsley.

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

The Mississippi River Bridge. In this issue is a very interesting article on the construction of the Mississippi River Bridge.

The method of sinking the foundations is interesting, indeed. No air pressure is used and there is no fear of workmen suffering from caisson disease or "the bends."

Mr. Melville's article is quite instructive and readable even to those whose normal fields of endeavor do not take them within the realm of heavy foundations.

Salaries and Engineers' Code. We have received from Colonel E. S. Bres, Chairman of Aims and Activities, Louisiana Section, American Society of Civil Engineers, the following memorandum. We commend it to your careful reading, and, if you agree, to your thoughtful support.

The committee appointed by the Louisiana Section, American Society of Civil Engineers to cooperate with the parent Society in a study and report of engineer salaries has forwarded its recommendations. The report was compiled for use in formulating the Engineers' Code which will be included as a part of the Construction Industry Code under the National Recovery Act.

Conditions were considered from viewpoints of both employee and employer. Normal economic conditions were assumed as those existing in the period of years from 1926 to 1929.

The schedule of yearly salaries submitted as thought appropriate for adoption in Louisiana was:

Chief Engineer in Charge.....	\$7,500
Assistant Chief Engineer.....	6,000
Department Head Engineer.....	5,500
Division Engineer.....	4,800
District or Associate Engineer.....	4,000
Assistant Engineer or Chief of Party.....	3,500
Junior, Resident, or Engineer or Maintenance Superintendent	3,000
Inspector	2,000
Instrumentman	2,000
Rodman and Chainman.....	1,200
Chief Draftsman.....	3,600
Assistant Chief Draftsman.....	3,000
Senior Draftsman.....	2,600
Draftsman	2,200
Assistant Draftsman.....	2,000
Junior Draftsman and Computer.....	1,800

The duties for the above grades to be comparable to U. S. Engineer, State and Municipal Public Works Departments.

Similar schedules from various parts of the country were submitted by 52 Local Sections of the American Society of

Civil Engineers. From these the Society will compile and recommend for the Code the proposed salaries for the various regions.

It is hoped that these recommendations will prove effective in making more liberal engineer salary allowances for the C. W. A. and other N. R. A. activities.

This action by the American Society of Civil Engineers is one which should receive the unanimous support of the engineering profession. It is a step forward to raise, professionally and economically, the status of the engineer.

All Louisiana engineers will not agree with the above schedule. It would be an unheard of happening if they did. However, if you agree, only in part, give it your support.

If you do not agree, even in part, support it by sending in your *constructive* criticism.

PAPERS AND DISCUSSIONS

SOME GENERAL NOTES ON THE MISSISSIPPI RIVER BRIDGE

By C. G. MELVILLE,*

Read before the Society, December 11, 1933.

I have been asked to tell you something about the construction of the Mississippi River Bridge.

In the first place you all know what kind of bottom the river has at the location for the site of the bridge. The bridge is a fixed type of structure and does not have a draw-bridge or swing-bridge nor is it of the Bascule type. The span stretches from bank to bank 3,524 feet. The distance from levee to levee is 3,378 feet. The bridge is an ocean-going under-clearance bridge. At normal low water it will clear the surface by 153 feet; at high water by 135 feet; with a channel span of 790 feet. The ocean-going under-clearance is great enough to permit any vessel ever built to pass beneath the bridge. It is the same clearance demanded of bridges in New York harbor.

There will be a double railroad track across the bridge, one lane for trains eastward bound; one lane for the westward trains. There will be four lanes for vehicular traffic, two of them eastbound, two of them westbound. There will be 18-foot roadways on each side of the bridge, one upstream, one downstream.

The foundations of the east bank approach are 100 per cent. complete. The steel work of the east bank approach is 100 per cent. complete. There remains to be done only the painting and the placing of the metal railroad deck to complete the railroad portion of this east bank approach. The east bank approach concrete roadway is 40 per cent. complete. The highway fill leading to the bridge and the traffic circles on the east bank are 75 per cent. complete. On the west bank approach the concrete foundations are 50 per cent. complete. The driving of the west bank approach foundation piling is 80

* Engineer of Construction, Modjeski, Masters and Chase.

per cent complete. No steel work at all has yet been erected on the west bank approach, but preparations are being made now to start the erection of steel on the west bank approach within the next 10 weeks. Two barges of steel have arrived and are being unloaded.

The foundation is constructed in the water by what is known as the sand island method. Air pressure is not used and there is no fear of workmen suffering from the Caisson disease, known as "The Bends".

The sand island method of construction is most interesting. The floating pile-driver drives piles into the bed of the river 135-foot long pilings of fir. They are driven 20 to 30 feet into the river bed and are braced together to form a great circle approximately 120 feet in diameter. Securely they are bolted and braced, made strong enough to withstand all the force of the current and to support on platforms the derricks used to construct the pier.

Inside this great mass of circular "false work" a huge circular steel shell is lowered into the river as section after section, each five feet high, swung from the derricks, is bolted to other sections, and a great pipe-like tube of steel nearly 120 feet in diameter is formed. Section by section it is fastened together and lowered until the bottom rim rests on the river bed, where it sinks of its own weight to a depth of four or five feet in the ooze. At its completion the great shell rises some 15 feet above the normal river stage when the river bed upholds its weight at last.

The shell is full of water at the same level as the river outside the curving steel wall. Then down from the site of the Southern Pacific ferry landing on the east bank near Harahan come barges loaded with clean river sand which has been dredged up from the Mississippi. Towed to the false work outside the steel shell, this sand is transferred from barges by a clam-shell dredge and dropped inside the circular steel shell. Steadily the sand displaces the water which flows back into the river over the side of the steel shell like water from a drinking glass filled too full. The clam-shell dredge piles in the sand until the level of the sand is several feet above the

level of the normal river. The interior of the steel shell has been made into an artificial sand island higher than the river. The last few feet of water at the top of the shell is pumped out. The sand is leveled smooth.

On this level, artificial sand island the first steel caisson is placed. Pointing downward, it has a cutting edge like a blunt chisel. That caisson is a steel form into which concrete reinforced by steel rods, is poured. Thus the first concrete "lift" or "story" is poured, heavily reinforced by steel reinforcing bars.

When that concrete hardens, the steel caisson forms are removed. A great mass of concrete rests, cutting edge downward, the whole mass 10 feet high, on the level sand inside the steel shell. That concrete caisson looks like a gigantic piece of hollow tile. It is pierced from top to bottom with 15 vertical openings the engineers call "dredging wells." Steel forms are fastened on top of the first 10-foot "lift" and a second layer of the great concrete cake is poured, heavily reinforced with those steel reinforcing bars, becoming an integral part of the first "lift".

Now the clam-shell dredge mounted on the false work comes into action again. Down each one of the "dredging wells" the great clam-shell scoops up a load of watery sand, hoists it, dumps it into the Mississippi river and returns for more. That dredging continues uniformly in each of the 15 dredging wells cast in the concrete, and as the material beneath the concrete caisson is removed evenly, the caisson settles down by its own weight. In other words the caisson is undermined by removing the material that is underneath the dredging wells. Engineers call this the "open dredging process."

Water rises in the dredging wells and stays in them the same height as the river level outside the steel shell that surrounds the concrete caisson. The dredging is carried on through the water in the dredging wells. And, after the caisson has sunk to the distance desired, another "lift" is poured on top of it by replacing the steel forms from the hardened concrete one story higher and adding the necessary reinforcing steel. When that 10-foot "lift" is sufficiently hardened, the steel forms are again removed, the dredging process again

repeated through the dredging wells, and the concrete caissons sink deeper into the river.

"Lift" by "lift" the concrete rises until the caisson has been built 135 feet high. Steadily it has been sinking into the river bed. Through all this height of 135 feet the dredging well have been continued vertically.

Thus, by dredging, the concrete, steel-reinforced caissons sink down to 170 feet below mean Gulf level, which is from 80 to 120 feet below the river bottom. That elevation is approximate. It may be increased or decreased, as the time arrives to get the desired supporting power of the river bed. But after the cutting edge, the bottom, of the concrete caisson has reached the desired elevation (depth), all of the 15 dredging wells are filled from the bottom up with concrete to an approximate height of 20 feet above the cutting edge.

This gives a solid, rectangular base to the concrete caisson on which the bridge pier is to rest. It is no longer cellular in construction. Its resemblance to a hollow tile, at the bottom, has ceased. It is entirely solid to the height of 20 feet. This concrete poured in the bottom of the dredging wells is known as a "tremie pipe" with which a wadding crowds the water out and concrete can be set 170 feet below the surface of the water without being washed by the water.

After the bottom of the caisson has thus been sealed, the tops of the dredging wells are covered by a block of concrete known as the distributing block, which is laid on top of the caisson. The pier-shaft that rises in air is placed on top of this distributing block. This pier-shaft is very much smaller in area than the hollow concrete caisson, the idea being to distribute the load from the pier over a very large area, thus making the load per unit on the bed of the river as small as possible.

From five feet below the normal river level to 20 feet above normal river level, the five main river piers (there are nine piers in all; four on land, two each on east and west bank) will be faced with granite. From this granite up to the bridge seats, the pier-shaft will be of concrete.

Thus the great span over the river rests in the sand and clay from 80 to 120 feet below the river bed. And the caissons

have been given ample opportunity to settle as far as they can go before the packed material beneath the great square concrete foundation at the bottom holds the whole weight up.

When the steel work begins jutting out over the Mississippi, it will be built out from east and west bank simultaneously and will meet in the middle of the stream.

Note: At the conclusion of Mr. Melville's talk he was kept busy for a considerable time answering the questions of a very much interested audience.—Editor.

MEMBERSHIP LIST

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- LOUIS CARON, JR., (1933), 1715 Napoleon Ave., New Orleans.
- RICHARD HARRISON CHURCH, (1933), Engineer, 7901 Willow St., New Orleans.
- AUBREY G. CODE, (1933), Engineer, 7814 Green St., New Orleans.
- ERNEST A. COULOHERAS, (1933), Civil Engineer, 2627 Peniston St., New Orleans.
- WILLIAM H. CREIGHTON, (1933), Petroleum Engineer, Shell Petroleum Corporation, Norco, La.
- DANIEL VAN S. CRESAP, (1933), 1225 Avenue F, Crowley, La.
- MARCEL EMILE CRETTE, JR., (1933), with Shell Petroleum Corporation, 5580 Woodlawn Place, New Orleans.
- LIONEL J. CUCULLU, (1928), with New Orleans Public Service Inc., 317 Baronne St., New Orleans.
- SALVADOR DI BENEDETTO, (1925), Civil Engineer, S. & W. Board, 526 Carondelet St., New Orleans.
- WILLIAM JOSEPH DRAWE, JR., (1933), Engineer, New Orleans Public Service, 7918 So. Claiborne Ave., New Orleans.
- ROBERT JOSEPH DREUDING, (1925), Assistant Engineer, Orleans Levee Board, 1220 Second St., New Orleans.
- HERMAN G. ENGELHARDT, (1932), Engineer, 706 Moss St., New Orleans.
- THEODOSE L. ESTORGE, (1933), Engineer, 614 State St., New Orleans.
- DANIEL D. EWING, JR., (1933), Engineer, 3339 Richardson Court, New Orleans.

- JOHN B. GEIGER, (1933), Chemical Engineer, Southern Cotton Oil Co., 902 Eighth St., Gretna, La.
- EDWARD H. GESSNER, (1933), Engineer, Lake Charles, La., 119 Audubon Blvd., New Orleans.
- JOHN S. GENTILICH, (1933), U. S. Waterways Experiment Station, Vicksburg, Miss.
- JOSEPH E. GUIDRY, JR., (1933), Engineer, 5121 Danneel St., New Orleans.
- ERIC J. HANEMANN, (1933), Junior Engineer, McDonald Engr. Co., 1126 Dumaine St., New Orleans.
- JOHN A. HAASE, III, (1933), Civil Engineer, 115 So. Hennessey St., New Orleans.
- W. T. HESS, (1933), Engineer, 202 Rosewood Drive, Metairie, New Orleans.
- ALVIN E. HOTARD, (1933), Parish Engineer, Jefferson Parish, City Engineer, City of Gretna, 829 Lafayette Ave., Gretna, La.
- EDWARD F. HUGHES, (1933), Instrumentman, Sewerage and Water Board, 4502 So. Miro St., New Orleans.
- JAMES S. JANSSEN, (1933), Junior Engineer, U. S. Engineers, 1903 Short St., New Orleans.
- WILHELM E. KOCH, (1913), Civil Engineer, 2627 Coliseum St., New Orleans.
- LOUIS I. KORN, (1933), Engineer, 6030 Garfield St., New Orleans.
- STANLEY M. LECOURT, (1933), Civil Engineer with Theodore Brent, 303 Board of Trade Annex, New Orleans.
- ALBERT E. MARKS, (1925), Engineer, 3320 Palmyra St., New Orleans.
- FRANK M. McDONALD, (1933), Engineer, 2820 Gen. Pershing St., New Orleans.
- GORDON J. McLEAN, (1933), Engineer, 1544 Henry Clay Ave., New Orleans.
- LEAL C. H. McLEAN, (1933), Engineer, Jones & Laughlin Steel Corp., 1544 Henry Clay Ave., New Orleans.
- JOHN K. MAYER, (1933), Instructor, Tulane University, 1738 Carrollton Ave., New Orleans.
- A. J. MEYERS, (1933), Engineer, 5517 Prytania St., New Orleans.
- CHARLES R. MONTEIRO, (1933), Junior Engineer, Lighthouse Service, 1817 Gen. Pershing St., New Orleans.
- HU. B. MYERS, JR., (1929), Civil Engineer, 2438 Palmer Ave., New Orleans.
- F. ROBERT MENDOW, (1930), Engineer, 2900 Calhoun St., New Orleans.
- CLAYTON L. NAIRNE, (1929), with New Orleans Public Service Inc., 1219 Valence St., New Orleans.
- J. CHRIS. NIELSEN, JR., (1933), Surveying (Transitman), 2118 Dublin St., New Orleans.
- MYRTIS M. NORTON, (1933), Instructor Tulane University, 1134 Joseph St., New Orleans.
- PASCAL PARETI, JR., (1933), Engineer, 619 Bourbon St., New Orleans.
- WILLIAM P. OSTER, (1928), Engineer, Equitable Equipment Co., 4651 Baccich St., New Orleans.
- PHILLIP FRANK PHILLIPS, (1933), Engineer, 4424 So. Claiborne Ave., New Orleans.
- CARROLL J. PEIRCE, JR., (1933), with Sewerage & Water Board, 8217 Nelson St., New Orleans.
- RAYMOND C. PROUET, (1933), Engineer, 5110 Freret St., New Orleans.
- CHARLES L. RITTENBERG, (1923), Chief Draftsman, Dock Board, 4437 S. Rocheblave St., New Orleans.
- JAMES M. ROBERT, JR., (1933), Senior Student, College of Law, Tulane University, 2141 State 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.
- HERBERT M. SHILSTONE, JR., (1933), with Dr. H. Shilstone Laboratory, 510 Gravier St., 1662 Valmont St., New Orleans.
- WALTER S. SIMPSON, (1933), Engineer, 19 Audubon Place, New Orleans.
- HENRY F. SIRGO, (1932), with Todd Dry Dock, Engineering and Repair Co., Inc., Engineering Division, 1215 St. Anthony St., New Orleans.
- DAVID STAYER, (1933), with R. C. A. Victor Co., 219 White Horse Pike, Audubon, N. J.
- FRANK G. STEWART, (1928), City Engineer's Office, Assistant Engineer, Bridge Department, 3816 D'Hemecourt St., New Orleans.

- J. FRASER THOMSON, (1933), Instructor in Mathematics, Tulane University, 139 S. Genois St., New Orleans.
 SID E. TROUARD, JR., (1928), Engineer, New Orleans Public Service Inc., 1526 Conery St., New Orleans.
 LOUIS M. TOGNONI, (1933), ERA Field Worker, 4609 Arts St., New Orleans.
 BERNARD J. TORTOMASI, (1933), Attorney-at-Law, 1601 Masonic Temple Bldg., New Orleans.
 NELSON W. TREMBLAY, (1933), Engineer, 2625 Jena St., New Orleans.
 WILDAY TUDURY, (1933), Engineer, with Pan-American Oil Co., Texas City, Tex.
 ALVIN A. VOSS, (1929), Engineer with U. S. Coast and Geodetic Survey, 1701 Valmont St., New Orleans.
 RICHARD E. WAGNER, (1933), Engineer, 1818 So. Gayoso St., New Orleans.
 JOHN W. WILSON, (1933), Engineer, 7916 Oak St., New Orleans.
 CARROLL L. WOOD, JR., Engineer, 819 Calhoun St., New Orleans.

NON-RESIDENT JUNIOR MEMBERS

- A. L. BLACK, JR., (1931), Engineer, LaPorte, Texas.
 CHARLES M. BROUGH, (1927), Engineer, 2127 Cherry St., Vicksburg, Miss.
 CHARLES D. DAVID, (1933), Engineer, Mandeville, La.
 GEORGE T. DeLa MATYR, (1933), Engineer, 235 W. Carter St., Route 1, Box 34, Hynes, Calif.
 C. E. DOLHONDE, (1933), 7008 Zimple St., New Orleans.
 FRED H. FENN, (1930), Instructor, College of Engineering, L. S. U., 204 Church St., Baton Rouge, La.
 JOSEPH E. LEININGER, (1931), Graduate Student, M. I. T., Boston, Mass., 920 Music St., New Orleans.
 JACOB F. MULLER, JR., (1932), Vice-President, Muller Furniture Mfg. Co., 7824 Hickory St., New Orleans.
 WALTER H. PRICE, (1933), U. S. Reclamation Bureau, Denver, Colo.
 BRISTER BLAKE PIERCE, (1929), Engineer, 841 St. Hypolite St., Baton Rouge, La.
 EDWARD A. RODRIGUE, (1933), Engineer, La. Light and Power Co., Sterlington, La.
 PAUL STOKELY, (1932), Engineer, Box 485, L. S. U., Baton Rouge, La.
 PHILIP A. WEBER, (1933), U. S. Coast and Geodetic Survey, Washington, D. C.

STUDENT MEMBERS

- WM. P. LEVERICH, 2100 Pine St., New Orleans.

SUMMARY

Resident Honorary Members.....	4
Life Members	18
Resident Members	164
Non-Resident Members	54
Associate Members	2
Non-Resident Associate Members.....	0
Affiliate Members	17
Non-Resident Affiliate Member.....	3
Junior Members	70
Non-Resident Junior Members	13
Student Members	1
Total.....	346

PAST PRESIDENTS

Sidney F. Lewis.....	1898	Samuel M. Young.....	1916
Thos. L. Raymond.....	1899	A. T. Dusenbury.....	1917
Henry J. Malochee.....	1900	John Klorer.....	1918
Frank M. Kerr.....	1901	Ole K. Olsen.....	1919
Alf. F. Theard.....	1902	John Riess.....	1920
Alf. Raymond.....	1903	R. S. Manley.....	1921
J. F. Coleman.....	1904	Donald Derickson.....	1922
W. B. Wright.....	1905	J. S. Barelli.....	1923
W. H. Hoffman.....	1906	James M. Robert.....	1924
G. W. Lawes.....	1907	Marcel Garsaud.....	1925
C. W. Wood.....	1908	Farrar P. Hamilton.....	1926
J. T. Eastwood.....	1909	Edward S. Lanphier.....	1927
W. B. Gregory.....	1910	John L. Porter.....	1928
J. C. Haugh.....	1911	Frederick H. Fox.....	1929
D. S. Anderson.....	1912	James M. Todd.....	1930
A. M. Shaw.....	1913	Frank G. Frost.....	1931
W. H. Williams.....	1914	Frederick N. Billingsley.....	1932
L. C. Datz.....	1915	John H. N'Neill.....	1933

MINUTES OF THE MEETINGS AND BUSINESS OF THE SOCIETY

Minutes of Board of Direction, December 11, 1933.

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

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

In accordance with the constitution Mr. Warren Johnson and Mr. F. W. Stevens were elected life members.

Communication from Richardson and Gay was read. After consideration of same, the Secretary was instructed relative to the reply to be made to the letter.

Communication from Mr. James M. Todd relative to work reported in the press was read, and carefully considered. On motion, duly seconded, it was voted that Mr. Todd be appointed chairman of the committee to look into the matter further, when opportunity permits, and submit a more detail report to the Board relative to the engineering work which is being done by others than engineers.

