PROCEEDINGS

Sixtieth Annual Convention
OF THE
American Railway
Bridge & Building Association
1955
Proceedings of the
Sixtieth Annual Convention

of the

American Railway
Bridge & Building
Association

Held at
CHICAGO, ILLINOIS
September 19-21, 1955

Published by the Association
Elise LaChance, Secretary
431 So. Dearborn St., Chicago 5
OFFICERS FOR 1955

H. M. Harlow .................................................. President
Chesapeake & Ohio, Richmond, Va.

J. A. Jorlett .................................................. First Vice-President
Pennsylvania, Baltimore, Md.

R. R. Gunderson ........................................... Second Vice-President
Western Maryland, Baltimore, Md.

W. H. Huffman .............................................. Third Vice-President
Chicago & North Western, Chicago

M. H. Dick .................................................. Fourth Vice-President
Railway Track & Structures, Chicago

Elise LaChance ............................................... Secretary
431 S. Dearborn St., Chicago

L. C. Winkelhaus ........................................... Treasurer
Chicago & North Western, Chicago

DIRECTORS

Terms Expire 1955


W. H. Bunge, Missouri Pacific ............................... Houston, Tex.


Terms Expire 1956

J. F. Warrenfells, Seaboard Air Line ......................... Raleigh, N. C.

H. D. Curie, Baltimore & Ohio .............................. Garrett, Ind.

J. M. Lowry, St. Louis Southwestern ......................... Tyler, Tex.

Past President

Lee Mayfield, Missouri Pacific ............................. Houston, Tex.
OFFICERS FOR 1956

J. A. Jorlett .......................................................... President
Pennsylvania, Baltimore, Md.
R. R. Gunderson .................................................... First Vice-President
Western Maryland, Baltimore, Md.
W. H. Huffman ..................................................... Second Vice-President
Chicago & North Western, Chicago
M. H. Dick ........................................................... Third Vice-President
Railway Track & Structures, Chicago
B. M. Stephens ..................................................... Fourth Vice-President
Texas & New Orleans, Houston, Tex.
Elise LaChance ..................................................... Secretary
431 S. Dearborn St., Chicago
L. C. Winkelhaus .................................................. Treasurer
Chicago & North Western, Chicago

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J. M. Lowry, St. Louis Southwestern ............................. Tyler, Tex.

Terms Expire 1957
W. H. Bunge, Missouri Pacific .................................... Houston, Tex.
G. W. Benson, Central of Georgia ................................ Macon, Ga.

Past President
H. M. Harlow, Chesapeake & Ohio ............................... Richmond, Va.
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<td>Engineers &amp; Contractors Directory</td>
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<td>Bolton, Gunite Contractors, Inc.</td>
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<td>Booth &amp; Flinn Company</td>
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<td>Cayuga Foundation Corp.</td>
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<td>Chicago Decorating Co.</td>
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<td>Codell Construction Co.</td>
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<td>DeLeuw Cather &amp; Co.</td>
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<td>Dickson, J. L.</td>
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<td>Gillen, Edw. E. Co.</td>
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<td>Harco Corp.</td>
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<td>Hudson Maintenance Corp., The</td>
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<td>Johnson Bros. Co.</td>
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<td>Modjeski &amp; Masters</td>
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<td>Morrison Knudsen Co., Inc.</td>
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<td>Murnane, John H. Co.</td>
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<td>National Boiler Washing Systems</td>
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<td>Nichols, W. H. &amp; Co., Inc.</td>
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<td>Republic Structural Painting Corp.</td>
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<td>Schwepe Engineering Construction Company</td>
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<td>Sebastian Corporation</td>
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<td>Strobel Construction Co.</td>
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<td>Sutton Co., Inc.</td>
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<td>Sverdrup &amp; Parcel Inc.</td>
<td>107</td>
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<tr>
<td>Wikstrom, A. S., Inc.</td>
<td>107</td>
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</tbody>
</table>
Those present at this meeting had the privilege of hearing first hand the many interesting and informative addresses as well as the seven comprehensive committee reports, which were delivered during the 1955 annual meeting.

As has been customary for the past several years, the B&B group held their meetings concurrently with, although separate from the Roadmasters and Maintenance of Way Association.

The attendance at the convention again broke all records for a non-exhibit year. Total registration for the two groups amounted to 1307, including 628 guests and 679 members. A total of 214 ladies also registered.