It was voted to hold Ladies' Night on December 20, to be self-supporting. Amendments to the proposed method of awarding scholarships were carefully considered along with the comments from the Deans of the College of Engineering of L. S. U. and Tulane. On motion, duly seconded, it was voted to approve the amendments with the amount of the scholarships remaining as at present. The Secretary was instructed to write to the Deans and send them copies of the amendments, and to also send a copy to the editor of the Proceedings for publication.

A resolution relative to the pay of engineers on C. W. A. projects was read and carefully considered. It was voted to recommend the resolution be passed by the Society with the request that the resolution be sent to the President of the U. S. A., Honorable Harold Ickes, Mr. H. L. Hopkins, Col. H. M. Wait, Mr. H. J. Early, A. S. C. E., A. S. M. E. and the American Engineering Council.

The Membership Committee submitted the name of Mr. Thomas E. Ernst for resident member. On motion, duly seconded, his name was ordered to ballot.

The Secretary was instructed relative to letters to be written to members in arrears.

There being no further business the meeting adjourned.

F. A. MUTH, Secretary.

Minutes of the Society, December 11, 1933.

The meeting was called to order about 8:15 P. M. by Mr. John H. O'Neill, President, in the Chair, F. A. Muth, Secretary, and Seventy-two members and guests were present.

The minutes of the previous meeting were read and approved. Reports were made by various committees, and the Chairman of the Entertainment Committee made a brief talk about the proposed "Ladies' Night" to be held January 20.

The resolution relative to pay of engineers on C. W. A. projects as recommended by the Board was presented to the Society. In accordance with the constitution and on motion, duly seconded, it was carried.

In accordance with the constitution the Nominating Committee submitted the following nominations:

For President.....Professor Archibald L. Dunlap
For Vice-President.....Colonel Edward S. Bres.
For Treasurer.....Mr. Walter B. Moses
For Secretary.....Mr. Frank A. Muth
For Board Member (to serve three years).....Prof. Claire W. Ricker

On motion, duly seconded, the Society voted that nominations close, and the nominations submitted by the Nominating Committee were declared the nominees to be ordered to ballot.

Technical exercises consisted of a most interesting address on a "General Talk on the New Orleans Bridge," by Mr. C. C. Melville. This address was followed by an interesting discussion. A rising vote of thanks was tendered the speaker, and the meeting adjourned to the usual collation.

F. A. MUTH, Secretary.

Minutes of Board of Direction, January 20, 1934.

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

The minutes of the previous meeting were read and approved, and bills on hand were ordered paid, including those for the Annual Meeting.

The Secretary was instructed to write to the banks in which the frozen deposits were held, and to have the bank confirm by letter the balances as shown by the records of the Society.

The reports of the Treasurer and Secretary were read, and the Secretary was instructed relative to portions to be printed in the Proceedings. The report of the Board of Direction was read and the Secretary was instructed to have same printed in the Proceedings.

There being no further business, the meeting adjourned to the Annual Meeting.

F. A. MUTH, Secretary.

Minutes of the Annual Meeting of the Society, January 20, 1933.

The meeting was called to order about 8:30 P. M., in the Convention Hall of the St. Charles Hotel. Mr. John H. O'Neill, President, in the chair, F. A. Muth, Secretary, and 133 members and guests present.

On motion, duly seconded, the reading of the minutes of the previous meeting was dispensed with. The reading of the Annual Report of the Board of Direction was also dispensed with and was ordered printed in the Proceedings.

The result of ballots for new members was announced, there being 63 formal ballots and 6 informal ballots. Therefore, the following were declared elected:

Resident Members

Thomas E. Ernst, David Moodie, Gerald L. Rhodes

Announcement was made that the tellers had counted the ballots for the election of officers for the following year, and that there were 69 formal ballots and 6 informal ballots cast. The following officers were therefore declared elected:

President.....	Mr. A. L. Dunlap
Vice-President.....	Edward S. Bres
Treasurer.....	Walter B. Moses
Secretary.....	Frank A. Muth
Member of Board (to serve 3 years).....	C. W. Ricker

The incoming President, Professor Dunlap, was then inducted into the Chair and was presented with the gavel by the retiring President, after which he thanked all members, officers and committees for their co-operation during the year. Mr. O'Neill made some appropriate remarks and the meeting then adjourned to the Ladies' Night, with Mr. James M. Todd as Toastmaster. The Ladies' Night was an affair enjoyed by all. The entertainment was provided by the Woman's Auxiliary of the Louisiana Engineering Society. Mr. Walter Parker was the guest speaker. Dinner was followed by dancing and a varied program of entertainment, and the meeting adjourned.

F. A. MUTH, Secretary.

ANNUAL REPORTS

ANNUAL REPORT OF THE BOARD OF DIRECTION

Year 1933.

To the Members of the Louisiana Engineering Society:

Gentlemen—Your Board of Direction begs to report that during the year 1933 there were held 9 meetings for the transaction of the business of the Society.

The Technical Papers Committee had given us a most excellent program of high grade papers covering a variety of interesting topics. These papers have all been printed in the Proceedings for permanent record.

The Library Committee has done good work and some valuable accessions have been made to the library during the year. Expenditures have been kept well within the amount allotted to the committee for its activities. An important feature of the work has been in making the library facilities available to the non-resident members. This is an important innovation, and it is believed will be of considerable benefit to the out-of-town members in giving them the opportunity to use certain technical books of the library.

The Committee on Employment has kept up its fine performance record in securing positions for unemployed engineers. The committee reports filling 43 vacancies. Special effort has also been put forth by the Society, as well as the Employment Committee, in bringing to the attention of Federal Activities the names of the unemployed engineers in Louisiana, with the result that many of them have been located in positions which they now hold. Engineers and draftsmen in need of employment should use the facilities of this committee.

The Membership Committee has found it most difficult to secure new members, as this year was not a propitious one for a campaign of membership expansion. An accomplishment of the year has been in raising the grade of 59 student members and 6 junior members to higher grades. Effort has been put forth to secure eligible members by circularizing registered engineers and the members of the American Society of Mechanical Engineers and American Society of Civil Engineers who reside in Louisiana outside of New Orleans. It is hoped that a number of members will be enrolled during the year as a result of the efforts put forth in this direction, especially in view of the fact that the library facilities are now made available to members residing outside of New Orleans.

The Publication Committee has carried on its good work in issuing the Proceedings and the editor deserves the highest praise for the tone and quality of this publication. The committee has worked diligently

in keeping down the cost of the Proceedings without impairing its appearance or scope of coverage, as a result of which the cost of the publication for the year 1933 was approximately \$75.00 less than for a similar number of issues during the preceding year.

The Committee on Entertainments and Outings has handled this phase of the activity of the Society in an admirable manner. The Third Annual Golf Tournament was held in May, and was very well attended. Numerous trophies, generously donated for the occasion, were distributed at the dinner which followed the tournament. A most interesting excursion to the Mississippi River Bridge was made in October, and was enjoyed by a large number of the members. The Annual Meeting was held as a Ladies' Night and was well attended, with enjoyment to all. All of these activities were largely self-supporting.

A Code of Ethics was adopted and was printed in a booklet containing the new Constitution and By-laws, also the Rules of the Library. These booklets were sent to all the members.

Special committees were appointed during the year and submitted reports on certain matters of particular interest to the Society as follows:

Meeting Place.

Code of Ethics.

Retirement of Federal Employees.

Current Engineering Events.

Fire Insurance Regulations Affecting Engineers.

Scholarships.

Student Members and Student Chapters.

In response to the need for a careful use of operating funds, the Board authorized the appointment of the Finance Committee as a Budget Committee which rendered report, setting forth recommendations for a budgetary control of the Society's expenditures. As a result, the expenses of the Society were kept within the income which decreased both in membership fees and advertising in the Proceedings. However, on account of the fact that the sum of \$2,205.00 was deferred in the checking account, it was necessary to withdraw \$165.00 from the reserves to take care of two scholarships, otherwise the Society operated well within the budgeted allotment.

The Society continued its practice of awarding junior memberships to two outstanding students. This year the awards were made to Mr. Malcolm H. Barnes of Tulane University and Mr. George de la Matyr of Louisiana State University.

The award of two scholarships was continued. The recipients this year were Mr. Louis M. Tognoni of Tulane University and Mr. John H. Gillum of Louisiana State University.

It is believed that some of the deferred savings account will soon be available for use in carrying on the activities of the Society.

At this time, some effort should be put forth to secure the re-enrollment of some of those members who were forced to terminate their membership on account of business conditions. Some increase in advertising in the Proceedings may reasonably be expected before long.

In conclusion, the Board wishes to express its appreciation to the various committees and members of the Society for their support and cooperation in assisting to carry on the activities of the Society so successfully during this trying period.

Respectfully submitted,

JOHN H. O'NEILL, President,
A. LEE DUNLAP, Vice-President,
F. A. MUTH, Secretary,
WALTER B. MOSES, Treasurer,
FRANK G. FROST,
E. S. BRES,

Board of Direction.

CONSOLIDATED FINANCIAL STATEMENT

January 1, 1934.

Assets:

Cash in Bank.....	\$ 65.39
Accounts Receivable (Members).....	495.80
Investments (Market Value, \$3,858.57) as Estimated by Auditor	7,131.92
Checking and Savings Accounts, Balances Frozen.....	4,239.28

Total Assets.....\$11,931.40

Liabilities:

Proceedings Reserve Fund.....	\$ 1,177.60
Library Fund.....	566.82
General Reserve Fund.....	9,881.03
Accounts Payable.....	290.95
1934 Dues in Advance.....	15.00

\$11,931.40

Cash Account—Year 1933

Balance in Checking Account, January 1, 1933.....\$ 2,082.72

Receipts:

Dues for 1932 and prior years.....	\$ 417.00
Dues for 1933.....	2,021.00
Dues for 1934.....	11.00

\$2,449.00

Smoker	5.00
Advertisers	408.92
Interest	112.50
A. S. C. E. and A. S. M. E.....	20.00
Proceedings Sales.....	2.70
N. S. F. Checks.....	10.00
Interstate Bank and Tr. Co., Savings Transferred to Checking	165.00
Exchange	.63

3,173.75

\$ 5,256.47

Disbursements:

Exchange	\$ 4.90	
Proceedings Misc. Expense.....	165.00	
Salary Secretary.....	495.00	
Salary of Editor and Secretary.....	355.00	
Smoker Expense.....	156.25	
Library Expense.....	187.65	
Accounts Payable (1932).....	252.90	
General Expense, Supplies and Printing, etc.....	184.55	
Printing and Postage.....	298.25	
Refreshments	135.40	
Printing and Mailing Proceedings.....	436.43	
Scholarships	165.00	
N. S. F. Checks.....	99.84	
Auditor	50.00	
		2,986.17
		\$ 2,270.30
Loss Deferred Account in Checking.....		2,205.00
Balance in Checking.....	\$	65.30

Proceedings Fund**Revenues:**

Sales	\$ 2.95	
Advertising Revenues.....	352.95	
Members' Subscriptions	728.00	
		\$ 1,083.90

Expenses:

Salary Secretary and Editor.....	360.00	
Printing and Mailing.....	591.43	
Proceedings, Miscellaneous Expense.....	180.00	
		1,131.43
Deficit for Year 1933.....	\$	47.53

Library Fund

Balance, December 31st, 1932.....	\$1,300.47	
Allotted for Year 1933.....	480.00	
		1,780.47
Expenditures for year 1933.....	213.65	
Transferred by Board to General Fund.....	1,000.00	
		1,213.65
Balance, December 31st.....	\$	566.82

General Fund**Earnings:**

1933 Membership Dues.....	\$2,589.00
Smoker and Entrance Fees.....	8.50
Income from Investments.....	112.50
Misc. (A. S. C. E. & A. S. M. E.).....	38.63
	\$ 2,748.63

Expenses:

Secretary Dues.....	\$ 10.00
Allotment for Proceedings.....	728.00
Allotment for Library.....	480.00
Salary Secretary.....	540.00
Printing and Postage.....	362.92
Refreshments	142.40
Smoker Expense	156.25
General Exp., Tax, Exchange.....	162.73
Auditor	50.00
Scholarships	165.00
Loss on Dues, N. S. F. Checks.....	99.84
	2,897.14
Deficit for Year.....	
	\$ 148.51

Investments

(From Treasurer's Report)

1.—Union Title Guar. Gold Note.....	\$ 1,000.00
1.—N. O. Securities Gold Note.....	720.00
2.—\$100.00—1st Liberty Loan.....	200.00
1.—\$ 50.00—1st Liberty Loan.....	50.00
5.—\$ 50.00—(1917) Liberty Loan.....	250.00
Greater New Orleans Homestead.....	1,184.90
Union Homestead	500.00
Standard Homestead	500.00
Italian Homestead.....	500.00
Security Homestead.....	500.00
Columbia Homestead.....	500.00
Interstate Trust & Savings Bank—	
Free	\$ 85.82
Deferred	1,630.59
	1,716.41
Canal Bank Trust & Savings—	
Deferred	\$ 403.69
National Bank of Commerce (Savings).....	1,140.30
Interstate Bank, Deferred Checking.....	2,205.00
	\$11,370.30

The Proceedings of the Louisiana Engineering Society

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JAMES M. ROBERT, Editor.

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LOUISIANA ENGINEERING SOCIETY

OFFICERS FOR 1934

President, A. LEE DUNLAP, 1318 Nashville Avenue.
Vice-President, E. S. BRES, 1007 Maritime Building.
Secretary, FRANK A. MUTH, 7705 Willow Street.
Treasurer, WALTER B. MOSES, 425 S. Peters Street.

DIRECTORS

CHARLES WIGGIN, JR., 329 Balter Building.
PAUL F. HOOTS, 317 Baronne Street.
CLAIRE W. RICKER, Tulane University.
JOHN H. O'NEILL, 637 Lowerline Street.

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

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

PROCEEDINGS OF THE LOUISIANA ENGINEERING SOCIETY

VOL. XX.

APRIL, 1934

No. 2

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EDITORIAL NOTES AND COMMENT

The Inalienable Right to Vote. It was Abraham Lincoln who said, "The Lord must love the common people. He made so many of 'em."

But the "common people" as a class are the objects of more than just unselfish love. For them there is no affection quite so great as that of the politician. For the politician, this class, with the so-called inalienable right to vote, (which is all too frequently alienated for a price), has been the source of constant solicitude, purchasable votes and considerable graft. For the politician, this class also has been the "goose that lays the golden eggs"—a goose to be carefully nurtured and ap-

parently not amenable to the law of diminishing returns. It is quite easy for a politician to put over any measure not in the public interest.

The intelligent men of any community, with public interest paramount in their minds, all too frequently have their votes nullified at the polls by unintelligent men with easy consciences and purchasable votes. We do not mean to say that the votes of *all* the "common people" are purchasable. Nor do we mean to say that the intelligensia have a monopoly on high minded honesty. Far—oh, very far—from it. But we do mean to say that the number of intelligent votes based solely on public interest is limited. It therefore becomes quite easy for the unscrupulous politician to glean from the great mass of the "common people" ("He made so many of 'em"), enough purchasable votes to put over any nefarious legislation in which he may have a selfish, pecuniary interest.

The right of every citizen to vote may be fundamental to our form of government. But it is a pity that such safeguards can not be thrown around that right as to insure the removal from the laws of barter and trade the votes of the unintelligent and unscrupulous. By the very nature of our form of government the mass intelligence of our vote can not be very high. Anything that could bring up the average would help. All too frequently the public is kept entirely out of consideration by rival politicians seeking unintelligent and purchasable votes on selfish interests.

Building Blocks of the Universe. Published in this issue is a paper with the above title. It is by Dr. D. S. Elliott, Head of the Department of Physics at Tulane University. In this article Dr. Elliott has given us the high points of the battle in which the physicists are attempting to take apart the atom. Not only is Dr. Elliott's article very instructive, but quite up to date. In it he calls attention to discoveries made as late as a month before this paper was written, which discoveries at the present moment are still unexplained.

Industrial Alcohol. A very interesting discussion of the manufacture of industrial alcohol appears in this issue. If

there is anything in the economic principle that a commodity should be made in a locality which is most suited to its manufacture, then the territory around New Orleans is an ideal location for alcohol plants. This territory, with its proximity to Cuban molassas supply, low cost fuel, labor and ample water, does not leave much else to be desired. And with the use of alcohol in the industrial arts continually on the increase, the production of this commodity becomes a matter of considerable economic interest to this community.

Our New Club Rooms. Before the June meeting the Society will have moved to its new location. The library and headquarters will then be in the St. Charles Hotel, where the Society has secured a suite of rooms on the fourth floor.

The rooms are being specially refinished and refurnished and when complete will be a combined library and club where the members may drop in for reading, conferences or lunch, which latter can be secured through the room service of the hotel.

It is the earnest hope of the officers that the new set-up will fill a heretofore unfilled need of the members. It is also the wish of the officers that the membership will make free, full and frequent use of the new club rooms.

Society Scholarships for Engineering Students. We wish to call attention to the fact that each year the Louisiana Engineering Society awards one scholarship at Tulane University and one scholarship at Louisiana State University to deserving students in engineering. The rules for making awards were amended some time ago and we print below the amended rules:

1. The announcement of the Scholarship Award shall be set up and carried in the *Proceedings*.
2. The cards sent out by the Secretary for the notice of the April meeting shall include a statement relative to the Scholarship Award and request members to make recommendations or nominations. The April issue of the *Proceedings* shall also carry an article on the Award.

3. The scholarships shall be set up as honor awards to the children of the members of the Society or to other worthy students who are financially unable to begin or continue their Engineering studies. Awards shall be made, preferably, to a dependent of a member of the Society or of an Engineer.

4. The scholarships shall be awarded in the Colleges of Engineering for undergraduate study only. The scholarships awarded to a student in Tulane University will be \$125.00 per annum, and to a student in Louisiana State University \$40.00 per annum.

5. The Award shall be made for one year and may be renewed annually until the undergraduate course of study has been completed, provided proper scholastic grades have been maintained in accordance with the regulations set up by the Universities for the annual renewal of scholarships.

6. An Awards Committee consisting of three members of the Society shall be appointed annually by the President.

7. Applications for Scholarship appointments shall be made to the Awards Committee. In the event that no award is made by the Awards Committee, the Dean of the College in question shall be requested to nominate a candidate for the scholarship.

8. All applications shall be referred to the dean of the College of Engineering of the proper university. The dean shall rate the applications and submit the entire list to the Awards Committee together with all available information and such recommendations as he may deem fit.

9. The President shall make the award on the recommendation of the Awards Committee.

Stag Smoker. After the March meeting the members and their guests adjourned to the American Legion Hall, where an informal buffet supper and stag smoker was held. The comestibles were freely interspersed with music, songs and dances by musicians and entertainers secured especially for the occasion. Our chairman of the Entertainment Committee, Mr. H. L. McLean, was in charge and as usual he did a good job.

Apparently the occasion was greatly enjoyed by all present.

Federal Public Works Administration, Louisiana Division List of Applications Received and Approved

Applicant	Address	Character of Project	Approved Total Amount
City of Alexandria	Alexandria	Electric Lights, Water, Gas	\$ 250,000.00
Town of Welch	Welch	Street Paving	4,500.00
State of Louisiana	Baton Rouge	Mississippi River Bridge	7,000,000.00
City of Gretna	Gretna	Filtration Plant	269,000.00
City of Houma	Houma	Incinerator	18,000.00
Town of De Quincy	De Quincy	Culverts	6,000.00
Town of St. Joseph	St. Joseph	Street Surfacing	5,200.00
Town of Franklin	Franklin	Sewers and Disposal Plant	177,000.00
Town of Zachary	Zachary	Gas Distribution System	16,000.00
City of Shreveport	Shreveport	Municipal Market	50,000.00
City of Shreveport	Shreveport	Incinerator	200,000.00
City of Shreveport	Shreveport	Fire Station	20,000.00
City of Shreveport	Shreveport	Fire Station Repairs	10,000.00
City of Shreveport	Shreveport	Auditorium Repairs	40,000.00
City of Shreveport	Shreveport	Street Repairs	150,000.00
City of Shreveport	Shreveport	Fire, Police Alarm Extension	60,000.00
City of Shreveport	Shreveport	Play Grounds Extension	125,000.00
City of Shreveport	Shreveport	Police Radio System	5,000.00
City of Shreveport	Shreveport	City Hall Repairs	40,000.00
City of Shreveport	Shreveport	Municipal Building Repairs	18,000.000
City of Shreveport	Shreveport	Sewers and Water Repairs	9,500.00
Sewer District No. 1	Slidell	Court and Jail Repairs	14,000.00
Tensas Parish	St. Joseph	School with Auditorium	5,000.00
DeSoto Parish School Board	Mansfield		

OBITUARY

FLORANCE JOSEPH SCHWAB

Florance Joseph Schwab died at his home in New Orleans, February 21, 1934. Though he had been in failing health for some time, the suddenness of his passing came as a shock to his host of friends.

Mr. Schwab was born in New Orleans, May 11, 1880. He was graduated from St. Stanislaus College in 1896 and attended Cornell University from 1899 to 1903, being a graduate of the Mechanical and Electrical Engineering course.

Following graduation, he joined the New York Telephone Company, with whom he was identified until 1907. Upon his return to New Orleans he was employed by the New Orleans Railway and Light Company. He served this company and its successor, New Orleans Public Service Inc., continuously until death. At the time of his demise, he was Manager of the Industrial and Commercial Service Department of that organization.

Florance Schwab was the son of Mrs. Caroline Pfister Schwab and the late George Schwab. He is survived by his widow, the former Miss Mary White, two sons, John White and George Arthur, and a daughter, Miriam.

Mr. Schwab was Secretary-Treasurer of the Audubon Golf Club from 1929-1933, and was also a member of the Louisiana Engineering Society and other engineering and civic organizations.

His engaging personality, unquestioned ability and broad-minded attitude toward life and its problems won the sincere esteem and respect of his many associates in the business and social world.

As an expression of the high regard of his fellow-members in the Louisiana Engineering Society, it was resolved that this obituary notice be spread upon the minutes of the Society and be published in the *Proceedings*.

L. J. CUCULLU.
F. G. FROST,
J. M. TODD,

PAPERS AND DISCUSSIONS

BUILDING BLOCKS OF THE UNIVERSE

By D. S. ELLIOTT*

Read before the Society March 8, 1934.

In the pre-scientific preparation period, the natural philosopher arrived at the idea of the atom, a building block of the universe, by purely introspective methods. For the next two thousand years, this atomic view received amplification and modification to conform with accumulating experimental evidence. But throughout the entire series of changes, an atom continued to be regarded as impenetrable, indestructible, and non-convertible into another kind of atom or into energy. This was the picture until 1895. And then suddenly, without warning, there broke a series of discoveries so important in their consequences that the scientific progress of the next forty years is regarded by many as equal to that of several preceding centuries. It was the attempt to understand and control these new phenomena that sent us back to the study of individual atoms and an attempt to get inside of them.

This part of the story begins with the discharge tube, ancestor of the neon sign, a familiar advertising display on any downtown street. Scientists, ably led by J. J. Thomson, took up the study of these discharge tubes in the hope that it might lead to a better understanding of matter and by 1900 had forced it to give up one of its secrets. One thing about these discharge tubes exciting special curiosity, was the fact that one end of the discharge tube continued to glow brightly the whole time the discharge was passing. A study of this phenomenon led Conrad Roentgen to the discovery of X-rays. Then Becquerel made a search among natural substances for this unknown ray of Roentgen's, found a similar ray known later as the gamma ray and discovered radioactivity.

*Member. Head of the Department of Physics, Tulane University.

Let us return to the discharge tube. Thomson showed that the electrical discharge in these tubes was due to two sets of oppositely charged particles moving in opposite directions. The negatively-charged particle was called by him the electron, and the positively-charged was named the positive ray. But this is the main point: No matter what was the nature of the gas, the character of the electrodes, or any other factor in the tube, the negative carrier was always the same—the electron. Hence the inference: a still smaller building block of the universe had been discovered—the electron—in size about one one-hundred-thousandth of the radius of the atom, moving with velocities up to ten thousand miles per second. Certainly something exciting ought to happen when these high speed electrons strike the walls of the container and that's how X-ray are born. More than that, reliable methods have been devised for weighing the individual particles in these tubes to an accuracy of a twentieth of a percent, to determine their speed to a small fraction of a percent, and even to register photographically the paths over which these particles travel. Just a word about the methods used.

Without going into confusing details, the determination of the mass speed and charge on these high speed particles are computed from the way they are pulled and pushed aside when they pass through the space between the plates of an electrical condenser, the poles of an electromagnet, or both. Just as you can tell where a bullet strikes a hill by the dust it kicks up, in the same way working with targets of phosphorescent material placed inside the tubes at the ends, every time one of these high speed charged particles strikes a molecule of the receiving screen, that particular molecule flares up and continues to give out light for some time. As a matter of fact, we can substitute a photographic plate for the phosphorescent screen and get permanent registration. The method for registering the trajectories of the charged particles in their flight was first devised by C. T. R. Wilson, and is based on the following facts. A charged particle travelling through a gas tears out electrons from the atoms through which it passes. If now this space is also supersaturated with moisture, the water condenses on these torn atoms rather than the untornd atoms. Snapshot photographs can be

taken of these fog tracks. This is one of the most important pieces of research technique in modern physics.

While Thomson was at work with his discharge tube, other scientists, notably Rutherford, working with radioactive substances, were disposing of the old doctrine of the immutability of atoms. In radioactive substances, heavy atoms break down spontaneously into lighter ones. Radium for example, ends in lead. An examination of the fragments which are breaking off in these natural disintegrations showed three distinct types: first, beta particles, electrons moving with velocities up to one hundred and seventy thousand miles per second; second, alpha particles, the heart of helium atoms, travelling with velocities up to fifteen thousand miles per second; third, the gamma ray, nature's own x-ray, penetrating and generated in the heart of radioactive atoms. The alpha particle, heart of a helium atom, is to be regarded as another building block of the universe.

Moreover Rutherford and his co-workers early recognized the fact that in radioactive substances, nature had provided a very powerful research tool. Consider the fact that radium is laying down an incessant barrage of alpha particles; why not direct this barrage against a target of other atoms and see what happens. Two important discoveries resulted. Using a target of thin gold, it was shown that the atom, instead of behaving like a hard elastic sphere, really behaves like a miniature solar system, consisting of a nucleus which contained practically all of the matter, with electrons swinging around this nucleus like planets around the sun. For hydrogen there was a single electron revolving around the nucleus, and the relative geometry of this atom is represented by a spider, the nucleus, hanging at the center of a fifty-foot room, while, a fly, the electron, circles the walls. Directing this barrage of alpha particles against other targets revealed another building block of the universe—the proton. Usually these alpha particles crash through the outer regions of the atoms and merely tear loose electrons. But in about one case in a million roughly, the alpha particle strikes into the very nucleus of the atom itself, from which it rebounds, but not before, in some cases, it has knocked loose from the heart of the bombarded atom, a proton which is itself the heart of a hydrogen atom. Hence two things have been accomplished by the last experiment; we have revealed another building block of

the universe, the proton; at the same time we have succeeded in transmuting artificially one substance into a lighter one.

In the meantime, equally startling changes had taken place in our idea of energy. When the subdivision goes far enough, radiant energy turns out to exist in individual bricks or units called photons. One of the outstanding achievements of the past ten years, for which he was awarded the Nobel prize, was the demonstration of collisions between photons and electrons by Professor A. H. Compton.

Let us take stock for a moment. Electrons, protons, alpha particles and photons. Granted that you have exploded an atom in a few cases, and isolated a few of the building blocks; there are still several questions. First, how do you know you have all of the building blocks? Second, what do these ultimate particles look like? And third, is there available a satisfactory architectural plan or engineering design of an atom? Frankly there is at present no satisfactory model of the atom. We don't know how an atom is put together, but we have learned by probing it with protons, electrons and other fragments, how an atom behaves, and therefore know that the atom must be a very wonderful and intricate mechanism to effect the energy conversions of which it is capable.

Just a few specifications. We know that you can add heat to a metal under proper conditions and boil out electricity. This is known as thermionics and has been exhaustively studied. The vacuum tube works on this principle. Let a photon—light—collide with an atom. In exchange for the energy of the photon, the atom emits electrons. This is the photoelectric effect, and the photoelectric cell, silent watcher in industry, is based on this principle. Let a swiftly moving electron collide with an atom, and the energy of this swiftly moving electron is converted into radiation, which might be ordinary light, ultra-violet, the x-ray whose value to humanity alone justifies all research which has been made on matter, the gamma ray or even the youngest member of this radiation family, the cosmic ray. These are just a few performance specifications of the atom.

To the question of what these ultimate particles look like, we have no answer. If we treat them as spheres, it is merely begging the question, although this simple view has been pro-

ductive up to a certain point. Frankly there is experimental evidence to show that this view is too simple, and that both matter and energy are more complicated than we had yet suspected, and many were led to suspect that the ultimate form and structure were beyond the apprehension of the human mind. However this view did not lead to discouragement, but as a matter of fact, stimulated on one hand a new strategy of theoretic attack, and on the other hand impelled a search for more powerful weapons with which to continue the attack on the nucleus of the atom.

Let us first consider the theoretical attack, that of the quantum mechanics, contribution largely of Schroedinger, Heisenburg and Dirac, all recent Nobel prize winners. In this new attack, these younger men fearlessly ceased trying to see these ultimate building blocks as small replicas of the ordinary, but instead started with assumptions of properties entirely different from anything perceptible. Then by special statistical methods, they endeavored to account for the newest experimental findings and even predicted unsuspected relations between matter and energy and the inner nature of light.

And while the mathematical physicist carried out his attack on that sector, the experimental physicist continued to storm the atom with still more violent weapons. By this time, it was realized that from one to ten million volts were desirable for the investigation of the nucleus. From that point on, the attack divides; one group, notably Van der Graaf, Lawrence and Lauritsen, using man-made machines generating tremendously high voltages for hurling charged particles at atoms; the other group working with radio-active particles and cosmic rays. Just a few of their findings:—

Cockcroft and Walton, in their high voltage laboratory at Cambridge, hurled the proton, a hydrogen nucleus, into the heart of a lithium atom, where it stuck, transmuting the lithium into two alpha particles. These results were verified by Lawrence and Livingston in their high-voltage laboratory at the University of California.

In 1931, Chadwick discovered a new building block, the neutron. The neutron is found to consist of a hydrogen nucleus together with an electron bound in so close that the

whole behaves like a single uncharged entity. An alpha particle travelling with 1,300,000 electron volts, disintegrates beryllium with the production of neutrons. Brown, Lauritsen and Salter, working in their high-voltage laboratory at California Tech, produced neutrons artificially. The neutron was predicted by Rutherford as early as 1920. Just a few reactions:

Beryllium plus hydrogen gives five boron atoms plus a neutron; or lithium plus hydrogen gives two helium atoms plus a neutron.

And here again in the neutron, nature has provided us with another research tool for the experimentalist. A systematic study was immediately made by turning these neutrons in turn on the nuclei of other atoms.

Another weapon which nature furnished for the offensive is the cosmic ray, a radiation according to Millikan, a million times more penetrating than X-ray, though of like nature, a radiation growing stronger as we leave the earth. Are these cosmic rays the birthcries of atoms born in outer space? Is it here that we have an interconversion of matter and energy? Men have circled the earth, climbed the tallest mountains and have even penetrated into the stratosphere for data to answer these questions. Let us see how energetic these cosmic rays are. The energy of a projectile is best measured by the armor required to stop it. Electrons driven by 100,000 volts, penetrate only a few thousandths of an inch of the lighter metals; the fastest beta particles from radium of 100,000,000 volts energy, penetrate only a few sixteenths of the same metal; x-rays are stopped by a quarter inch of lead. The cosmic rays penetrate several yards of lead. In the cosmic ray we have a very energetic tool. Every second, twelve of these rays pass through the average size man, and if their number were increased to the number of light rays that fall on the earth, inside of a month the temperature of the earth would be raised to ten times that of the sun.

In 1933, Anderson was working at California Tech on cosmic rays, photographing their fog tracks in a special Wilson chamber with a magnetic field capable of bending electrons of six hundred million volts energy. If cosmic rays are ex-

clusively photons, these fog tracks would be straight lines. Most of them actually were, but along with these straight tracks, Anderson's experiments showed tracks due to a new building block—the positron—with the same mass and charge as the electron only positive instead of negative. Blackett and Occhialini working in Rutherford's laboratory, not only verified this discovery but also observed that equal numbers of electrons and positrons seemed to appear simultaneously. Dirac with his wave mechanics, had previously predicted that two photons under certain conditions would break down into an electron and a positron. In other words, here we have an interconversion between light and electricity.

Another interesting and the most recently discovered phenomenon is artificial radio-activity. This was made by the Joliot's about a month ago. Madame Joliot is the daughter of Madame Curie. She and her husband just missed the discovery of the neutron. The Joliot's found that under certain conditions, when a high speed alpha particle struck aluminum, the aluminum continued to give off positrons from fifteen to thirty minutes after the impinging projectiles ceased. This phenomenon was unsuspected and is at the present moment unexplained.

In summary then: Electrons, positrons, neutrons, protons, alpha particles, photons—building blocks of the universe. Photons—radiations forming ordinary light, x-rays, gamma rays, cosmic rays; thermionics, photoelectricity, radio-activity, artificial transmutation of elements in the formation of neutrons, interconversion of light into electricity, artificial radio-activity, and the transmutation of matter into energy and energy into matter—where will it all end? Who can say? Looking over the path we have come, perhaps we may yet be able to tap the inner energy of the nucleus on an economic basis. Perhaps we may not. But this much is certainly true: as long as the race continues to produce gifted minds to show the way, as long as their civilization provides a place and materials for these men with which to work, from the far-flung stretches of the stars to the innermost recesses of the atomic nucleus, men will search out the unsuspected and the undiscovered from the building blocks of the universe.

INDUSTRIAL ALCOHOL

By R. L. HOCK,*

Read Before the Society, February 19, 1934.

Industrial alcohol is generally considered pure alcohol denatured with chemicals and sold to industries without payment of the internal revenue tax of \$3.80 a gallon.

New Orleans and vicinity, formerly producing 40% of this country's industrial alcohol, is losing this position as large distilleries open in the East and freight rates from the East decline. With its proximity to Cuba, low fuel, labor and ample water, this vicinity still offers an ideal location for alcohol plants.

While alcohol plants may be located in any locality near to water, their construction must conform to definite requirements. Bonded portions of premises must be built according to government regulations. Still house buildings are generally from 80 to 100 feet in height; fermentation buildings may consist of a collection of steel or wooden tubs, not necessarily roofed over in New Orleans, but necessarily so elsewhere, as outside temperatures when low stop fermentation. Fermentation tanks, when of steel, deteriorate in 6 to 8 years, whereas, the preferred cypress tanks have an indefinite life. Yeast rooms must be located above fermenters to permit dropping yeast by gravity.

Power is next to molasses in the cost of producing alcohol. Boilers must furnish 50 pounds of steam for every gallon of alcohol produced, or burn 400 barrels of oil in a plant producing 40,000 gallons of alcohol daily. Steam is generated at 100 pounds gauge in order to operate prime movers from which all exhaust is used in distillation, making the generation of electricity a decided economy.

Two supplies of water are necessary. Mississippi River water is used exclusively for cooling and, for fermentation in winter. In summer cooler water from 900-foot driven wells must be supplied in the process. A pumping capacity of 3,000 to 4,000 G. P. M. is necessary in a large plant.

* Superintendent, U. S. Industrial Alcohol Co., Westwego, La.

Before an alcohol plant can operate it must conform strictly to government regulations. Valves, pipe lines, tanks, etc., must be sealed. Plans must be drawn of all buildings and of every still. In operation, rigid control of all alcohol is kept by the government, and unexplained losses or negligence may subject the producer to heavy fines.

Alcohol is made out of molasses imported from Cuba, as Louisiana molasses is too small in volume and of too high a price. Imported molasses, a waste product of sugar manufacture, is stored in bonded tanks until used, at which time a duty of \$.002 a gallon must be paid.

Molasses will not ferment as such. It must be diluted with water to such a point that final alcohol content and temperature will not be too high to kill the yeast and stop fermentation. Sulphuric acid is added to obtain the acidity necessary for fermentation.

Yeast is a plant cell that reproduces itself by budding to form a second cell every two hours. The yeast used is a special species that ferments most alcohol from sugar in the shortest time. Other species have different properties. Production of this yeast requires the utmost cleanliness and best laboratory technic. Yeast for a day's production is obtained by touching a yeast culture with a sterile platinum wire, which, when shaken in a yeast media, starts fermentation. The volume of yeast is increased by adding small yeast colonies to volumes twenty times larger until the proper amount for setting a large fermenter of 100,000 gallons capacity is obtained.

Equal weights of alcohol and carbon dioxide are produced during fermentation. This gas is collected, purified and sold in commerce as "soda water" gas, or for making "dry ice".

Thirty to fifty hours after yeast is added to molasses the fermentation is complete and the resulting beer is distilled. The beer still is a column of 25 copper plates similar in appearance to sieves. Steam admitted from the bottom picks up alcohol out of beer dropped in top, driving this alcohol out of the top as a crude product known as "high wines" and containing from 50 to 75% alcohol.

High wines are chemically treated, then distilled from kettles into distilling columns having from 40 to 60 plates. Dis-

tilled slowly, alcohol containing low boiling impurities is obtained first, which alcohol finds usage as an anti-freeze in automobile radiators. From 60 to 80% of charge is obtained next as absolutely pure ethyl alcohol of 192.6 proof. Lastly is obtained high boiling impurities, known as "fusel oil". Pure alcohol run into receiving tanks must be promptly weighed and put into bonded warehouses, as required by the government.

Alcohol may be sold under four classes, namely: tax-free, for scientific purposes to colleges, hospitals, etc.; tax-paid, with a government tax of \$3.80 a gallon added, to manufacturers of medicines, drug stores, etc.; specially denatured, when various chemicals are added to suit its uses, after which it can be sold under rigid permit to particular industries only, without the payment of tax. (This alcohol is only partially denatured and might be easily recovered, so that the government keeps strict supervision over its sales.) Completely denatured alcohol is denatured with four or five chemicals, has a bad odor and taste and cannot be recovered, so that its sale is permitted to anyone.

Specially denatured alcohol is the most important to industry. Sold to the extent of 60,000,000 gallons in a normal year, some of its formulae are of special interest. Formulae Nos. 1 and 2B, to the extent of 23,000,000 gallons, denatured respectively with 5% wood alcohol and $\frac{1}{2}\%$ benzol, are used in the manufacture of chemicals, varnishes, paints, lacquers, etc. Formulae No. 4A, containing nicotine and a dye, is used in cigarette and cigar manufacture. Formula No. 13A, containing 10% ether, produces all anaesthesia ether used. Formulae Nos. 18 and 35A, denatured respectively with half vinegar and 5% ethyl acetate, are used to the extent of 10,000,000 gallons in the manufacture of vinegar, in which an acid-forming bacteria turns the alcohol into acetic acid, or vinegar. Formulae No. 23A, containing 10% acetone, is used to the extent of 5,000,000 gallons in making rubbing alcohols. Formula No. 25A, denatured with iodine, is used in making the tincture. Formula No. 32 makes ethylene for anaesthesia and calorene, a cutting and welding gas. Formulae Nos. 37 and 38, containing aromatic chemicals, are used in mouth washes, dentals,

etc. Formula No. 39B is an odorless denatured alcohol used in perfumes, etc.

Completely denatured alcohol is used almost wholly to the extent of 40,000,000 gallons as an automobile radiator anti-freeze.

During the summer of 1933, when grain prices were low, the production of industrial alcohol from corn and use of alcohol as a motor fuel with gasoline, was contemplated, but the rising price of grain put an end to this movement. Alcohol is made in quantities from grain, but the production and material costs are much higher than those of molasses. Grain must be cleaned and finely ground, then pressure cooked with malt to change the starch to sugar, after which it can be fermented. Fermentation and distillation processes are the same. The waste from a grain plant produces, after filtration and drying, a valuable cattle food. Grain alcohol is exactly identical with alcohol made from molasses in every respect.