Two Joint Sessions

The first of two joint sessions with the Roadmasters Association convened at 10:00 a.m. on Monday morning, September 19. During this session members of both these organizations heard major addresses by J. P. Kiley, president, Milwaukee Road and R. N. Begien, Jr., staff assistant to vice-president operations, Chesapeake & Ohio.

On Tuesday afternoon these two groups held another joint meeting at which H. C. Munson, vice-president and general manager, Western Pacific addressed the group. Later during that session, a panel discussion took place. The subject of the discussion was "What Kind of Housing for Maintenance Men?" The Moderator was E. L. Anderson, chief engineer, Frisco. The speakers were, H. B. Christianson, Jr., assistant chief engineer, Rock Island who spoke on Trailer Housing. G. R. Collier, district engineer, Gulf, Colorado & Santa Fe spoke on Camp Cars and R. V. Dangremond, roadmaster, Elgin, Joliet & Eastern spoke on the subject of Permanent Camps.

Separate Sessions of B&B Group

President H. M. Harlow presided over the separate sessions of the B&B Association, which were taken up almost entirely with the presentation of seven committee reports. These reports dealt with the following subjects: Use of Special Bolts in Structural Work; New & Improved Tools for B&B Work; Welding—Application to B&B Work; Heating & Ventilating Diesel Shops; Construction & Maintenance of Roadway Signs; Sanding Facilities for Diesel Locomotives and Trends in B&B and Water Service Organizations.

Comments by President Harlow

After extending a warm welcome to both members and guests at the opening session of the B&B convention, President Harlow went on to say that, "this Association was founded in 1891, 64 years ago, by a group of railroad men, just like yourselves, to further their specialized interests as B&B and Water Service men. They felt that by forming the body they could help the individuals to become better men in their field of endeavor. Their premise has been proven sound by the very fact that your Association has lived and flourished through these 64 years, some of which were anything but conducive to existence.

Why has it lived this long? That question logically follows. It has come to us down through the years because it has performed, and is performing, a definite service for you men engaged in B&B and Water Service work that no other existing organization has done. That service consists basically of bringing special information to its members that will widen their knowledge of their work and improve their ability to perform it. I believe I am safe in saying that not one of you have ever attended one of these conventions without going home with at least one new idea and, in more cases than not, with several new ones. A committee report or a discussion of the report might have given you the thought, or a new tool seen or described to you might have done it. A conversation with another member or group of members, or meeting a supply company rep-
resentative could have done it. Where else can all this be found except at your Annual Conventions.

I wish the time could be taken to read the replies I received to letters of invitation to this convention written to top railroad executives of all the roads represented in this Association. Recognition of the merit of the work we are doing was expressed in one way or another in all of them. Your management approves of what we do in this Association and encourages the continuance of our work.

How can you, as an individual member, make the Association more productive of these good things? The work done by the Subjects Committees is the formal expression of the purpose of the Association. The committee reports present the information to the members. The accumulation and organization of this data is the big job and I can think of no greater contribution by a member than to participate in the work of the committees. All you have to do is volunteer and then follow through when assigned. After the presentation of the reports, the discussion comes, and it is here that you can voice your experience on the subjects. This is an extremely valuable feature of the meeting and the entire membership is earnestly urged to take part in these discussions. Telling what you know about a problem is always of interest to all of us.

You can help the officers and directors of your Association to do a better job by suggesting subjects for committee reports. What interests you is bound to be of interest to others as all of us have basically the same problems. All suggestions pertaining to the work or the policies of the Association are always given full consideration by your Executive Committee when presented. Perhaps a suggestion from you will help make a better job possible."

In the election of Bridge & Building officers, J. A. Jorlett, now engineer—structures, Pennsylvania, Baltimore, Md., was advanced from first vice-president to president; R. R. Gunderson, engineer maintenance of way, Western Maryland, Baltimore, from second vice-president to first vice-president; W. H. Huffman, assistant engineer maintenance, Chicago & North Western, Chicago, from third vice-president to second vice-president; and M. H. Dick, western editor, Railway Age, Chicago, from fourth vice-president to third vice-president. B. M. Stephens, assistant chief engineer, Texas & New Orleans, Houston, Tex.; and a director of the association, was elected fourth vice-president. New directors elected are W. H. Bunge, assistant engineer, Missouri Pacific Lines, Houston; E. R. Schaf, assistant superintendent water service, Illinois Central, Chicago, both re-elected; and G. W. Benson, superintendent bridges, Central of Georgia, Macon, Ga.