A new method for producing industrial alcohol is operating at South Charleston, West Virginia. At this site alcohol is made from the small amount of ethylene contained in natural gas. The ethylene, absorbed in strong sulphuric acid, is changed into ethyl alcohol when water is added to the acid solution. This alcohol, while not quite as pure as molasses or grain alcohol, is used to the extent of 10,000,000 gallons in industry.

Many years ago Louisiana had a unique alcohol plant at Fullerton, where wood chips, treated with sulphuric acid under pressure, produced a sugar that was fermentable into alcohol. Corrosive difficulties and other causes made this process uneconomic.

Industrial alcohol may be produced from any plant or material containing sugar, or starch and cellulose that might be converted into sugar. The only drawback is the production cost as compared to the low cost when a readily available material, such as molasses, is used.

MINUTES OF MEETINGS AND BUSINESS OF THE SOCIETY

Minutes of the Board of Direction, February 19, 1934.

The meeting was called to order by President Dunlap and the following members were present: Messrs. Hoots, Moses, O'Neill, Bres, Ricker and Muth. Mr. H. L. McLean was also present.

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

The communication from Mr. F. N. Billingsley was read and the nature of the communication to the Association of Commerce was outlined. Several other communications were read and ordered filed.

The President presented a list of standing committees for the year which were approved, subject to additions which he may care to make during the year.

A vote of thanks was tendered the chairman and members of the Entertainment Committee for so successfully conducting the Annual Ladies Night.

Mr. McLean, chairman of the Entertainment Committee, presented his plans for a smoker to follow the March meeting, which is to be a joint meeting in connection with the organization of the local chapter of A. I. E. E.

There being no further business the meeting adjourned.

F. A. MUTH, Secretary.

Minutes of the Regular Meeting of the Society, February 19, 1934.

The meeting was called to order about 8:15 P. M. Mr. A. L. Dunlap, President, in the chair, F. A. Muth, Secretary, and 54 members and guests present. On motion, duly seconded, it was voted to dispense with the reading of the minutes.

Several interesting reports were made by committees and Mr. McLean explained in some detail the plans for the March meeting.

The technical exercises consisted of an interesting paper on Industrial Alcohol, by Mr. R. L. Hock. This paper was illustrated with motion pictures, and an interesting discussion followed. A rising vote of thanks was then tendered the speaker and the meeting adjourned to the usual collation.

F. A. MUTH, Secretary.

Meeting of the Board of Direction, March 12, 1934.

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

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

Communication from Prof. B. W. Pegues of Louisiana State University, inviting the Society to hold a meeting on the Louisiana State University campus, was read and considered. In view of the fact that the Chairman of the Technical Papers Committee was not able to furnish a schedule of the meetings at the time, the Secretary was instructed to communicate with Prof. Pegues, thanking him for the invitation and advising him that the Chairman of the Technical Papers Committee would communicate with him direct making arrangements for a convenient date for such a meeting.

The Chairman of the Technical Papers Committee was also requested to report on assignments of meetings during the year to local chapters of the National Engineering Societies represented in this State.

Colonel Bres, Chairman of the Committee on Meeting Place, reported that a tentative proposition had been prepared for consideration of the Board based on moving the headquarters and library of the Society to the St. Charles Hotel. He was requested to have this Committee furnish further details for information of the Board at a special meeting to be held between the March and April meetings.

The death of Mr. F. W. Schwab was announced and the President was authorized to appoint a Committee to prepare appropriate resolutions or obituary.

There being no further business the meeting adjourned.

F. A. MUTH, Secretary.

Regular Meeting of the Louisiana Engineering Society, March 12, 1934.

The meeting was called to order about 8:15 P. M., Prof. A. L. Dunlap, President, in the chair, F. A. Muth, Secretary, and 85 members and guests present.

On motion, duly seconded, the reading of the minutes of previous meeting was dispensed with. Announcements were made by the Chairman of several committees.

The technical exercises consisted of a paper on Building Blocks of the Universe, by Dr. D. S. Elliott. This talk was illustrated with lantern slides and was followed by an interesting discussion.

The meeting then adjourned to the Stag Smoker, which was held in the American Legion Hall, and was enjoyed by all.

F. A. MUTH, Secretary.

Special Meeting of the Board of Direction, Louisiana Engineering Society,
March 26, 1934.

A special meeting was called by President Dunlap at the St. Charles Hotel, 12:10 P. M., Monday, March 26th, and the following members were present: Messrs. O'Neill, Hoots, Bres, Moses, Wiggin, Ricker and Muth. Mr. A. T. Dusenbury was also present.

The meeting was called to consider report of the Special Committee appointed to investigate the possibilities of securing a centrally located place for the headquarters and library of the Society. The Board inspected the suite of rooms on the fourth floor after considering the report of the Committee.

On motion, duly seconded, the report of the Committee was received and the Board voted to recommend to the Society that the move be effected. Also that the President be authorized to appoint such additional committees as will be necessary to carry out this project if approved by the Society. The Secretary was instructed to issue a circular letter to all members informing them of the plans and inviting their attention to the fact that the matter is to be voted upon at the meeting on April 9th.

There being no further business, the meeting adjourned.

F. A. MUTH, Secretary.

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The headquarters of the Society are in the St. Charles Hotel, Room 422.
All business communications should be addressed to F. A. Muth, Secretary,
7705 Willow Street, New Orleans, La.

PROCEEDINGS OF THE LOUISIANA ENGINEERING SOCIETY

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JUNE, 1934

No. 3

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EDITORIAL NOTES AND COMMENT

A Few Observations. You have often heard that "the laborer is worthy of his hire." Substitute the word engineer for laborer and then ask, "Is the engineer worthy of his hire?" The answer can not be but "yes". But let us ask the question the other way around,—“Is the hire worthy of the engineer?”—and we must at present make some quite embarrassing admissions. All of which brings up the few following observations:

Under our present economic set-up each of us does our daily work (when we have a job) and at the end of the day, week, or month, we are paid so much money. When we do our daily work we may be doing it in the office or "on the job" of some organization. We may say we are "working for" so and so or such and such an organization. As a matter of fact we are working for the public. Whatever form our services may take, those services, or the results of them,

are ultimately passed on to the public. It is true that our services or their results may have to pass through many hands or many organizations before becoming of public benefit, but they ultimately reach the public.

In a like manner, when you receive your daily, weekly, or monthly stipend it is true that said stipend is handed you by some individual or organization. Don't lose sight of the fact, however, that you are being paid for your services by the *public*, no one else. The money with which you are paid originally comes out of the public pocket-book.

The individuals or firms who pay you act as collecting agencies, collecting the money, perhaps with many ramifications, from the public and passing it on to you. And they do this in the same way that they act as distributing agencies for your services.

Summing it up then, every individual, be he engineer, artist, "business man", prize fighter, clown or crooner, is ultimately working for the public and is ultimately being paid by the public for his services.

The money that any individual receives for his services, therefore, is not a measure of what he thinks those services are worth, nor is it a measure,—and note this well,—of what his services are *actually* worth; but what the *public* thinks they are worth.

Let us observe further. Recently we were regaled with the details of a championship prize fight, and during the coming year the winner will be deluged with extremely remunerative contracts.

On the stage or over the radio we are entertained by a clown who wants to sell a duck; our ears are assailed by the maudlin musical meanderings of a popular crooner who sets women's hearts aflame, but who is being divorced by his wife. We go to the movies and watch the salacious gyrations of a performer who draws an astonishingly enormous salary.

Now with all these facts in mind, let us as engineers lay this flattering (?) unction to our souls.

The annual income of all the members of the Louisiana Engineering Society put together probably does not equal that of the

prize fighter, the clown, the crooner, or the perveyor of pornography.

Think that over for a while.

That is what the public thinks our services are worth as against what the public thinks their services are worth.

"But", you say, "we *know* that as engineers our services are of much greater public benefit than this great discrepancy in compensation would indicate. What can we do about it?" And we have to say with Shakespeare, "Ay, there's the rub."

It is quite certain that the public will do nothing about it of their own accord. Our economic set-up would prevent that. If anything is to be done about it; if we engineers as a group are to receive compensation commensurate with the benefits of our labor, *we* are the ones who must initiate the movement.

What form this movement should take is a moot question. It is quite certain that the public must be educated to *think* that the engineer's services are worth more than the public *now* thinks they are. Perhaps a great national organization is needed to accomplish this education.

The medical profession is pretty well entrenched behind the banner of the American Medical Association. There are what you might call "departmental" medical societies galore, but the A. M. A. is pan-professional. Its very all-inclusiveness makes it all powerful. When it comes to professional policies, both internal and public, no one will deny that the A. M. A. is the supreme arbiter. The dictum of the A. M. A. is the law of their professional land.

The same remarks apply to the legal profession. Like the *medicos* the lawyers are closely and harmoniously knit by one large, all-inclusive organization, the American Bar Association.

As engineers we have no such large organization that has made much headway as yet. We have many large and powerful organizations which are doing good work for groups, but none of them all-inclusive. We also have several all-inclusive organizations but none of them yet powerful enough to dictate unequivocally the policies, both internal and public, of the whole engineering profession.

We still need a Moses to lead us out of the wilderness into that promised land where the public will reward the engineer in keeping with his worth to society.

Fusion Welding. Probably no development in recent years has done quite as much to change methods of design and fabrication as has the improvement of welding processes. After an initial period of indifferent success, methods of welding were developed which today insure reliable welds in varieties of work varying from the joining of large masses of metal to the junction of sheet metal for automobile bodies.

To permanently sew together a long seam in an automobile body in a second or two is quite a sight to see and quite an engineering achievement to accomplish.

The application of fusion welding to the fabrication of pressure vessels is increasing every day. In this issue is printed an interesting article on this particular phase of the welding art.

The Civil Works Administration in Louisiana. Elsewhere in this issue is published a statement by the State Engineer of the Civil Works Administration. A careful reading of this statement will convince one that the Administration has no small-sized job on its hands. With a total of 4441 projects calling for approximately twenty-two million man-hours of labor, it will be seen that the State will have been benefitted considerably when all these projects are finished. The statement in this issue makes interesting reading indeed.

Our New Quarters. To those who attended the June meeting in our new quarters, it will be remembered as a very auspicious and pleasant occasion. The chairman of our House Committee, Mr. John Riess, has, indeed, done a good job of moving.

The rooms have been thoroughly renovated, the library installed in appropriate book-cases, and the whole atmosphere is one of simple dignity worthy of the Louisiana Engineering Society.

The House Committee, however, does not feel that it has finished its labors. Electric fans will be installed in a few days. Later it is hoped to install a telephone so that members who are in the library may be in constant touch with their offices.

It is hoped that out-of-town members will make the rooms their headquarters while in the city. It is also planned to make the rooms available to the local sections of national engineering organizations as well as other professional groups.

Suggestions for improvement of the rooms in order to make them of greater service to members will be welcomed by the House Committee. Send all suggestions to the Secretary.

In order to refresh your memory, the location is St. Charles Hotel, Room No. 422. If you find it closed, the key may be obtained from the hotel clerk.

PAPERS AND DISCUSSIONS

CHARACTERISTICS OF MODERN FUSION WELDING

By E. R. FISH*

Read before the Society April 9, 1934.

The term "Fusion Welding" is now the generally accepted designation for that method of joining separate pieces of metal that involves the deposition of additional metal and the raising of the temperatures to the melting or fusion point by the electric arc or oxyacetylene flame. The electric method is the one most generally used. The term "Autogenous Welding" was used for awhile, but that name is now obsolete and rarely heard.

Fusion welding has been practiced for a number of years, dating from just prior to the World War. It got a great stimulus during the war and its use grew very greatly immediately thereafter. A vast number of pressure vessels for all kinds of service were made and widely distributed. There seemed to be a blind faith that a welded seam must be dependable. Little or no effort was made to determine the characteristics of welded work or to set up any standards by which the integrity of a weld could be judged. Unfortunately there were enough serious failures of pressure vessels that came to the attention of insurance companies to make them very hesitant about insuring such vessels. Nor, for a long time, could the Boiler Code Committee of the A. S. M. E. be persuaded to sanction welding in the construction of code vessels.

This reluctance to put the seal of approval on this kind of fabrication undoubtedly stimulated many manufacturers to exhaustively investigate the principles involved. Both those who made the vessels and those who furnished the equipment participated in these researches. Some 6 or 8 years ago one or two manufacturers formulated methods and developed materials that gave dependable welds.

* Chief Engineer, Boiler Division Hartford Steam Boiler Inspection and Insurance Company.

Long ago it became apparent that the physical characteristics of the deposited or "weld" metal were not what they should be. That these characteristics should closely approach those of the parts to be joined or "base metal" was stated as the goal sought. Also that there must be no lack of fusion. When it was found that these ends could be consistently reached, some standards for assuring the results were evidently necessary.

Long and careful study produced some general principles and requirements that could be definitely laid down. These are now what are prescribed by the A. S. M. E. Boiler and Unfired Pressure Vessel Codes, having first appeared in 1931, less than 3 years ago. Prior to that the Hartford Steam Boiler Inspection and Insurance Company had worked out some requirements as a basis on which it would shop inspect and approve welded work that it would be willing to insure in service.

It was recognized that there are various degrees of hazard involved in different kinds of service and consequently pressure vessels were divided roughly into three general classes. It was recognized also that to a great extent the nature of the finished work is dependent on the skill and conscientiousness of the welder or operator, but that in the final analysis the responsibility for good work rests with the shop management.

It was decided that the welding done on Class 1 Vessels, or those used in the most hazardous service, such as boiler drums, should be safeguarded to the greatest possible extent, while those used in less hazardous services need be subjected to less rigid requirements. All Class I Vessels must be X-rayed and stress relieved, and in addition test plates must be made for each drum or shell. X-raying is not required for Class 2 Vessels, but within certain limits they must be stress relieved. Class 3 Vessels are not required to be either stress relieved or X-rayed.

Certain kinds of tests, different from any that had heretofore been used in determining the qualities of metals were developed. These are (1) the reduced tensile test section, (2) the free bend and (3) the nick break tests. (1) is to determine the tensile strength of the weld metal, which shall not be less than the minimum of the range for the plate for Class I Vessels, 95% of the range for Class 2 Vessels and 85% of the range for Class 3 Vessels. (2) is to determine the ductility of the weld metal. For

Class I Vessels the minimum stretch of the outside fibers is 30%, for Class 2, 20%, and for Class 3, 10%. (3) is to disclose the soundness of the weld metal. It is not required for Class I Vessels as the X-ray performs this function, but it is required for Class 2. It was not deemed necessary to impose this requirement on the relatively unimportant Class 3 Vessels.

Welders employed on Class 1 Vessels do not have to pass any special qualification tests as test plates are made for each individual vessel, the tests of which must comply with the requirements. Welders employed on Class 2 or Class 3 Vessels must have been qualified by successfully passing the required tests. The welding procedure used in making all test plates must be also used in the fabrication of the vessel. To assure this being done the manufacturer should be required to write out in detail for the guidance of the Inspector, a specification covering all the characteristics of the process, including the kind of rod used.

In designing, maximum efficiencies of 90% and 80% may be used for Class 1 and Class 2 Vessels, respectively, while for Class 3 Vessels certain unit stresses, applying to various types of joints, are prescribed.

Only by a careful study of the Code requirements can a full understanding of what is demanded be gained. The foregoing gives only a hint of what is contained in the full text of the Code.

In conclusion it may be truthfully stated that good and dependable welds can be made, but the work must be conscientiously done by qualified welders, using a technique that has been positively demonstrated to give acceptable results. Welded vessels should be purchased only from those who have proved their ability to construct safe vessels. There are now a very considerable number of such concerns and that number is rapidly growing.

THE CIVIL WORKS ADMINISTRATION IN LOUISIANA

By H. M. GALLAGHER*

Read before the Society May 14, 1934.

Accurate statistics concerning the extent of unemployment in Louisiana are not available. The best barometer of the unemployment situation in Louisiana at the inception of the Civil Works Administration is the records of the Louisiana Emergency Relief Administration which had its peak load of relief cases on February 6th, 1933, when 134,700 families or non-family persons were receiving relief.

The Federal Civil Works Administration deriving its funds of \$400,000,000.00 from the Public Works Administration was created in November, 1933, for the purpose of providing employment to the vast army of unemployed citizens who through no fault of their own were either being cared for by the Federal Emergency Relief Administration or were subsisting on a fast diminishing reserve of resources.

To find immediate employment for 43,652 persons transferred from the Emergency Relief Administration to Civil Works Administration on November 20th was a herculean task and doubtless may have been the cause of some waste in the beginning of the program.

QUOTAS—In order that you may better realize the fluctuating number of employees that had to be provided with employment, I submit herewith the quotas at work in the State of Louisiana at various periods during the Civil Works Administration program:

November 20, 1933.....	43,652
December 1, 1933.....	68,848
January 18, 1934..... (Maximum)	86,848
February 15, 1934.....	68,848
February 23, 1934.....	47,500
March 2, 1934.....	30,500
March 9, 1934.....	27,500

*State Engineer, Civil Works Administration.

March 16, 1934.....	24,500
March 23, 1934.....	21,500
March 30, 1934.....	18,000

WAGE RATES—Wage rates were uniformly 40c per hour for common labor and \$1.00 per hour for skilled labor. Where labor was organized and the prevailing rate was more than \$1.00 per hour, the prevailing rate was paid. These minimum rates are required in the Public Works Bill and payment was mandatory.

HOURS OF EMPLOYMENT—Prior to January 19th, 1934, all projects were worked thirty hours per week. Upon receipt of instructions from Washington, effective January 19th, 1934, the hours of employment were divided into two classifications. In the urban areas, or in cities and towns of twenty-five hundred population and over, the permissible number of hours any project could be worked was fixed at twenty-four hours per week. In the rural areas or in districts outside the limits of towns having a population of twenty-five hundred and over, the hours of employment were fixed at fifteen hours per week.

PAYROLL STATISTICS—The total amount paid in wages and salaries from November 20th, 1933, to February 22nd, 1934, for the services of 66,642 employees amounted to \$9,492,420.76, or an expenditure of approximately \$100,983.00 per calendar day.

PROJECTS—From November 20th, 1933, to March 31st, 1934, there were received at State Headquarters a total of 4,441 projects calling for approximately twenty-two million man hours of labor.

The classification of these projects by types together with their percentage to the whole furnishes a far better perspective of the scope of the Civil Works Administration program than could be described herein.

There is submitted herewith a classification of these projects by types, showing the number of man hours called for in each type and the percentage each type bears to the whole:

SUMMARY OF PROJECTS THROUGHOUT STATE

Streets	2,222,160 man hours.....	10.4%
Roads	3,361,774 man hours.....	15.7%
Municipal Improvement.....	3,442,999 man hours.....	16.0%
Highway Beautification.....	554,091 man hours.....	2.6%
Park Improvement.....	5,172,281 man hours.....	24.2%
Drainage	3,145,060 man hours.....	14.7%
Schools	1,504,236 man hours.....	7.0%
Malaria Control.....	205,023 man hours.....	1.0%
Service	518,429 man hours.....	2.4%
Airports	340,003 man hours.....	1.6%
Sanitation	214,436 man hours.....	1.0%
Pest Control.....	748,569 man hours.....	3.5%

21,429,061 man hours

EXAMINATION OF PROJECTS—In the examination of applications for projects, one of the problems with which the Administration was confronted was a criterion by which the worthiness of a project could be judged.

One of the important conditions for which a project application was examined was whether or not it was to be undertaken on publicly owned property.

Another important feature which perhaps caused more concern than any other in consideration of applications was the ratio of cost of material to the cost of labor.

Early in December, the following rule was adopted by the State Administration governing the ratio of material cost to labor cost:

RATIO OF LABOR AND MATERIAL CIVIL WORKS ADMINISTRATION PROJECTS—Each department of government, whether it be municipal, parish, State or Federal, is expected to furnish all of the material, or as much of it as possible, required for each Civil Works job. Where it is impossible to furnish all of the material, this Administration, on recommendation of the Parish Civil Works Administration will approve projects on which the labor ratio is 2.6 times the cost of our portion of the material. For example, suppose the entire project costs \$10,000.00, labor being \$6,500.00, our portion of material \$2,500.00, community donations of material \$1,000.00.

The application of this rule to all cost estimates undoubtedly caused more concern among the various political subdivisions submitting applications than any other regulation.

It will be observed that with a high labor cost, the more material could be requested of the Civil Works Administration.

MALARIAL CONTROL—Anticipating the advantages to be derived from an organized campaign of Mosquito Pest Control, the Louisiana State Board of Health under the immediate supervision of your former President, Mr. John H. O'Neill, early in the Civil Works Administration program undertook projects whose object was the elimination of mosquito breeding areas and the resultant lowering of the death rate from malaria throughout the State.

The program which was adopted by the State Board of Health with the co-operation of the United States Public Health was divided into four stages.

The first stage called for the drainage of low lying tracts of land in order to remove the water from sluggish marshes and sloughs.

The second stage of the Malaria Mosquito Control program to be undertaken upon completion of the first stage provides for the oiling of all low lying areas where the run off to the drainage ditches is at a low velocity or difficult to attain.

The third stage not yet undertaken calls for the inoculation of all inhabitants adjacent to malarial districts with quinine.

The fourth stage which it is hoped may be undertaken as part of the Rural Rehabilitation program about to be undertaken is the proper screening of all dwellings in malaria infested districts.

UNITED STATES COAST AND GEODETIC SURVEY IN LOUISIANA—Initiated as a Federal project by the United States Department of Commerce and carried on from February 15th to March 31st as a State project, and since March 31st as a local project, the United States Coast and Geodetic Survey under the supervision of Mr. A. T. Dusenbury, State Representative of the United States Coast and Geodetic Survey, has undertaken the establishment of concrete monuments throughout the State.

This project consists of triangulation traverse and levelling over the State of Louisiana for the purpose of establishing accurate locations of concrete monuments in which are placed United States Coast and Geodetic Survey bronze markers about one mile apart throughout the State.

The monuments with their definite locations supplied by the United States Coast and Geodetic Survey will be for public use, and by providing accurate starting points for all surveys will fill a long felt want of the engineer and the surveyor engaged on State, Parish or private property line surveys.

The original project called for the organizing of forty-two parties of ten men each with six supervising engineers and a commensurate office personnel.

I have been supplied with a very comprehensive report on the results attained on this project by Mr. A. T. Dusenbury from which I would like to quote.

"You will observe that we have completed 285 miles of traverse out of the 3800 miles, more or less, contemplated in the original project and requiring forty-two field parties; this is $7\frac{1}{2}$ per cent. of the undertaking. By May 31st, I expect to have a total of about 525 miles completed or about $13\frac{1}{2}$ per cent.

As of April 30th, 1934, we have in addition set concrete monuments, covering 440 miles of alignment or $11\frac{1}{2}$ per cent of the original project. These monuments have been set principally along highway and railroad rights-of-way in order to secure the most accurate measurements.

In other words, as of April 30th, 1934, we have 285 miles of traverse completed which means, that our sixteen chiefs-of-parties have turned in their field books to this office with all angles read, all chainage completed and all levels run over the above miles of alignment. By the end of May, we expect to complete another 240 miles of the 440 miles already monumented, leaving a balance of 200 miles of traverse which is marked by monuments only. The 440 miles monumented as of April 30th, 1934, consists of concrete monuments of which, while the chiefs-of-parties have descriptions wherewith to find them, yet are unconnected by angle, distance or elevation.

As you may be aware, Washington regulations require that we make forty-eight operations at each point or monument, with an allowable error of closure of not over eight seconds. We must chain between monuments, both forward and backward, using spring-balances to which we apply a specified tension; temperature readings are required for each 100 foot measurement, as well as a record of the difference in elevation between the two ends of each recorded measurement. Levels must be run over the traverse with an error of closure not to exceed half an inch in 6 miles.

All field work data has to be analyzed and passed upon by this office as to their fulfillment of the United States Coast and Geodetic Survey Bureau regulations governing such work before we can commence the calculations.

The office computations consist of not only the analysis and tabulation of the detailed information recorded in the field books and the usual calculations, but, also necessitates the calculation of the co-ordinates of each monument on the Lambert Projection. This is an additional mathematical operation which commences with the Geodetic Longitude and Latitude of the initial and final First-Order Triangulation or Traverse Station. As you may know, our Control Survey loops are anchored and extend from one such Triangulation or Traverse Station to the nearest similar First-Order Station. Our loops have perimeters varying from 10 to 30 miles."

UNITED STATES GEOLOGICAL SURVEY IN LOUISIANA—Another project of particular interest to the engineering profession of Louisiana was that which was undertaken by the Louisiana State Board of Engineers in co-operation with the United States Geological Survey for the running of primary traverse and level control in various parishes in the State.

This project was initiated as a Federal project and on February 15th, 1934, was transferred to the status of a State project, and since March 31st, 1934, has been carried on as a local project.

The last official map of the State of Louisiana was made in 1895. Due to the many changes in the topography of the State caused by alluvial streams and the demands for a revised map

by public utilities, railroads, industries and public bodies, the State Board of Engineers entered into a co-operative agreement with the United States Geological Survey in 1931 for the mapping of the State of Louisiana.

The Civil Works Administration project covering the work of the United States Geological Survey was carried on in the following nine Parishes:

Acadia	Calcasieu	Rapides
Allen	Evangeline	St. James
Ascension	Jefferson Davis	St. John the Baptist

covering a total of 6,188 square miles.

The project which is expected to be completed by May 31st was under the supervision of Mr. Harry Jacobs, Chief State Engineer, with Mr. O. H. Nelson, and Mr. J. M. Lawson of the United States Geological Survey in charge of field operations.

LAKE PONTCHARTRAIN PARKWAY IMPROVEMENT—The largest project undertaken in the State both from the standpoint of dollars and cents and distance covered was represented by the improvements to the property of the Orleans Parish Levee Board situated on the south shore of Lake Pontchartrain in the City of New Orleans.

Two twenty-eight foot driveways on each side of the neutral ground in Franklin Avenue together with subsurface drainage for 2,880 feet back from the Lake Shore Drive.

One twenty-eight foot driveway in Elysian Fields Avenue connecting the Lake Shore Drive with Frenchmen Street entrance to Lake Shore property 3,098 feet.

One thirty-foot driveway with subsurface drainage on the west side of Canal Boulevard extending from the Lake Shore Drive back to connect with the present terminus of Canal Boulevard at Robert E. Lee Boulevard, a distance of 2,880 feet.

MINUTES OF THE MEETINGS AND BUSINESS OF THE SOCIETY

Minutes of the Board of Direction, April 9, 1934.

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

The minutes of the previous meeting were read and approved and bills on hand were ordered paid. Colonel Bres submitted budget report. On motion, duly seconded, it was voted to receive the report and to furnish a copy to each member of the Board, also to the House Committee and to the Editor of the Proceedings, inviting them to attend a special meeting in about ten days to discuss the budget.

In accordance with action taken at the special meeting of the Board calling for further report, Colonel Bres stated that Mr. Riess had estimated the cost of moving the Society to the new headquarters would not exceed \$375.00 to \$500.00. On motion, duly seconded, the Secretary was authorized to address a letter to the manager of the St. Charles Hotel accepting the invitation to occupy a suite of rooms at the hotel in the event the Society approves the moving to the headquarters.

A resolution was presented by Mr. O'Neill relative to the salaries of engineers as recommended by the American Society of Civil Engineers. On motion, duly seconded, the resolution was approved and it was recommended to submit the resolution to the Society for favorable action.

Ballots for new members were opened and there being 27 formal and no informal ballots, the following members were therefore declared elected:

Resident Members.

Arthur M. Hill

William Stone Leake

Paul T. Seashore

Non-Resident Member.

Berny Oakland

Junior Member.

Albert J. Fransen

There being no further business the meeting adjourned.

F. A. MUTH, Secretary.

Minutes of the Regular Meeting of the Society, April 9, 1934.

The meeting was called to order at 8:15 P. M., President Dunlap in the chair, F. A. Muth, Secretary, and 159 members and guests present.

On motion, duly seconded, the reading of the minutes of the previous meeting was dispensed with.

Several announcements of forthcoming meetings were made.

Colonel Bres brought to the attention of the Society the matter of providing headquarters for the Library of the Society at the St. Charles Hotel, in accordance with circular letter of March 27th, which was issued to all members. After the matter was thoroughly explained to the members of the advantage of moving the Society rooms to the St. Charles Hotel; it was pointed out the matter was up to formal vote, it was duly seconded and unanimously carried.

It was announced the committees would be appointed to take care of the move and members would be kept advised.

Announcement was made that arrangements would be made at an early date for a golf tournament.

Mr. John H. O'Neill presented a resolution relative to the salaries recommended by the American Society of Civil Engineers and on motion, duly seconded, the resolution was carried, the Secretary being instructed in regard to furnishing copies to the proper officials.

Mr. E. R. Fish gave a most interesting talk on characteristics of modern fusion welding. This talk was amplified with lantern slides and was followed by an interesting discussion. A rising vote of thanks was attended the speaker, and the meeting adjourned to the usual colation.

F. A. MUTH, Secretary.

Special Meeting of the Board of Direction, April 26, 1934.

A special meeting of the Board of Direction was held at 7:30 P. M. April 26th at Tulane University, and the following members were present: Messrs. Dunlap, O'Neill, Wiggin, Bres and Muth. Professor Robert, Editor of the Proceedings, also Mr. A. T. Dusenbury, member of the House Committee, were also present upon invitation.

It was voted to have the Secretary write to the State Engineer, P. W. A., calling attention to the law for registration of engineers, asking his co-operation in having applicants for projects involving engineering data of a civil engineering nature prepared by registered engineers, also requesting that engineers who are engaged on such work be registered. The Secretary was also instructed to write to the State Board of Engineering Examiners in regard to the foregoing.

The President was authorized to appoint a committee to confer with the P. W. A. in Louisiana to ascertain what service the Society can render in regard to expediting the program of the P. W. A. in this state with special reference to getting the matter explained by engineers in the various communities.

The Secretary was also instructed to write to the State Board of Engineering Examiners relative to the use of the Proceedings as outlined by the Board.

On motion, duly seconded, the President was authorized to have the Publications Committee, Division A, to confer with Local Sections of

the national engineering societies in Louisiana relative to the purchase of a page for each organization in the Proceedings for notices and news items for their organizations.

The Budget Committee Report, an exhaustive study of the fiscal matters of the Society, was carefully considered item by item.

The 1934 Budget of Expenditures, as outlined in Exhibit A, was adopted in accordance with notes on accompanying sheet.

On motion, duly seconded, it was voted that hereafter the Finance Committee prepare, immediately following the December meeting, the budget report for the following year which is to be submitted to the Board not later than the February meeting.

It was also voted that all committees of the Society, whether special or standing, should be required to submit detailed annual report of activities as of December 31st of each year.

There being no further business the meeting adjourned.

F. A. MUTH, Secretary.

Minutes of the Board of Direction, May 14, 1934.

The meeting was called to order by President Dunlap and the following members were present: Messrs. O'Neill, Wiggin, Bres, Moses and Ricker. In the absence of Mr. Muth, C. W. Ricker was appointed Acting Secretary.

The minutes of the previous meeting were read and approved.

A motion by Mr. O'Neill that the report of the Finance Committee and the minutes of the special meeting called to discuss that report, and a report as to the action taken following that special meeting be submitted to the Advisory Budget Committee for such comment and suggestions as they desire to make. This motion was duly seconded and unanimously carried.

Mr. O'Neill requested that copies of the report of the special meeting be given to members of the Board previous to the next regular meeting.

A motion was made, duly seconded and carried, that Mr. John Riess, Chairman of the House Committee, be authorized to make proper reduction in the fire insurance policy.

President Dunlap read several letters for the information and advice of the Board. It was moved that the Secretary be requested to reply to the letter from Mr. Orloff Henry. This motion was seconded and carried.

Mr. Moses requested and received a report on the new quarters in the St. Charles Hotel.

President Dunlap read the Treasurer's report, following which there was some discussion on certain items.

Mr. Bres reported the bills on hand and they were ordered to be paid. Mr. Bres was given authority to draw whatever amounts seem necessary for the rehabilitation of the new quarters in the St. Charles Hotel.

It was moved, seconded and voted, that the following motion be presented at the regular meeting of the Society: This Board tentatively approves the bill relative to Registration of Professional Engineers in its present form and reserves final approval until the Legislative Committee's report is received.

There being no time for further business, the meeting adjourned.

C. W. RICKER, Acting Secretary.

Minutes of the Regular Meeting, May 14, 1934.

The meeting was called to order at 8:20 P. M., President Dunlap in the chair, C. W. Ricker, Acting Secretary, and 63 members and guests present.

The minutes of the previous meeting were read and approved.

An obituary notice for Florance Joseph Schwab, prepared by F. G. Frost, J. M. Todd and L. J. Cucullu was read.

The report of R. H. Baumbach, Chairman of the Employment Committee, was read.

Mr. John Riess reported progress on the rehabilitation of the suite of rooms in the St. Charles Hotel which will shortly be the new home of the Society.

Mr. H. L. McLean reported on the golf tournament plans and also suggested that the Society have a celebration when it moves into the new quarters.

Mr. E. S. Bres read and explained the amendments to the bill relative to Registration of Professional Engineers, following which there was a general and rather free discussion relative to the membership of the Examining Board, and other features of the bill. A motion giving the Board of Direction authority to act for the Society in the amending of the bill and its presentation to the Legislature was duly seconded, but lacking a unanimous vote as is required for a formal motion, it failed to carry. A motion was made and duly seconded that due to lack of time and out of courtesy to the speaker of the evening, Mr. H. M. Gallagher, a special meeting be called for Monday, May 21, 1934, for the more careful consideration of the bill by the Society. This motion was carried unanimously.

Mr. H. M. Gallagher gave a most interesting talk on the C. W. A. work and exhibited photographs showing progress made on the various projects. A rising vote of thanks was tendered the speaker and the meeting adjourned to the usual colation.

C. W. RICKER, Acting Secretary.

Special Meeting of Louisiana Engineering Society, May 21, 1934.

A special meeting of the Society was held at 8:00 P. M. Monday, May 21st, at Tulane University, Prof. A. L. Dunlap, President, in the chair, and 28 members and guests were present.

A short talk on the Renovizing Campaign by the Association of Commerce was made by Mr. Biewer, representing E. R. A. in the city.

Colonel Bres, Acting Chairman of the Legislative Committee, explained the bill as proposed for registration of professional engineers. Colonel Bres explained that the bill in its present form had been endorsed by the Local Section of the A. S. C. E. and the N. O. Chapter of the A. S. M. E. and that if any changes were made in the bill it would have to go back before these organizations to be passed on again. Time would not permit this procedure as it is necessary to present this bill to the Legislature at an early date. Some discussion followed and several suggested changes were offered at the meeting. A count of voting members was made and it was found that there was not a quorum of 25 voting members present. It was voted that the members present express their approval of the bill and the following is motion voted upon: Moved that it is the sense of the meeting of the members present that the bill pass in its present form. There were 16 votes for and 5 against this motion. This vote was for expressing sense of meeting only.

On motion, duly seconded, it was voted that a meeting be called for Friday night, at 7:30 P. M., to be held in the same place to give the members an opportunity to express their views on the bill as presented.

The meeting then adjourned.

F. A. MUTH, Secretary.

**Minutes of Special Meeting of the Louisiana Engineering Society,
May 25, 1934.**

A special meeting of the Society was held at 7:30 P. M. Friday, May 25th, at Tulane University, Prof. A. L. Dunlap in the chair, and 36 members and guests present. It was explained that the purpose of the meeting was to vote on the proposed draft of the bill to amend the registration act so as to permit the registration of professional engineers and that the vote would be taken on the approval of the bill as presented, in view of the fact that time did not permit making changes in the bill and referring the bill back to the various societies and organizations which had previously approved it.

There was some discussion from the floor by those who suggested that the bill be voted for in order to get action. Some members who had previously opposed the bill stated that they desired to go on record as favoring it. At 7:50 P. M. the vote was taken of qualified voting members, with the result that 28 members voted for the approval of the bill. There were no votes cast against approval.

The meeting then adjourned.

F. A. MUTH, Secretary.

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JAMES M. ROBERT, Editor.

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LOUISIANA ENGINEERING SOCIETY

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Vice-President, E. S. BRES, 1007 Maritime Building.
Secretary, FRANK A. MUTH, 7705 Willow Street.
Treasurer, WALTER B. MOSES, 425 S. Peters Street.

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JOHN H. O'NEILL, 637 Lowerline Street.

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The headquarters of the Society are in the St. Charles Hotel, Room 422.
All business communications should be addressed to F. A. Muth, Secretary,
7705 Willow Street, New Orleans, La.

PROCEEDINGS OF THE LOUISIANA ENGINEERING SOCIETY

VOL. XX.

AUGUST, 1934

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EDITORIAL NOTES AND COMMENT

A Year of Renewed Activity. A year of renewed activity will soon be upon us. Each of us returning from our vacation anxiously awaits cooler weather so that we may follow our calling with renewed vigor. Each of us, too, anxiously wonders what the coming year has in store for us.

One thing is certain. We as engineers are needed more than ever. Haven't we as a profession been just a little neglectful of our public duties? Verily, it is a noble thing to build a machine that will do the work of fifty men, but it is a far nobler attainment to shape the fate of the fifty men whom the machine displaces.

The first we, as engineers, have done—and done well. The second, we haven't done—nor has anyone else.

We have been content to busy ourselves with only the construction of our machines. We have left to others, "business men," politicians, economists, etc., the application of these machines to the prospective benefits of mankind. Instead, we find that our machines have been used in a way which did not emancipate labor, which pauperized many by displacing men, and which aggrandized a few.

As engineers, we have been trained to think in logical sequences. This process of thought has enabled us to provide a vast mass of wealth and machinery which we call present-day civilization. Why shouldn't the same logical processes of thought applied to the destinies of men yield desirable results? We haven't taken much thought voluntarily in public affairs. Why shouldn't a little "human engineering" be a good thing for us and a good thing for the community right now? Along with our "technical mindedness" we must become more "human minded." Some of our meetings for the coming year should be devoted to discussions concerning the part the engineer should play in human affairs entirely aside from his technical achievements.

At a few meetings during the year we should get away from the narrowing confines of the purely technical.

Let's make this a banner year in our Society in both a technical and in a much broader sense.

Recent Progress in Highway Bridge Construction. As a chain is no stronger than its weakest link, so it is that great highways are no better than the bridges which span the inevitable obstructions that nature has placed in their course.

We in Louisiana have especial cause to take pride in the bridge engineering developed by our Highway Commission. Our problem here is peculiar. In the southern part of our State bridges must be constructed on very unstable foundations. Or rather should we say that stable foundations must be constructed on locations and ground which are frequently and inherently unstable. It has been incumbent on the bridge engineering department of our Highway Commission to meet and overcome these natural unsuitabilities of location and ma-

terial. This they have done—frequently by methods that are at once original, vigorous, unique and effective.

In this issue appears an article by Mr. N. E. Lant, who is in charge of the department of bridge engineering of our Highway Commission. It makes interesting reading, indeed.

Welcome to Louisiana Section, A. S. C. E. In the endeavor to make the *Proceedings* of more value to engineers in general, it is proposed that the local sections of national engineering organizations each take one or more pages of the *Proceedings* for the purpose of reporting their activities. For the local sections, this is much more economical and gives wider publicity than issuing their publication. For the profession in general it has the advantage of localizing in one publication—*The Proceedings*—the various engineering activities which are in progress. And at the same time it enlarges the scope of the *Proceedings*.

As the first local section to take advantage of this arrangement, we are glad to welcome to our new pages the Local Section of the American Society of Civil Engineers. This section comes not as a stranger, however, because a large proportion of the officers and members have always been ardent members of the Louisiana Engineering Society also.

The activities of the other engineering organizations will be added to these pages just as quickly as their arrangements to do so can be made. We hope to welcome them in the very near future.

Again Our New Quarters. Each member of the Society has received the following notice. We are repeating it here in order to urge our members to make full use of their quarters. For out-of-town members the club rooms make ideal headquarters while in the city. The notice follows:

TO OUR MEMBERS:—

We are now holding our fall sessions in our new Club Rooms on the 4th floor of the St. Charles Hotel. The suite has been completely outfitted as an Engineering Library with facilities for personal work, committee meetings, "get-togethers", etc.

Your Board and your House Committee urge that you make use of these rooms to the fullest extent, for the purpose intended, and especially for committee meetings of any organization, engineering or civic, to which you belong.

You who are members of other Engineering Societies are urged to carry this invitation back to your group.

For your comfort and convenience, ceiling fans have been installed. Room service can be secured the same as for the guest rooms.