Six new subjects have been chosen, which will be the basis of committee reports to be presented at the 1956 annual convention. These are as follows:

Advancements in Protective Coatings for Railway Structures; The Slow Order and Bridge Maintenance and Renewals; Prefabricated Buildings Versus Other Types of Construction; Moving the B&B and Water Service Gang Over the Highway; The Supervisor—His Records, Accounts and Cost Information; and Coach Watering Facilities Must be Sanitary.

REPORT OF AUDITING COMMITTEE

TO MEMBERS OF THE
AMERICAN RAILWAY BRIDGE & BUILDING ASSOCIATION:

Gentlemen:

The undersigned has examined the books of the Secretary and report of the Treasurer for the period from September 1, 1954 to August 31, 1955, inclusive, and has found them to be correct as of the latter date.

Respectfully submitted,

R. F. Dove,
Chairman, Auditing Committee

September 9, 1955
REPORT OF NECROLOGY COMMITTEE

TO THE PRESIDENT AND MEMBERS OF THE
AMERICAN RAILWAY BRIDGE & BUILDING ASSOCIATION:

We regret to advise that we have learned of the loss of eleven (11) members through death during the past year. It is possible that other members have passed away during the year, of which we have no information. The following have been reported:

<table>
<thead>
<tr>
<th>NAME</th>
<th>TITLE-RAILROAD</th>
<th>JOINED</th>
<th>DIED</th>
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<tbody>
<tr>
<td><strong>Active Members</strong></td>
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<td></td>
<td>Baltimore &amp; Ohio</td>
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<td></td>
<td>Baltimore, Md.</td>
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<td>Chesapeake &amp; Ohio</td>
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<td>Peru, Indiana</td>
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<td>Texas &amp; Pacific</td>
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<td></td>
<td>Dallas, Texas</td>
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<tr>
<td>Fred J. Stewart (Ret.)</td>
<td>Chief Engineer</td>
<td>June 23, 1944</td>
<td>(In 1955)</td>
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<td></td>
<td>Port Everglades Belt Line</td>
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<td>Port Everglades, Florida</td>
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<td></td>
<td>Southern Pacific Co.</td>
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<td></td>
<td>Oakland, Calif.</td>
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<td><strong>Associate Member</strong></td>
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<tr>
<td>J. F. Canning</td>
<td>President</td>
<td>July 15, 1949</td>
<td>Aug. 5, 1955</td>
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<td></td>
<td>Southwestern Petroleum Co., Inc.</td>
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<td>Fort Worth, Texas</td>
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<td><strong>Life Members</strong></td>
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<td>Ludvig Christiansen (Ret.)</td>
<td>Foreman B.&amp; B.</td>
<td>Mar. 1928</td>
<td>(1955)</td>
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<td></td>
<td>C.M.St.P.&amp; P.</td>
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<tr>
<td>D. L. Rehmert (Ret.)</td>
<td>Master Carpenter</td>
<td>Oct. 1918</td>
<td>(1955)</td>
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<td></td>
<td>Pennsylvania</td>
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<td></td>
<td>Columbus, Ohio</td>
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<td>J. P. Hofacker (Ret.)</td>
<td>Supervisor B.&amp; B.</td>
<td>1907</td>
<td>(1955)</td>
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<td>Lehigh Valley</td>
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<td>Chesapeake &amp; Ohio</td>
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<td>Grand Ledge, Mich.</td>
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<tr>
<td>E. J. Knetzger (Ret.)</td>
<td>Foreman B.&amp; B.</td>
<td>1926</td>
<td>(1953)</td>
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<td>Southern Pacific Co.</td>
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<td>Oakland, Calif.</td>
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</table>

We deeply regret the passing of these our fellow members. May we stand a moment in silence to honor these departed members.

Respectfully submitted,

J. F. WARRENFELLS, Chairman
R. R. GUNDERSON
M. H. DICK
Necrology Committee
SECRETARY’S REPORT  

of  

MEMBERSHIP AS OF SEPTEMBER 15, 1955

Total Active Members—September 15, 1954.......................... 514
New Active Members since September 15, 1954........................ 44

Less—Reported deceased ............................................. 5
Resigned a/c retirement, etc. ........................................ 10
Elected to Life Membership ........................................... 7
Dropped a/c Did Not Pay Dues ........................................ 33

Total Active Members—September 15, 1955.......................... 503

Total Associate Members—September 15, 1954........................ 96
New Associate Members since September 15, 1954........................ 5

Less—Reported Deceased ............................................. 1
Resigned ................................................................. 7
Dropped a/c Did Not Pay Dues ........................................ 6

Total Associate Members—September 15, 1955........................ 87

Total Life Members—September 15, 1954............................ 69
Elected to Life Membership ........................................... 7

Less—Reported Deceased ............................................. 5

Total Life Members—September 15, 1955............................ 74

Total Honorary Members—September 15, 1955.......................... 8

Total All Classes of Membership—September 15, 1955................. 669

RESOLUTIONS COMMITTEE:

The American Railway Bridge & Building Association, in convention assembled, recognizing that the special efforts of certain parties should be fittingly acknowledged, does hereby recommend the following resolutions, to wit:

Be it resolved that the appreciation of the officers, members and guests of this Association be expressed to the management and personnel of the Conrad Hilton Hotel for the cooperation and hospitality we have enjoyed.

Be it further resolved that the sincere thanks of the officers and members of this Association be extended to the Simmons-Boardman Publishing Corporation and its representatives. Their assistance and interest have been invaluable.

Be it further resolved that the sincere appreciation and thanks of the officers, members and guests of this Association be extended to the officers and members of the Bridge and Building Supply Men’s Association and to the Track Supply Association. Their untiring and devoted support of our Association at the convention and throughout the year is a vital factor in the success of our efforts. The banquet and entertainment is a bright spot in the year.

Be it further resolved that the appreciation and thanks of the officers, members and guests of this Association be extended to:
Mr. J. P. Kiley, President, Milwaukee Road;  
Mr. R. N. Begien, Jr., Staff Assistant to Vice President-Operations, Chesapeake and Ohio;  
Mr. H. C. Munson, Vice President and General Manager, Western Pacific,
for their beneficial addresses presented before our meetings, and to the appropriate officers of The Santa Fe and Kansas City Bridge Co. for the interesting motion pictures that have been made available for this convention.

Your Resolutions Committee recommends that these resolves be spread upon the Minutes of the Convention so that they become a part of our Annual Proceedings and that copies of these resolves be forwarded to the parties concerned.

R. R. Gunderson, Chairman  
Lee Mayfield  
R. E. Dove  
Resolutions Committee

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### TREASURER’S REPORT

#### SEPTEMBER 1, 1954 TO AUGUST 31, 1955

<table>
<thead>
<tr>
<th>Description</th>
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<td><strong>Cash Balance—September 1, 1954</strong></td>
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<td><strong>RECEIPTS</strong>:</td>
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<td>Dues</td>
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<td>Advertising (1953 Proceedings)</td>
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<td>Refund from Roadmasters and Maintenance of Way Association for Ladies Luncheon, 1954 Convention</td>
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<td>Refund from Roadmasters and Maintenance of Way Association for rental typewriters</td>
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<td>Salaries (Secretary and Clerical Help)</td>
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<td>Social Security and Withholding Taxes</td>
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<td>Stationery and Printing</td>
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<td>Proceedings (1954 edition including $125.00 to L. Waters, Typist)</td>
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<td>Office Rent and Telephone</td>
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<tr>
<td>1954 Convention Expense</td>
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<tr>
<td>Miscellaneous</td>
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<tr>
<td><strong>Total Disbursements</strong></td>
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<td><strong>Cash on Hand (August 31, 1955)</strong></td>
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<td><strong>BALANCE</strong>:</td>
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<tr>
<td>First National Bank of Chicago, August 31, 1955</td>
<td>$2,079.65</td>
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<tr>
<td>Less—Outstanding Checks</td>
<td>134.59</td>
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<tr>
<td><strong>Balance</strong></td>
<td>$1,945.06</td>
</tr>
</tbody>
</table>

L. C. Winkelhaus,  
Treasurer

APPROVED:  
R. E. Dove,  
Auditing Committee
Three easy lessons in modern railroad management are presented below.

How to Deal with Automation

The advent of automation and what railroads must do to take full advantage of it was the subject of an address by J. P. Kiley, president, Milwaukee. Mr. Kiley sees automation as an important part of railroading. He says the future always becomes the present, there is a lesson in this all of us should heed.