The key for Room No. 422, for entrance to our Club Rooms, can be secured at the Hotel desk.

The House Committee invites your suggestions regarding the use of your rooms.

The House Committee is willing to organize a semi-monthly luncheon, to be held somewhere in the hotel, if sufficient numbers indicate their desire for it.

You are requested to submit your suggestions to Mr. John Riess, Chairman, House Committee, Louisiana Engineering Society, Room 422, St. Charles Hotel.

Very truly yours,

A. LEE DUNLAP, *President.*

F. A. MUTH, *Secretary.*

PAPERS AND DISCUSSIONS

RECENT PROGRESS IN HIGHWAY BRIDGE CONSTRUCTION IN LOUISIANA

By N. E. LANT *

Read before the Society June 11, 1934.

There are approximately 8,000 highway bridges now in use in Louisiana as part of the highway system, having an aggregate length of approximately 140 miles and costing in excess of \$30,000,000. The majority of these bridges were built since the Commission was organized in 1921, and practically all of the larger and most expensive bridges have been built since 1928.

During the past six years the Highway Commission has spent in excess of \$15,000,000 on bridges, especially on the paved highway system. This is exclusive of any of the Mississippi River bridges but includes bridges over the Red, Ouachita, Black, Atchafalaya and other large rivers. Bridges constructed in the last six years include practically all types of steel movable spans, such as swing spans, bascule spans, vertical lift spans, and practically all other types of bridges with the exception of concrete arch bridges, which type is not suitable for use in Louisiana for obvious reasons. Several of these bridges are of particular interest to engineers on account of the unusual conditions met and overcome by unusual construction methods. This is particularly true of the Atchafalaya River bridges at Krotz Springs and Morgan City.

Many changes are now taking place in the Atchafalaya River and it is anticipated that eventually all of the excess flood waters of the Mississippi River will be carried from the mouth of Red River to the Gulf through the Atchafalaya Floodway. In planning the two bridges over the Atchafalaya River, therefore, one consideration of prime importance was the fact that this river was subject to enlargement, and any structure planned over it should be so designed that it would

* Chief Bridge Engineer, Louisiana Highway Commission.

not be affected by the deepening or widening of the river channel.

The survey to determine the location of the Morgan City bridge was an interesting problem in itself aside from the features discussed. As this bridge was to serve the traffic on the Old Spanish Trail a very elaborate and exhaustive survey was made of the entire area between the Southern Pacific Railroad bridge and the mouth of Bayou Teche. Hydrographic surveys and foundation borings were made over this entire area to determine the most favorable place for crossing; also keeping in mind the alignment of the Old Spanish Trail approaching the river from the east and from the west. Local interests were very insistent on having a highway bridge adjacent to the railroad bridge so as to connect with the business districts of Morgan City and Berwick. The Highway Commission and the Bureau of Public Roads (who were assisting in financing this project), were attempting to find a location where traffic could be brought to the bridge without widening of the existing streets and consequent high property damage. The location finally selected was four blocks north of the railroad bridge and two blocks north of the existing ferry location. At this point there existed in the town of Morgan City, a wide boulevard known as Brashears Avenue, which was especially favorable for an approach from the east side. On the Berwick side or west side of the river this location did not meet up with any of the dedicated streets, but since it was far enough away from the business district on practically unimproved property, the location was considered satisfactory. The depth of water and foundation materials as disclosed by foundation borings at this site were better than at any other site north of this location. After considerable discussion at several public hearings, a permit was given by the War Department for a fixed type of bridge providing 50 feet of vertical clearance in mid channel and 40 feet of vertical clearings at the shore line. Another condition of this permit required that no revetment or mattress work be placed in the river bed to protect the piers from scour, as the War Department expected this stream to enlarge its channel something in the neighborhood of one hundred percent. This same condition applied to the

bridge at Krotz Springs, and which partially explains why we carried the main piers of these two bridges to such unusual depths.

The four main piers of both the Krotz Springs and the Morgan City bridges were designed as hollow cylinders with an outside diameter of 44 feet and an inside diameter of 24 feet. The general design of these piers is similar to the piers we constructed at Chef Menteur and the Rigolets in 1928, except that they are much larger and are designed to be sunk to a greater depth. Difficulty was anticipated in the preliminary stages of sinking these piers on account of the expectation that sunken logs would be encountered at considerable depth, and for that reason the plans and specifications were so drawn that the sinking to an elevation of approximately 100 feet below low water would be by the pneumatic process and when the limit of air work was reached the pier would be opened up and sunk by open dredging. The caisson was designed and detailed, therefore, with a working chamber roof that could be placed after the pier was landed on the river bed and removed later when the limit of air work was reached. This precaution proved to be well taken as we encountered several large trees and logs as expected.

At Morgan City the maximum depth of water at our bridge location was approximately 65 feet, and we planned on sinking these piers to a depth of 145 feet below low water. We experienced no difficulty with any of the piers except pier No. 3. We did not reach satisfactory foundation material at the plan depth on the pier, consequently continued sinking until we had reached satisfactory material and at a depth of 176.5 feet below low water.

At Krotz Springs all of the piers were constructed at plan elevation—140 feet, and we experienced some very hard sinking in the final stages of these piers, as was expected; in fact the two bank piers at Krotz Springs have a penetration in the ground of approximately 170 feet, and this developed considerable friction, requiring the use of the inside and outside jets that had been placed in the caisson cutting edge.

The floating of the three 608-foot spans, weighing approximately 1400 tons each, is worthy of some comment. This was

accomplished during the summer of 1933 in a very short time, and without any difficulties. At Krotz Springs the two bank spans, each 500 feet long, were erected as simple spans on falsework, and the channel span was erected as a cantilever with temporary tie-backs to the two bank spans. This was also rather unusual work but accomplished without any trouble.

The field engineering and instrument work on these two projects was very carefully done by competent engineers, and after the steel spans were erected and the first direct measurements were taken, they checked the distances between piers as determined by triangulation, and the greatest amount that we were off on the distance between any two piers was $\frac{3}{4}$ of an inch in 608 feet.

Another unusual project which is now under construction is the Bonnet Carre Spillway bridge. This bridge will consist of a concrete pile trestle 6,000 feet long, having a 40-foot driveway, concrete deck girder spans 38 feet 9 inches long, supported on precast concrete pile bents, six piles per bent. We have just completed the driving and loading of 49 concrete test piles on this project used to determine the length of permanent piles, and have just recently furnished the contractor a bill of permanent piles ranging in length from 75 feet to 90 feet. The contract on the Spillway bridge was let in such a way that the span length and number of piles per bent could not be determined until after the test piles were driven and loaded. We provided in the original plans design for a 28-foot, 34-foot and 38-foot span; also a design for a 6 and 7 pile bent. Concrete test piles of the same cross section as the permanent piles were driven and loaded in increments of ten tons to failure. The different combinations of pile bents and span lengths produced a design load per pile varying from 29 tons to 43 tons per pile. Some of these concrete test piles sustained loads up to 150 tons, the loading being accomplished by the use of concrete blocks weighing five tons each. The ten-ton increment loads were applied at twelve-hour intervals and deflections were read at three-hour intervals. After these tests were completed we were in a position to select the most economical pile length, span length and number of piles per bent. We are now casting the permanent piles for this bridge and will probably be able to complete the project in the spring of 1935.

ACTIVITIES OF LOCAL SOCIETIES

LOUISIANA SECTION AMERICAN SOCIETY OF CIVIL ENGINEERS

OFFICERS

President,	John H. O'NEILL.
1st Vice-President,	F. P. HAMILTON.
2nd Vice-President,	CLIFFORD H. STEM.
Secretary,	H. A. SAWYER, c/o Lone Star Cement Company of Louisiana, 1120 Hibernia Bank Building, New Or- leans, La.
Treasurer,	R. L. MORONEY, 8134 Sycamore Street, New Or- leans, La.

The annual meeting of the Louisiana Section was held June 6, 1934, at 508 Millaudon Street, New Orleans.

The section voted to continue scholarships at Tulane and Louisiana State University.

Mr. A. T. Dusenbury reported on the surveys being made by the E R A and the Coast and Geodetic Survey. The Section telegraphed the Public Works Administration and others endorsing this activity and requesting continuance of same.

Mr. Alvin Fromherz, President, New Orleans Chapter, Associated General Contractors, and Chairman, Louisiana State Administrative Agency, Divisional Code Authority for General Contractors, presented paper on the provisions and operation of the Code of Fair Competition for the construction industry. The paper brought forth much interesting discussion.

MINUTES OF MEETINGS AND BUSINESS OF THE SOCIETY

Minutes of Board of Direction, June 11, 1934.

The Board meeting was held in the new rooms of the Society in the St. Charles Hotel.

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

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

On motion, duly seconded, it was voted to elect Mr. Alfred J. Cooper, Junior of Tulane University, and Mr. John Gillum of Louisiana State University, as Junior Members, in view of the fact they were selected by the faculties of their universities as the outstanding seniors to be awarded the annual Junior Prize Membership of the Society.

On motion, duly seconded, it was voted that the Secretary confer with the Chairman of the Membership Committee to see what arrangements could be made relative to method of new members paying the entrance fee, etc., in installments, report to be submitted to the Board.

On motion, duly seconded, it was voted that the House Committee investigate the matter to see what arrangements could be made to secure a telephone for the new quarters, the Chairman of the House Committee to submit report to the Board.

The personnel of the House Committee as appointed by the President was read and was approved by the Board.

In accordance with instructions of the Board at the last meeting the Secretary had submitted to the Board and to the Advisory Budget Committee, copy of the minutes of the Special Meeting of the Board of Direction of April 26th, together with the report of the action taken at that meeting on the Budget Report by the Board. During the meeting the Advisory Budget Committee approved the above mentioned minutes and Budget Report as follows: Messrs. A. T. Dusenbury, James M. Todd, W. B. Gregory and John Riess.

There being no further business, the meeting adjourned.

F. A. MUTH, Secretary.

Minutes of Regular Meeting of the Society, June 11, 1934.

The meeting was called to order in Room C of the St. Charles Hotel. Professor A. L. Dunlap, President, in the chair, F. A. Muth, Secretary, and 108 members and guests present.

On motion, duly seconded, it was voted to dispense with the reading of the minutes of the previous meeting.

Following the usual custom, the Society voted to recess during the months of July and August.

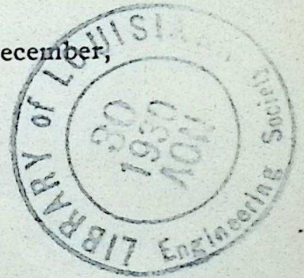
A most interesting address was given by Mr. N. E. Lant on "Recent Progress in Highway Bridge Construction in Louisiana." This address was followed by considerable discussion of the paper. A rising vote of thanks was then tendered the speaker and the meeting adjourned to refreshments served in the Society rooms under the charge of Mr. H. L. McLean, Chairman, Entertainment Committee.

F. A. MUTH, Secretary.

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JAMES M. ROBERT, Editor.



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PROCEEDINGS OF THE LOUISIANA ENGINEERING SOCIETY

VOL. XX.

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EDITORIAL NOTES AND COMMENT

Automobile Traffic Control and the Engineer. Public hysteria is, indeed, queer. Quite recently it was directed against the engineer, laying on his shoulders complete responsibility for our economic chaos. The engineer was eternally and vigorously damned because the machines which he designed and built to lighten the labors of all men were prostituted to the double purpose of throwing some men out of work and *not* lightening the burdens of those who were retained in industry.

And hysteria blamed the engineer for building the machine! There are those who still hold this groundless view.

By the same logical (?) processes of thought, we presume that because the engineer designed and built the automobile he already stands convicted of responsibility for the terrible toll

of automobile accidents and deaths which is now denuding the country of its citizens. Phooey!—and Hooley!

The mounting number of traffic accidents and deaths is creating public clamor for their reduction. It is our opinion, however, that the reduction of accidents and deaths is a problem for engineers to handle, rather than a problem for the police department. We believe that in the regulation of traffic, on country roads or city streets, the three following thoughts must be kept constantly in mind:

1. *The watchword of civilized progress is speed.* Otherwise our transportation necessities would be adequately supplied by the horse and buggy, ox cart and sailboat, rather than railroads, automobiles, airplanes and steamships. The former are certainly cheaper.
2. *Human beings are innately and supremely selfish.* This is a remnant of the "tooth and claw" necessities of antedeluvian times, when we had either to kill or be killed. Translating this to modern conditions we are always (and sometimes unconsciously) trying to better our own advantage even though it be a disadvantage to others.
3. *Human nature can not be changed by law or police dictum.* It might be thinly veneered by education, but oh! so thinly.

With regard to the first observation above, let us indulge in pure, rank heresy at the outset. *It is our firm conviction that any form of traffic control which seeks to set arbitrary speed limits is foredoomed to failure.* There are two reasons for this belief. First of these, speed limits, *per se*, do not necessarily mean safety. Even in large cities, there are conditions when a speed of sixty or seventy miles per hour is perfectly safe while other conditions will make a speed of eight or ten miles per hour extremely dangerous.

Secondly, and more important, the automobile is built essentially and primarily for speed. Ever since men first substituted the four longer and swifter legs of a horse for his own two, his appetite for speed has been insatiable. The automobile was devised as an attempt to appease that appetite. Even the improvement of the automobile has been along the lines of continually increasing speed—and the end is not yet. Speed, even

when dangerous, is an almost fundamental human desire, and it can no more be eliminated by police than the drinking of poisonous wood alcohol was eliminated by the prohibition law.

Only one of two things will curb speed to any extent. First prohibit the manufacture and sale of all automobiles except those with power so small that they can't run above the legal limit, or, secondly, detail one law enforcement officer to ride always with each driver. You know how far either proposition would or could get under our present set up. And who knows that even in the second instance the law enforcement-nurse wouldn't say occasionally to his driver-ward, "Step on it, Buddy, nobody's looking. Let's see what she'll do."

It is even conceivable that under certain conditions higher speed means greater safety for the pedestrian. With present speeds of 20-35 miles per hour, a pedestrian has no hesitancy trying to weave his way across a street in and out of traffic. Even the most venturesome, however, would hesitate to step from the curb with traffic at 50-60 miles per hour. He will wait until his clear crossing is assured.

The engineer devised the automobile and we believe he is capable of devising safe conditions for its operation. The engineer should be called into consultation on traffic problems much more frequently than he is. Trying to change human nature by the police won't do. Whatever system of traffic safety is eventually evolved, it will be a system in which advantage must be taken of innate human selfishness. We shall have to devise some system of traffic regulation in which it will be obviously advantageous for the individual to be safe rather than reckless. This goes for both pedestrian and driver. We believe that the satisfactory solution of the traffic safety problem involves the adopting of physical conditions to fit a fundamental human desire (speed) rather than the curbing of that desire to fit inadequate physical conditions.

We believe that the engineer is the man best fitted by training and experience to do that job rather than the policeman. The control of traffic and traffic safety is essentially an engineering job. All traffic, whether in city or state, should be controlled entirely by the engineering department (with its own police

powers). The police department as such should be completely relieved of an engineering problem that is inherently not its responsibility.

Termite Control. The above subject of our October meeting brought out quite a large audience. Dr. Snyder's talk was fully illustrated with lantern slides. The large volume of discussion showed that the interest in the subject was widespread indeed. There was an editorial in one of the papers next morning calling attention to our meeting and the subject of discussion.

A careful reading of Mr. Snyder's paper, published in this issue of the *Proceedings*, will convince one that the protection against termites is neither troublesome, nor in the beginning, expensive. His advice is that the termite be recognized by our building regulations through the incorporation in the latter of standards recommended by the Federal entomologists.

During the discussion Dr. Snyder contradicted a widespread local impression that the Argentine ant will search and destroy termites. He said the termites are able to protect themselves against the ants by walling them off.

Our Historian. We record with delight the appointment of an Historian for our Society. He is none other than our good friend Mr. G. W. Lawes. We all know him well. A happy choice it is, too.

When Mr. Lawes writes a history of the Louisiana Engineering Society, he will write it not from tradition and not from research, but *from personal experience*. His membership in the Society is as old as the Society itself, and the full life of the Society has been part of his life too. His face is a familiar one at all meetings and functions. We should tell you his age, but to do so would belie his activities and ideas. In 1907 he guided the destinies of the Society as its President.

Our Historian is anxious to receive information on facts, incidents and anecdotes that should properly go into a history. If you have anything of interest be sure to communicate with Mr. Lawes.

When the history of our Society is written it will be interesting to note at least two contributions of major civic benefit—one way streets and the building code. The adoption of one-way streets for the city of New Orleans was first proposed by members of our Society—against earnest opposition of merchants. (It would be interesting to note the reaction of those same merchants to any present suggestion that the one way street be abolished.)

The building code for the city of New Orleans was another civic contribution. The Louisiana Engineering Society was instrumental in sponsoring and pushing to a successful conclusion the adoption of one of the finest building codes possessed by any city in the country.

Nominating Committee. A committee has been appointed to nominate officers of the Society for 1935. The committee is composed of James M. Robert, Chairman, A. T. Dusenbury and F. N. Billingsley.

This committee will make its report at the December meeting, and in the meantime will be glad to receive suggestions from the membership.

Scholarship Awards. In accordance with the annual custom, the Society this year again awarded two one-year scholarships—one to Louisiana State University and one to Tulane University.

A special awards committee was appointed by the President. Upon the recommendation of this committee, the President announced the successful candidates for these scholarships to be Mr. J. S. Conner of L. S. U. and Mr. Arthur C. Porter of Tulane.

PAPERS AND DISCUSSIONS

TERMITE CONTROL

By THOS. E. SNYDER *

Read before the Society, October 8, 1934.

WHAT ARE TERMITES?: Termites represent an important group of social insects, other groups being ants, bees, and wasps. While resembling true ants, termites belong to an entirely distinct order of insects and are closely related to the Blattidae, or roaches. These so-called "white" ants are not true ants, although they look like ants and live in colonies made up of different forms or castes.

DISTRIBUTION OF TERMITES: While termites occur in numerous forms commonly in the tropics and sub-tropics, they are also native in temperate countries. They are found from latitude 30° north to latitude 50° south.

There are 1,978 different species of termites in the world, including 63 fossils. In the United States, there are 56 living species and 8 fossils; the fossils occur in rocks in the States of Washington, Colorado, and Tennessee. Fossil termite pellets have been found in Florida; the age of the rocks bearing termite fossils indicate that they were present on this continent at least 55 million years ago, far before man.

In the United States, termites have been found in all states, except North Dakota. In Arizona, 25 species occur, 20 in Texas, 19 in California, 15 in Florida, 8 in Nevada, and other states have from 1 to 5 species. Only 5 have been recorded from New Mexico, doubtless due to lack of thorough investigation.

TWO TYPES OF TERMITES: There are two types of destructive termites in the United States, namely, the subterranean or groundnesting forms and the drywood forms. The former are more widespread and require moisture for their existence. To obtain this moisture they must, as a rule, maintain contact with

* Senior Entomologist, Bureau of Entomology and Plant Quarantine, United States Department of Agriculture.

the soil when attacking the woodwork of buildings. This is a weak point in their life habits, since they can be killed by breaking their connections with the ground. Shut off from soil moisture they will dry up and die.

The drywood species can fly to and attack wood directly and they can live in very dry wood.

DAMAGE BY TERMITES: Damage by subterranean termites is much more common and generally more serious structurally than that caused by drywood termites. For the entire world damage can be proportioned between these two groups in the ratio of 95 per cent by subterranean termites and 5 per cent by drywood species.

NO ACCURATE FIGURES ON EXTENT OF DAMAGE AVAILABLE: It is estimated that termites cause a loss of 40 million dollars annually in the United States. From 2,000 to 2,500 cases of termite damage to the woodwork of buildings are annually reported to the United States Department of Agriculture. Of course, this represents but a small proportion of the actual damage. From November, 1930, to August 15, 1931, 1,840 cases of termite damage were reported to the Termite Investigation Committee of the University of California to have occurred in Los Angeles County alone. There are no accurate figures of extent of infestation or money losses for our extensive country.

The number of such reported cases seems to be controlled by several factors, chiefly (1) latitude (especially temperature and humidity); (2) altitude; (3) population; (4) general education of the public; and (5) educational propaganda and the activity of commercial termite control operators. Factors leading to periodic changes are 4 and 5. The lowering of water tables and artificial irrigation as in the Southwestern United States are also factors.