"First, it should teach us to keep our thinking fluid. The railroad official or supervisor who allows himself to think that the way we are doing it today is the way we'll be doing it tomorrow is certainly not an asset to his railroad.

"Second, there's the question of manpower. We must ask ourselves what type of employee will be needed to run the railroads of the future?

"Third, I sincerely believe that the fate of the railroads depends upon our adopting every possible technological improvement to increase our efficiency. High and still higher efficiency—this is the key to the successful railroad of the future."

"Fluid thinking," said Mr. Kiley, "means constantly searching for better ways of doing the job." This, in turn, means that steps should be taken to insure that "new ideas generated at meetings, such as this, percolate through the organization." He believes that the "free flow of ideas from the top downward—or as I prefer to put it, from the center outward—is essential for a coherent efficient organization. Also important is the flow of ideas from the periphery inward."

He doesn't have any "packaged plan" to offer on how to generate two-way communication. "Frequent information letters is one way, and I think they should be rather informal. Personal visits, whenever possible, are, of course, another good way. It really depends on the individual."

"Some find it easier than others. Easy or not, I believe you will all agree that wide exchange of ideas on better ways of doing things improves performance, increases mutual respect and confidence and makes for a better-knit organization that works as an enthusiastic team."

Discussing his second point—manpower—Mr. Kiley said railroads face the problem of educating employees in handling and operating the new machines being developed. Possibly they will "have to invade the educational field and set up schools. Possibly a group of railroads should cooperate on some such plan." Perhaps railroad suppliers should be brought into the picture by setting up training centers within their own plants. "Still another thought is for railroads to work out a cooperative program with vocational schools, both public and private, to train men in mechanized railroad work."

As for technological improvements, Mr. Kiley believes there should be a long-range plan aimed at efficiency through technology and research. "Such a plan," he continued, "should spring from big ideas—a clear recognition that practically nothing is impossible—that the way we are doing it now is not the way we'll be doing it 10 or 20 years hence."

How to Work Together

"With maintenance of way and structures standing relatively so high in importance, why should there be some who consider it as incidental only?" This question was raised in an address by H. C. Munson, vice-president and general manager, Western Pacific. As an illustration of what he meant, Mr. Munson cited the example of a telephone conversation he overheard between a superintendent of another railroad and a roadmaster on that road. He heard the superintendent say: "You take care of the d--- track. We'll run the trains."

This was a symptom of what Mr. Munson called "narrow-viewed supervision." He believes maintenance men should know about other phases of railroading and have not only the right to question superiors and explore other department functions but in some instances actually have a duty to do so. Obviously, he said, superior officers have that duty constantly.
It is well known, he declared, that a man evinces a degree of interest in a matter that is proportionate to his understanding. "If a man understands little about maintenance, he'll probably not show too much interest in it." He suggested that maintenance-of-way supervisors should endeavor to find opportunities to talk "shop" with their superior officers on the division. "If they don't sell their superior officers on the importance of their job, how can they ever sell them on proposals which are of benefit to the railroad, such as 'detouring' trains around rail or bridge gangs in multiple-track territory where this practice is consistent?"

As an aid in breaking down the barriers between supervisory officers and their superiors, Mr. Munson advocated "all-department" staff meetings wherein, perhaps at least once a year, supervisors and officers would meet and have an opportunity to renew their acquaintance with the president and other general officers and hear them describe the problems and accomplishments of the railroad and its plans for the future.

Mr. Munson stressed the need for officers and supervisors being entirely factual, frank and honest in their dealings with each other and refraining from "buck-passing," no matter where "the chips may fall." "Every man knows that every other man makes mistakes, except, he who does nothing. It should, therefore, follow that as a 'doer' it is no disgrace to occasionally be guilty of an error in judgment. The important thing is to bring it to light, correct it and permit as many others as possible to take advantage of the experience to avoid its recurrence, not only to the individual directly involved but to the others."

Mr. Munson's answer to this and many other supervisory problems is better communication between individuals, "from the top down, from the bottom up, and horizontally. We all know that to improve this may not be as simple as it sounds in conversation or on paper. The big job continues to be the breaking down of barriers between the people concerned — barriers such as those raised by a remark made when an inexperienced clerk at a small station asked an officer if plans for the coming year included the laying of rail through that particular area. The officer replied: "What the h--- difference does it make to you?" Obviously, said Mr. Munson, communication with others, insofar as that young clerk was concerned, was stifled from then on, or at least for a long time.