INCREASE IN TERMITE DAMAGE: By man's disturbances of the balance of nature in felling and clearing forests and woodlands, the cultivation of the fields and encroaching civilization evidenced by more extensive building operations, termites have been forced from the natural habitats. They have been driven to attack the woodwork of buildings for both food and shelter.

Termite damage in the past has often been mistaken for decay or dry rot caused by fungi and this fact would lead to an apparent increase in damage.

There has been no spread of our native termites from the tropics to our country or spread of termites from the southern states to the northern. Examination of the old colonial homes in Virginia, which have been attacked and reattacked by termites over long periods, leads some authorities to believe that there are periodic rises and drops in the activities of termites or "biologic waves"—cycles of greater damage.

TERMITE DAMAGE TO BUILDINGS DUE TO IMPROPER CONSTRUCTION: Most of the damage caused to buildings by subterranean termites is due directly to improper methods of construction. Despite popular opinion, the age of the building does not determine whether or not it is liable to termite attack since newly constructed buildings are often badly damaged by termites.

INSULATION: Complete insulation from the ground of all untreated woodwork of buildings is the only effective permanent preventive or remedy against attack by subterranean termites.

HOW SUBTERRANEAN TERMITES INFEST BUILDINGS: The principal methods by which subterranean termites get into buildings are:

The use of untreated wood or fiber products in basements, or foundations of buildings, where termite damage is most likely to start.

The penetration by termites of masonry walls where improper grades of mortar have been used in foundation and working up through the interior walls.

Through earth-like shelter tubes termites are also able to crawl over impenetrable walls and thus infest buildings.

MODIFICATION OF CITY BUILDING CODES: One of the simplest, most effective and practical means of preventing infestation would be to modify the building regulations or codes of various cities so as to include a few simple rules recommended by the Bureau of Entomology in the mandatory section to protect buildings from damage by termites. These suggestions, of course, would have to be enforced or they would be worthless.

Essentially these specifications pertain to methods of keeping termites from coming up from the ground, where they live and obtain moisture, and burrowing into the untreated woodwork of buildings. It is recommended that: No untreated wood shall be used in foundations, basements or cellars; that cement foundations must be capped with concrete or mortar and slate; metal mechanical barriers should be placed over foundations, and that proper ventilation and screening of all ventilation openings and doors be secured. Earth should not be used as a filler for the foundations of porches adjoining houses.

SOIL POISONS: The possibility of stopping termite work in buildings by means of soil poisons placed about the foundations is indicated by large scale experiments which have been under way for several years by various agencies interested in termite control. The use of such soil poisons, however, on present information, cannot be recommended as a permanent remedy. On the other hand, where termite reconstruction herein recommended is deemed by the owner to be impracticable or too expensive, the following type of soil poisoning may be used and should give at least temporary relief:

Poison the soil in all unexcavated areas under the building after digging a trench 30 inches deep (in no case lower than the top of footing) and at least 12 inches wide at the top around the foundation walls and piers, removing all wood debris and breaking off all earth-like shelter tubes over foundations. Saturate the soil at the bottom of the trench with full strength orthodichlorobenzene at the rate of one gallon per ten linear feet, replace the soil and repeat the treatment within 3 inches of the surface.

In cases where there is danger of orthodichlorobenzene reaching the spreading roots of living vegetation, use paradichlorobenzene in the crystalline form in the same manner as specified above. Crystals shall be used at the rate of approximately 5 pounds per 10 linear feet. Or use a mixture of one part coal tar creosote and three parts kerosene oil at the rate of one gallon of this mixture per 10 linear feet.

FEDERAL SPECIFICATIONS FOR REMEDYING TERMITE DAMAGE:
The Bureau of Entomology has prepared for use by custodians

of Federal buildings a set of specifications for remedying termite damage. These are based on four different types of structures. They are in mimeographed form.

COST OF TERMITE-PROOFING SLIGHT: A few hundred dollars additional spent in the proper construction of buildings may save thousands of dollars later in repairs and replacements. It is much simpler and cheaper to keep termites out of a building than to get rid of them and repair the damage after they are once in, involving necessary repairs which may be too costly for the small householder. These suggestions for the prevention of termite damage to buildings will probably add only from 1 to 2 per cent to the initial cost of the buildings (mainly chargeable to supervision), but they are a form of insurance, not only to the householder, but to the person financing the buildings. Bankers have shown their understanding of this point by their willingness to lend more money or give a lower rate of interest to a home owner constructing a building in accordance with these provisions.

The chemical impregnation with standard preservatives of all woodwork to be used in the building where there is considerable damage by drywood termites is recommended as a further precaution to persons who can afford this expense. But such use of impregnated wood would increase the initial cost of termite-proofing to approximately 10 per cent. This would cover the additional cost of handling treated timber.

TERMITE RESISTANT WOODS: In view of the fact that but few termite resistant woods occur in the world, it is recommended that, in general, commercial woods grown in the United States be impregnated with standard chemical wood preservatives, rather than attempt to obtain termite resistant woods.

On Barro Colorado Island during April, 1927, several buildings and a tower were also erected of redwood (*Sequicia sempervirens*) of the Pacific Coast to determine the resistance to attack by termites of a special grade to close grained heartwood redwood. An examination in September, 1934, revealed no penetration of the wood by termites. Other native resistant woods are being tested.

THE STORY OF STEEL

By WILLIAM KERKHOFF, JR. *

Read before the Society, September 10, 1934.

The great bulk of the steel made in the United States is made in a basic open hearth furnace. While there are a number of deposits of iron ore throughout the United States, the greatest source of supply is from mines in the northern part of Minnesota. This ore is mined by both the open pit and underground methods, and is transported by rail to the shipping ports on the Great Lakes, and thence by water to Cleveland, Conneaut Harbor and Gary and other points on the Great Lakes, and from there to the mills by rail. The ore carriers on the Great Lakes are usually of 10,000 tons capacity and can be loaded at Duluth in from thirty to forty minutes each. The entire cargo can be discharged at the ports mentioned above in approximately 2 hours and 30 minutes. It is then transported from the ore docks to the mills and placed in stock piles, adjacent to the blast furnaces, until ready for use. In modern practice these blast furnaces are usually of about 600 tons capacity, called a heat, and the charge generally consists of iron ore, coke and limestone in the proportion of 2 tons of coke and 1000 pounds of limestone to each ton of iron ore. When the heat is finished the molten metal is poured into ladle cars and taken to the mixer which is, in effect, a storage place for the molten iron until it is ready to be charged into the open hearth furnaces. From the mixer it is again tapped into ladles and carried to the open hearth furnace for charging—limestone being charged on the bottom, then scrap steel on top of the limestone—and the entire mass is heated in the furnace for about 2 hours or until it is white hot and slightly fused. The molten pig iron is then added, causing a lively reaction in which almost all of the silicon, manganese and phosphorus, and part of the carbon are oxidized—the first three forming compounds that slag with the iron oxide to join the limestone and iron silicates that are already melted. Eighty per cent of this slag is drawn off at the end of 2 or 3 hours more, during which time the limestone has been decom-

* Carnegie Steel Co.

posed by the heat, its CO_2 bubbling up through the batch and exposing part of the metal to the flame, thus oxidizing it and completing the purification started by the reaction of the ore.

Each heat is tested frequently by the melter for chemical analysis, and the proper ingredients are added to get the desired result, at which time the furnace is then tapped. After the slag has been skimmed off the top of the steel, the molten batch is poured into iron molds (ingot molds) to cool, after which the ingots are taken to the mills for rolling and finishing.

The processes of manufacture at the various finishing mills are largely the same. The ingots are first broken down on a "roughing mill" to the required billet sizes. The billets are then placed in a re-heating furnace, adjoining the rolling mill, and brought up to suitable rolling temperature. From this point on the actual rolling of the finished steel takes place. The procedures for rolling rails, bars, shapes, rods, etc., are all similar. Plates, however, are rolled on an entirely different type of mill. In rolling rails, bars, structural shapes, etc., the billet passes through various "stands" of rolls, coming nearer to its finished shape at each pass until it reaches the finishing rolls, at which time the desired form and size is obtained. Plate mills are of several types—the universal mill, the 2-high reversing mill, and the 3-high mill. The universal mill breaks the slab down to the gauge desired, and side rolls control the width, thus giving the universal mill plate a rolled edge. In rolling sheared plates the slab is rolled to the desired gauge and length only, as it usually runs over the width wanted and has to then be sheared to the required width.

The manufacture of pipe, which is handled entirely by the National Tube Company, is decidedly different from any of the processes mentioned above, except as pertains to the producing of the semi-finished steel. In both the butt-weld and lap-weld processes the semi-finished material carries the mill name of "skelp", although the large diameters of pipe are made from plates.

In the butt-weld process the "skelp" is first charged into a heating furnace, and when it reaches welding heat the pointed ends are grasped by long-handled tongs and pulled through a

die or welding bell, forcing the edges squarely together and making a sound weld. While still hot the welded pipe passes through the sizing rolls, then across a cooling table, and through the scale free process. In this process the pipe is passed successively through several special rolls designed to reduce the cross section and, at the same time, increase the length of the pipe. This working of the metal in opposite directions breaks off the heavy welding scale (mill scale) and leaves a clean, smooth, scale-free surface inside and out. Following the scale-free process the pipe goes to the cross rolls, where it is straightened and given a smooth finish. It is then conveyed to a large tank, where the loose scale is washed out, or, in the case of smaller sizes, to a bench, where the loose scale is blown out with compressed air. The rough ends are now cropped and the pipe is reamed and threaded. Every length of butt-weld pipe is given a hydrostatic test of from 700 to 2200 pounds per square inch, according to the size of pipe and the service for which it is intended.

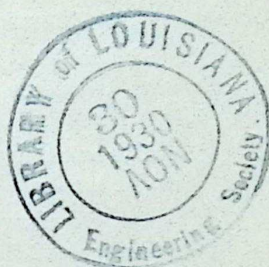
The lap-weld process is so named because the edges of the plates or skelp are overlapped and welded in this position, in contrast to the butt-weld process in which the square edges of the skelp are butted together in a weld. The skelp is first charged into the bending furnace and heated preparatory to beveling or scarfing the edges, forming the rough tube. This rough tube with overlapping edges is then charged into the welding furnace for re-heating. When it has reached the proper welding temperature it is pushed from the furnace into the lap-welding rolls. Here, a mandrel or ball serves as an anvil, while the rolls act as a sledge to weld the lapped edges of pipe. The pipe now passes to the sizing rolls, which give it the correct diameter; then to the cross rolls, which straighten it and give it a true circular shape. Finally it passes across a long cooling table, after which it is inspected and the ends cropped. From this point on lap-welded pipe receives the same finishing operations as the butt-weld pipe, except that the hydrostatic test varies from 450 to 3000 pounds per square inch, according to pipe size and service requirements.

In the "seamless" method of manufacturing pipe, square "blooms" or billets are re-heated and rolled into round bars, which are subsequently cut up into shorter lengths containing

the proper amount of metal for a given size of pipe. Each of these short length rounds has a centering hole punched in one end. After another re-heating to forging heat, the centered end is pushed forward into the rolls of the first piercing mill, where the forwarding action of the revolving rolls forces the solid billet over the piercing point of the mandrel, forming a tube with thick walls. Larger sizes require a second piercing to enlarge the inside diameter and reduce the wall thickness, at the same time elongating the pierced pipe itself. This rough seamless tube is next passed over adjustable rolls over a mandrel held by a long steel bar, which thins down the walls and smooths out the finish. While still at a suitable working temperature, the rolled tubes pass on through the "reeling" machine, which is a sort of rolling machine with the rolls at an angle to each other, and a "reeling plug" or mandrel. This operation gives the pipe a smooth burnished surface. The tubes then pass on to the sizing rolls, finishing rolls, cooling table, and straightening machines, after which the ends are cropped, inspection made, and the hydrostatic test applied to the pipe far in excess of actual specified working pressures. A coating of oil is applied for protection during shipment. This product is known as *hot finished seamless tubes*.

[EDITOR'S NOTE:—This talk was accompanied by fine reels of motion picture film. They proved a very interesting addition to the talk.]

ACTIVITIES OF LOCAL SOCIETIES



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1st Vice-President,	F. P. HAMILTON
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Treasurer,	R. L. MORONEY, 8134 Sycamore Street, New Orleans, La.

Annual meeting at New Orleans in May.
Special meetings at call of President.

The scholarships maintained by the Section have been awarded as follows:
Tulane University to Mr. H. P. Cullen.
L. S. U. to Mr. Wilson Broussard.

STUDENT CHAPTERS

Louisiana State University

President, R. H. Hamilton
Secretary, W. E. Epperson

Tulane University

President, H. M. West, Jr.
Secretary, A. J. Cooper

The Federal Housing Administration held a regional meeting for discussion of the Government's "Better Housing Program", at the Hotel Roosevelt, New Orleans, November 1st. All interested were invited to attend.

The F. E. R. A. program for so-called "white collar" projects appears to offer opportunity for unemployed engineers. It is suggested that engineers in need of employment consult with F. E. R. A. representatives in their community for information on this subject.

MINUTES OF MEETINGS AND BUSINESS OF THE SOCIETY

Minutes of Board of Direction, September 10, 1934.

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

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

The Secretary brought up the matter of binding of periodicals and was instructed to secure information from the librarian at Tulane.

Communications relative to the sale of the Union Title Guarantee Company, Series D Trust Notes, were read and the action of the President in effecting the sale was approved.

The Secretary brought up the matter of the expense entailed by the President in connection with his official duties in attending conferences, luncheons, etc., as a representative of the Society. On motion, duly seconded, it was voted that the expenses of the President in his official capacity be approved.

Letter from the Housing Committee of the National Conference of Housing Officials was read and the President was authorized to appoint representatives of the Society to attend the conference.

Communication from the Chairman of the Housing Committee was read and the President and Secretary were authorized to prepare circular letter to the membership relative to the facilities offered the members in the Club Rooms. The Secretary was also instructed to write to the engineering societies in New Orleans inviting them to use the Club Rooms for committee meetings, gatherings, etc.

Report from Mr. James M. Todd, Chairman of the Legislative Committee, was read and the Secretary was instructed to write to Mr. Todd and others so actively engaged in attempting to secure legislation for registration of engineers, thanking them for their efforts in behalf of the Board.

At the close of the meeting Colonel Bres presented for consideration at next meeting the following items: Having a stenographer occupy the quarters, in order to keep the rooms open; moving of certain Engineering Society records to the Club Rooms so as not to inconvenience the Secretary, and appointment of an historian.

There being no further business the meeting adjourned.

F. A. MUTH, Secretary.

Minutes of the Regular Meeting of the Society, September 10, 1934.

The meeting was called to order in Room C, St. Charles Hotel, about 8:10 p. m. Mr. A. Lee Dunlap, President, in the chair, F. A. Muth, Secretary, and 62 members and guests present.

Owing to the lateness of the hour, it was voted to dispense with the reading of the minutes.

Several committee chairmen made announcements as to the work of their committees and the President referred to the possibility of holding semi-monthly luncheons.

Motion pictures showing the "Basic Process of Manufacture of Steel" were shown by the courtesy of the Carnegie Steel Company. Mr. William Kerkhoff, Jr., made some introductory remarks. A rising vote of thanks was then tendered Mr. Kerkhoff.

The meeting then adjourned to the collation served in the Club Rooms.

F. A. MUTH, Secretary.

Minutes of Board of Direction, October 8, 1934

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

Mr. Dusenbury was present upon invitation.

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

The President announced upon recommendation of the Awards Committee that he had designated Mr. J. S. Conner of L. S. U., and Mr. Arthur C. Porter of Tulane University to receive the Scholarship for this year. On motion, duly seconded, the Board authorized the payment of the Scholarship to L. S. U. in full and a payment of \$75.00 on the Scholarship to Tulane University, the Secretary being instructed in regard to letters to be written.

A communication was read from the New Orleans Office of E. R. A. relative to having the Secretary certify applications for certain applicants on Engineering Projects. On motion, duly seconded, the Secretary was authorized to represent the Society on such applications that may be submitted to E. R. A. and for projects with which the Secretary is familiar.

It is also voted to have the President appoint a committee to call on the E. R. A. Office, to ascertain that if there are sufficient projects to assimilate all applicants and to cooperate in advancing the work outlined by the E. R. A. Office.

A communication was read from the Federal Land Bank relative to the availability of a Hardee Map of Louisiana. The Secretary was instructed relative to reply to be made after the letter is read at the Society.

The Secretary was instructed to take up with the Editor the matter of preparing a separate sheet to be inserted two or three times a year in the Proceedings, calling attention to the Society's scholarships. Also to request the Editor to set a definite date for issuing the Proceedings and the Board to be advised as to what the date is, in order that ar-

rangements can be made to carry certain notices, etc., in the Proceedings to be made available to the members for certain occasions.

This will make the Proceedings of greater value to the members.

In accordance with the Constitution, the President appointed the following Nominating Committee, which was approved by the Board: Professor James M. Robert, Chairman, Mr. F. N. Billingsley, Mr. A. T. Dusenbury.

The Secretary was instructed to communicate with the Chairman of the Entertainment Committee, requesting him to submit his report of the proposed entertainments for the winter.

Ballots were opened for new members, there being 24 formal ballots, one informal ballot, with none scratched, therefore the following members were declared elected:

Resident Member
Walter S. Rainville, Jr.

Affiliate Member
P. E. Terroy

Non-Resident Member
Oscar Higginbotham

Junior Member
Horace C. Welman

Non-Resident Junior Member
Henri J. Molaison

A communication from the Central Institute of Technical and Economic Information of U. S. S. R. was read and the Secretary was instructed as to reply.

The Board voted to have an historian appointed to prepare a history of the Society, which, it is believed, will be of interest to the members. The President was authorized to make the appointment.

There being no further business, the meeting adjourned.

F. A. MUTH, Secretary.

Minutes of the Regular Meeting, October 8, 1934.

The meeting was called to order about 8:15 p. m. in Room C of the St. Charles Hotel, President A. Lee Dunlap in the chair, F. A. Muth, Secretary, and 109 members and guests present.

The minutes of the previous meeting were read and approved. Announcements were made by various committee chairmen, and the Secretary read a communication from the Federal Land Bank, requesting information relative to the availability of a Hardee Map of 1895.

Professor Gregory referred to the death of Mr. Calvin W. Rice on October 2nd, Secretary of the A. S. M. E. On motion, duly seconded, the President was authorized to appoint a committee to draft suitable resolutions to be furnished to the American Society of Mechanical Engineers and to the family of Mr. Rice.

An interesting address was presented by Dr. Thomas E. Snyder on "Termites" and "Termite Control". This lecture was illustrated with lantern slides and an instructive discussion followed. A rising vote of thanks was then tendered the speaker and the meeting adjourned to the collation in the Club Rooms of the Society.

F. A. MUTH, Secretary.

The Proceedings of the Louisiana Engineering Society

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JAMES M. ROBERT, Editor.

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LOUISIANA ENGINEERING SOCIETY

OFFICERS FOR 1934

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Vice-President, E. S. BRES, 1007 Maritime Building.
Secretary, FRANK A. MUTH, 7705 Willow Street.
Treasurer, WALTER B. MOSES, 425 S. Peters Street.

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John Klorer
James M. Todd

The headquarters of the Society are in the St. Charles Hotel, Room 422.
Members may obtain key to rooms at hotel desk.

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

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Federal Engineering Offices and Officials

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Masonic Temple Bldg., New Orleans.

District Engineer, 1st New Orleans District

Major Henry Hutchins, U. S. Army
Union Bldg., New Orleans.

District Engineer, 2nd New Orleans District

Lieut-Col. J. N. Hodges, U. S. Army
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Superintendent of Lighthouses

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224 Customhouse Bldg., New Orleans.

U. S. Coast and Geodetic Survey

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314 Customhouse Bldg., New Orleans.

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805 Canal Bank Bldg., New Orleans.

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207 New Orleans Court Bldg., New Orleans.

Orleans Levee Board

Mr. John Klorer, Chief Engineer,
606 Common St., New Orleans.

Louisiana Highway Commission

Mr. Harry B. Henderlite, Chief Engineer,
Baton Rouge.

Louisiana State Board of Engineering Examiners

Mr. J. T. Bullen, President, Shreveport, La.
Mr. F. A. Muth, Secretary, 817 Audubon Bldg.,
New Orleans.

PROCEEDINGS OF THE LOUISIANA ENGINEERING SOCIETY

VOL. XX.

DECEMBER, 1934

No. 6

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EDITORIAL NOTES AND COMMENT

Greetings of the Season. At this season of holiday and merry making, let each of us pause for just an instant to reflect on the past and contemplate the future.

In our survey of the past let us note the mistakes we have made, both of omission and commission, and resolve not to make them again.

For the future, let us resolve to work, to play, to love, to live, to look up at the stars, and above all, to be cheerful whatever comes. Let us always remember that even in the ooze and

slime of mud we can always see the reflection of the stars if we look for them.

For the Society, let us all resolve to make it the greatest year the organization has ever known. With the will to do, it can be done. And so, above—'way above—the trite expressions for the good wishes of the season, the Editor most heartily wishes each of you *contentment* during the coming year.

A Survey of the Engineering Profession. We wish to call attention to what is probably one of the most far-reaching surveys of the engineering profession to be undertaken. We are calling attention to it in this manner because the success of the survey will depend upon the individual effort of those engineers who receive questionnaires to return answers. A notice of this survey is given in a letter from the executive secretary of the American Engineering Council to the secretaries of the different societies. We quote from this letter:

URGENT NOTICE!

“A SURVEY OF THE ENGINEERING PROFESSION, of fundamental importance in immediate and future planning to improve the status of engineers, is about to be made by the Bureau of Labor Statistics, U. S. Department of Labor, in cooperation with American Engineering Council and as many engineering societies as will participate.

“The Survey will be conducted under the guidance of American Engineering Council's Committee on Engineering and Allied Technical Professions, of which Mr. George T. Seabury, Secretary of the American Society of Civil Engineers is Chairman.

“IT IS A BIG JOB to secure this information on a profession-wide basis and the profession is fortunate in the acceptance of the project by the Department of Labor. UNSIGNED CONFIDENTIAL questionnaire returns from some 100,000 individuals are contemplated. After careful planning over a period of months, a form has been developed to secure a maximum of data with a minimum of individual effort—mostly ‘yes and no’ questions which can be checked off on the sheet.

“FACTS TO BE COVERED include salaries, types of employers, duties, etc., for the past several years; educational background; and present employment status. It

is believed to be the most comprehensive nation-wide study ever made of a profession. When the returns are in, we will know for the first time just where the profession stands and will have a wealth of background information which can serve to illuminate our course of action. In short, for the first time the principle of engineering analysis really is applied to the profession itself."

This survey is being undertaken by the U. S. Department of Labor and questionnaires will soon be mailed to over one hundred thousand engineers throughout the country. The questionnaires will be mailed by Mr. George T. Seabury, Secretary of the American Society of Civil Engineers, to assist the Department of Labor. Because of the personal nature of the questions asked the questionnaires are to be returned unsigned, so that identification will be impossible.

Therefore, you are most earnestly urged to answer all questions frankly and fearlessly with the full assurance that your identity will remain unknown. For the good of the profession, be sure to answer your questionnaire completely and return it at the earliest possible moment.

Directory of Engineering Offices and Officials. This issue of the *Proceedings* contains an innovation which we hope will be of material service to our members. It frequently happens that an engineer wishes to communicate with some public official and at the moment does not have access either to the location of the office or the official's name. For the convenience of our members we are publishing on the page following the Officers of the Society, a directory of Federal and State officers and officials. Suggestions of omission or commission will be welcomed by the Editor.

Student Honor and Professional Integrity. We have always believed that the type of student who offers himself for a course of engineering study is high-minded in every particular. Student honor is but the forerunner of professional integrity. For this reason, therefore, we are glad to give space to a letter received by us from the officers of the Engineering

Student Body at Tulane University. The letter speaks for itself and is as follows:

TULANE UNIVERSITY

New Orleans, La.,
December 7, 1934.

Mr. James M. Robert,
Editor, "Proceedings of Louisiana Eng'g. Soc.,
Tulane University,
New Orleans, La.

Dear Mr. Robert:

Below is an excerpt taken from the minutes of December 7, 1934, of the Honor Board of the College of Engineering of Tulane University.

It has come to our attention that it is generally believed that the Honor System has been abolished in the College of Engineering. We feel that it is essential to the reputation of the College and the Student Body, since it is a professional college and its students naturally pursuing a professional education, that outsiders are acquainted with the true manner in which the students are presenting themselves for study, especially those outsiders in the field of engineering.

Accordingly, the following resolutions were adopted by the Honor Board of the College:

"It having come to our attention that the abolition of the Honor System in the College of Arts and Sciences of Tulane University has been misconstrued as also applying to the College of Engineering, we, the Honor Board of the College of Engineering, have adopted the following resolutions:

"Be It Resolved, That the Honor Board of the College of Engineering of Tulane University, in regular meeting assembled, wishes it to be definitely understood that the Honor System is still in existence in this College and is functioning most efficiently.

"Be It Further Resolved, That the Chairman of the Board give this statement to Mr. James M. Robert, Editor of the "Proceedings of the Louisiana Engineering Society", with the request that he publish it in

that organ so that members of the engineering profession may be acquainted with the true state of affairs in this matter.

"Be It Further Resolved, That the 'Tulane Hullabaloo' and the daily press be likewise furnished with a copy of these resolutions with a request for publication of them.

"Adopted December 7, 1934, by the Honor Board of the College of Engineering of Tulane University."

We will appreciate any publicity that you may be able to give this matter.

Thanking you for your cooperation, I am,

Yours very truly,

C. JULIAN BARTLETT,
Chairman of the Board,
President of the Student Body.

Bearing Piles.—Their Type and General Characteristics.

We are glad to publish in this issue a paper by one of our non-resident members, Mr. J. F. Tompkins.

Engineers who are used to dealing with foundation problems in other parts of this country have to learn an entirely different technique in dealing with foundation problems in this locality. While steel piles have been used considerably in this part of the country for coffer dam work, their use as bearing piles here has not been undertaken to any great extent. This is due principally to the fact that information concerning loads that these piles will sustain in this section has been quite absent. The steel companies, therefore, undertook to supply this information as outlined in Mr. Tompkins' paper.

We note with great interest that a copy of the full report is being presented to the Library of the Society.

Officers for 1935 Nominated. In accordance with the Constitution, the Nominating Committee to nominate officers for 1935 was appointed as follows: Professor James M. Robert, Chairman, Mr. F. N. Billingsley and Mr. A. T. Dusenbury. At the December meeting of the Society this committee rendered

its report and offered the following nominations: For President, Colonel Edward S. Bres; for Vice President, Mr. Allen S. Hackett; for Secretary, Mr. Frank A. Muth; for Treasurer, Mr. Walter B. Moses; for Director to serve three years, Mr. Bernard H. Grehan.

Those holding over on the Board of Direction are: Professor A. Lee Dunlap, Mr. Paul S. Hoots and Professor Claire W. Ricker.

Stag Smoker. At the conclusion of the December meeting the members adjourned to the Hunt Room in the St. Charles Hotel for participation in one of the old-time smokers. The attendance was quite large. The Entertainment Committee, headed by Mr. H. L. McLean, was in charge of the occasion.

The committee spared no effort to make the occasion a success, and we can say without fear of contradiction that the comestibles, combustibles and cotillions were enjoyed by everyone present. There may have been some members present who did not enjoy the smoker, but if any such were there they were certainly not in evidence. The cost of the smoker was one dollar—pay as you enter.

Social Engineering. There has come to our desk the first issue of the periodical called "Social Engineering." It is put out by the government agencies in charge of relief work in this section. Its editor is Mr. H. B. Cooley. While in the last analysis all engineering is social engineering, it is usually not thought of as such. The social aspect of engineering is usually lost in a maze of technical and financial development.

We, therefore, welcome this little periodical devoted entirely to the social side of engineering and we wish it good luck in its projected career.

U. S. Coast and Geodetic Survey Establishes Tape Calibration Station. It will be of considerable interest to engineers of this section to know that the United States Coast and Geodetic Survey has established at Tulane University two stations for calibrating and standardizing tapes. One of these stations

is for standardizing tapes which are supported throughout their length; the other for tapes which are supported only at the zero and hundred foot points.

The first of these stations is the distance between two brass markers embedded in and flush with the concrete floor of the Gas Engine Laboratory and Machine Shop in the rear of the Engineering Building at Tulane University. The distance is measured between two minute holes one thirty-second of an inch in diameter in the center of each of these markers. The distance is 99.994 feet at eighty degrees F. This interval of length will vary according to the temperature variation of the concrete.

The other calibration station for tape, supported only at two ends, is the distance between two brass markers embedded in the top of two six-inch tiles set in a concrete base in the ground on the Tulane University Campus between the Engineering Building and the Chemistry Building. They are eight inches above the ground level and are surrounded by dirt mounds. The distance between the two marks in the center of these brass plates is exactly one hundred feet at a temperature of sixty-eight degrees F. Complete data for these two stations will be on file with the Department of Civil Engineering at Tulane University and with the mechanician for the engineering shop. Engineers are invited to make use of these calibration stations.

Heretofore it has been necessary to send tapes to the Bureau of Standards at Washington in order to have them calibrated. These calibration stations at Tulane University, therefore, should be of considerable convenience to engineers in this locality.

Annual Dinner Dance. As the year rolls around we are again reminded that the annual meeting and annual dinner dance will take place on Saturday, January 19, 1935. The entertainment committee is now at work to make the occasion the same success it has been in past years. The location will be announced later, but meanwhile, reserve the date on your calender. Be sure also to have your wife or sweetheart reserve the same date on her calender and be sure to bring her.

PAPERS AND DISCUSSIONS

BEARING PILES—THEIR TYPES AND GENERAL CHARACTERISTICS

By J. F. TOMPKINS *

Read before the Society, November 12, 1934.

Bearing piles in Louisiana, particularly in the territory adjacent to New Orleans, are the chief source of support for structures of any magnitude. A foundation is necessary to provide safe and unyielding support against downward and lateral motion. In foundation engineering we are confronted with the effective stress on beds of natural material which we have so far been unable to definitely specify. This is not surprising in view of the variations in the character of our natural deposits. Foundations for structures can be classed into two groups: those that transmit super-imposed loads to bed rock and those in which the load is distributed to the soil by spread footings or bearing piles. In certain sections of the United States structures of magnitude are supported by solid rock, while in alluvial sections, such as the New Orleans district, structures must be constructed upon piles to provide adequate foundation except for unusual structures such as the main structures for the bridge now being built across the Mississippi above the City of New Orleans.

Until recently, there were only two materials used for bearing piles. Wood piles, treated and untreated, have been used extensively in foundations in this section and other alluvial districts in the United States for years. Concrete has been developed for this purpose and during the past few years steel has become an active material for this use.

Wood piles have proven successful for this purpose in many projects where the material could be procured advantageously. When constantly saturated, wood has given ideal service without treatment when not exposed to deteriorating elements. In

* Non-Resident Member, Engineer, Carnegie Steel Co., Tennessee Coal, Iron & Railroad Co., Houston, Texas.

many cases it is necessary that wood piles be given a treatment of some nature to prevent deterioration. Several methods of preservation of wood piles have been evolved, and the most generally used today is that of creosote saturation.

Concrete piles are often used for foundation work where wood would not work to advantage. Numerous types of concrete piles have been developed but the most generally used seems to be the precast type. Concrete piles have proved very successful where used.

The producers of steel in recent years have been promoting the use of Steel H-Beams for use as bearing piles, and because of the economy afforded and other advantages, it is thought that this class of material will become much more widely used in the future.

Many projects have been constructed with wood and with concrete piles in many localities in the United States and multitudes of bearing tests have been made to determine their carrying capacities. The use of steel H-Beams for bearing piles, being a recent development, has not enjoyed this wide range of investigation and consequently the available data on the bearing capacity of steel piles is very limited.

The territory adjacent to New Orleans probably represents one of the worst soil conditions for foundation work anywhere in the United States and in order to develop some information concerning the ability of steel piles for bearing pile purposes, in this vicinity, the Carnegie Steel Company, the Illinois Steel Company and the American Bridge Company recently conducted a comprehensive test to determine the relative efficiency of steel beams in comparison with concrete and wood for bearing pile purposes. The test was conducted near Laplace, Louisiana, adjacent to the Bonnet Carre Floodway, and from it some very interesting information was secured. The several purposes of this test were as follows:

- (1) To determine the relative efficiency of steel piles, as compared with a concrete and wood pile in the delta type of soil found in this locality.
- (2) To obtain a comparison of bearing values of several types of CB-Section piles at various depths of penetration.

- (3) To try to determine whether the skin friction value varies with the depth of penetration, and whether it is constant for all depths and types; also whether it is a function of the net superficial area or gross superficial area of the pile.
- (4) To try to determine the ratio of the pulling resistance of a pile to the load bearing value (in terms of skin friction or in terms of soil displacement or both)
- (6) To try to determine the worth of several driving formulae for use in estimating the bearing value of a steel pile.
- (7) To try to determine the lateral supporting power of the earth against a pile.

These tests were made with hydraulic jacks rather than the usual method of putting a direct dead load upon the piles. In making a test of this nature, a number of steel H-Beams were driven as anchor piles, to which beams were attached for connection to the jacks to be used in the test. The piles to be tested were driven between the anchor piles. The use of hydraulic equipment for the tests permitted a very accurate loading of the piles and proved to be very successful. Two types of steel piles were tested, one being plain H-Section and the other an H-Section with a plate welded between the tips of the flanges to make it a box type pile. Both types of piles were pointed at the bottom ends. The plain piles under test were 8" CB 33#, 10" CB 49# and 12" CB 65#. The box section was a 10" CB 49#. For the anchor piles 14" CB 87# sections were used. The concrete pile tested was a 20" x 20" pile 75' in length made according to Louisiana State Highway Commission specifications. The wood pile was 85' long, having a butt diameter of 16" and a point of 8". Bearing tests were made on each of these piles and tests were conducted upon the steel piles at various depths of penetration. Both accelerated and sustained tests were made.

In the accelerated tests, the loads were applied to the piles in 6.12 ton increments at $7\frac{1}{2}$ minute intervals, until failure. In the sustained tests the loads were applied to the piles in 24.48 ton increments at 5 minute intervals up to a load of approximately 70% of the value of the pile attained in the accel-

erated tests. The load was sustained for at least twelve hours and then increased in 12.24 ton increments at intervals of not less than 12 hours, which in some cases was extended to 48 hours. Observations for settlement during the sustained test were made hourly. Besides the accelerated and sustained tests mentioned above pulling tests were also made on some of the steel piles to determine the relative bearing and pulling capacity of the steel beam.

A core boring to a depth of 121' was made at the site of the test to determine the strata through which the test piles were driven. The general character of the material encountered, except for an occasional stratum of sand, was that of a stiff, plastic clay, evidently of alluvial formation. It was very tenacious, and although laden with fine sand at certain depths, the sandy content was not sufficient to alter the stiff, tenacious and slightly elastic properties of the clay. A five-foot stratum of fine grey packed sand was encountered from 60' to 65' below the surface and was the most resistant soil penetrated and offered the only appreciable point resistance developed in the entire strata. When piles were driven through this particular stratum, relatively harder driving was encountered.

In these tests it was found that the type of soil through which the steel piles were driven was of such a nature that the adhesion of the soil to the inside of the flanges of the piles was greater than the cohesion or the side frictional shear of the soil between the tips of the flanges and consequently only the net perimeter of the piles was effective for skin-frictional resistance. The plain H-Sections developed practically the same carrying capacity as the box section described above. The concrete and wood piles tested considerably higher than the steel sections under investigation, but this was possibly due to soil displacement in the hard stratum of pack sand encountered between 60' and 65' below the surface of the soil.

The tests upon the steel piles, however, were considered entirely satisfactory and proved conclusively that steel piles could be used to advantage in the New Orleans Region for economical foundation work. These tests also gave interesting information relative to the pulling capacity of the piles and it

was shown that in the soil encountered at Bonnet Carre where point resistance was not developed, that the pulling value of a steel pile was practically the same as its bearing capacity. In the tests conducted, it was found that a 12" CB 65# section was possibly the most economical H-Beam for the particular locality in which the experiment was conducted.

Piles tested in this experiment were driven with Vulcan Hammers, the steel and wood piles with a #1 Vulcan and the concrete pile with a #0 Vulcan Hammer.

The American Bridge Company has made use of the data developed at Bonnet Carre in the construction of their temporary piers for use in connection with the construction of the main spans for the bridge now being erected across the Mississippi River above New Orleans. These false piers are so constructed that the steel piles may be put into both tension or compression as at times the trusses under erection become somewhat off balance.

A copy of the report on the test at Bonnet Carre is being presented to the Louisiana Engineering Society Library and will be available to any of its members who may wish to review it.

President,
JOHN H. O'NEILL

1st Vice-President,
F. P. HAMILTON

2nd Vice-President,
CLIFFORD H. STEM



Secretary,
H. A. SAWYER,
care Lone Star Cement Co.,
of La., 1120 Hibernia Bank
Building, New Orleans, La.

Treasurer,
R. L. MORONEY,
8134 Sycamore Street, New
Orleans, La.

Annual meeting at New Orleans in May.
Special meetings at call of President.

STUDENT CHAPTERS

Louisiana State University

President, R. H. Hamilton
Secretary, W. E. Epperson

Tulane University

President, Waldo S. Powell, Jr.
Vice-President, Wilbert L. Argus
Secretary, William B. Settoon
Treasurer, Louis C. Bisso

Awards of Junior Membership in the American Society of Civil Engineers have been made by the Louisiana Section to Mr. Alfred J. Cooper, Tulane University and to Mr. Wilson Broussard, Louisiana State University.

Mr. A. F. Barclay, Mem. A. S. C. E., formerly Chief Engineer, New Orleans Public Belt R. R., is now General Manager of that organization.

Mr. V. J. Bedell, Mem. A. S. C. E., has been appointed to succeed Mr. Barclay as Chief Engineer, New Orleans Public Belt R. R.

Mr. Harry B. Henderlite, Mem. A. S. C. E., has been reappointed State Highway Engineer.

Members of the Section are urged to attend the Annual Ladies' Night Party of the Louisiana Engineering Society at the St. Charles Hotel, Saturday, January 19, 1935.

MINUTES OF MEETING AND BUSINESS OF THE SOCIETY

Meeting of the Board of Direction, November 12, 1934.

The meeting was called to order by President Dunlap and the following members were present: Messrs. Wiggin, Moses, Ricker and Muth. Mr. McLean was present upon invitation.

The minutes of previous meeting were read and bills on hand were ordered paid, including an account of the President.

Mr. McLean's report of proposed entertainment for the fall was read. It was voted to hold an excursion to the Freeport Sulphur Plant at first favorable opportunity. It was also voted to have a stag smoker following the December meeting for which a charge of \$1.00 per person was to be made, to be collected at the door.

Report of the editor was carefully considered and it was voted to retain the present size of the Proceedings and for the editor to set a definite date for each issue so that the Proceedings can be issued on that date.

The Secretary presented a list of members who were in arrears for years preceding the current year. On motion, duly seconded, it was voted to remove the names from the roster in accordance with the Constitution if no reply is received to a communication to be sent to each person at this time.

Being no further business the meeting adjourned.

F. A. MUTH, Secretary.

Regular Meeting of the Society, November 12, 1934.

The meeting was called to order about 8:15 p. m. Prof. A. Lee Dunlap, President, in the chair, F. A. Muth, Secretary, and 52 members and guests present.

The minutes of previous meeting were read and approved and several announcements were made by committees.

An inspiring talk was made on the Community Chest by Mr. Thomas Martin.

Announcement was made that an outing to the Freeport Sulphur Plant would be made at an early date and as the number who could be accommodated would be limited, those who desire to attend were asked to leave their names so that they can be notified when a convenient date could be set.

Resolution on the passing of Mr. Calvin W. Rice, Secretary, American Society of Civil Engineers, was presented, and on motion, duly seconded, it was voted that copy be furnished the family of the deceased and a copy be spread upon the minute book of the Society.

Mr. J. F. Tompkins gave an interesting talk on "Bearing Piles—Their Type and Characteristics". This was followed by an interesting discussion. A rising vote of thanks was tendered the speaker.

The meeting adjourned to the usual collation.

F. A. MUTH, Secretary.