Mr. Munson said supervisors who have any apprehension about talking to superiors "should simply sit down and do a little reminiscing and remember the time when they themselves considered men with titles such as they now possess as being relatively unapproachable. The same relative situation continues up and down the officers' ranks and there aren't many railroads today where the president or any general officer is difficult to approach. In fact, most of them invite it."

Mr. Munson warned that it is not sufficient to render lip service to the idea of importance of better communication between personnel. "What must then take place is demonstration through actual deed among officers and supervisors that they not only believe in it but are carrying it out to the best of their ability." The result, he believes, would be improved morale among personnel on the railroads, lower overall cost, because people would avoid the common pitfall of being "penny wise and pound foolish," and better and safer service—all helping to increase net income.

How to Keep "Modern"

To keep "modern" we have to do some renovating and renewing, both mentally and physically, said R. N. Begien, Jr., staff assistant to vice-president—operations, Chesapeake & Ohio, in a third address before the joint sessions of the two groups. In explaining what he meant, Mr. Begien described some of the newer developments that are helping to put railroads on a more efficient basis. One of these is the digital computer. He said that one of the most important fields in which the digital computer with auxiliary memory can be used is that of record keeping. "It has been estimated that one person out of six is involved in some kind of clerical work. It takes little imagination to appreciate increased efficiency made possible by mechanized record keeping. In connection with record keeping, certainly in the maintenance of way field, payrolls and inventories will eventually be taken over by computers. I might hazard a guess that unit cost accounting would follow — budgeting with accuracy would be the final result."

Improvement in cars, yard modernization, faster interchange of cars between railroads, possible uses of atomic energy on railroads, and piggyback service were other developments discussed by Mr. Begien.

He wound up his address with some remarks about human relations. "No matter how well your railroad is equipped with tech-
nological advances; no matter if you have the finest tools in the world; without the employees' will to do—the push, the spark, of the men working for you—you will never achieve the maximum.

"It makes such a difference to the man under you how you treat him. He will reflect your moods in his work. If you treat him as you would expect to be treated, he will do better work, and you will do better work.

"You can only do your work as well as your organization. Without their efforts you will be ineffective.

"The other day I ran across a recipe of words for evaluating human relations. They are:

Five most important words—'I am proud of you.'
Four most important words—'What is your opinion?'
Three most important words—'If you please.'
Two most important words—'Thank you.'
Least important word—'I.'"

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**Heating and Ventilating Diesel Shops**

**Report of Committee**


The provision of adequate facilities for the repair and servicing of the diesel locomotive units with the minimum loss of available locomotive time has become of prime importance.

This report considers the several types of shop and service buildings relative to the problems of heating and ventilation.

Generally, the diesel shop comprises a structure designed for the purpose, or a converted structure, into which diesel units are brought for routine servicing, running repairs, periodic maintenance or heavy repairs.

**Repair and Service Shop**

The size and arrangement of the diesel shop including the number of tracks and servicing equipment depends on the number and size of diesel units in service and the servicing policy of the railroad.

Production line running repairs and servicing requires that all portions of the locomotive be readily accessible, with ordinary maintenance, supplies and equipment located adjacent to the servicing point. In many cases the heavy repair shop is combined with a servicing and running repair shop. The present trend is to design the combined shop on a functional basis. Through tracks are provided for servicing and running repair facil-
ilities. Either through or stub tracks are provided in the heavy-repair section.

The servicing and running repairs can best be performed on the inspection pit, served by both a depressed floor and a high-level floor or working platform.

Elevated platforms constructed of non-combustible materials in the area between adjacent servicing tracks, as well as the outer sides of these tracks, are generally considered necessary in the diesel locomotive running maintenance shop.

In order that repair parts may be readily available for maintenance, a store room for parts is necessary as an integral part of the diesel-shop facility.

Offices for the diesel shop supervisor and his clerical staff should be located adjacent to the shop area for proper supervision and the maintaining of records.

**Converted Steam Locomotive Shops**

Many steam locomotive shops have been converted to diesel repair and servicing use by application of functional design requirements to the individual shop. In many cases the conversion consisted mainly of adjusting floor levels, installation of elevated platforms, modernized heating, ventilation, modernized lighting, lubricating oil facilities and the provision of diesel-repair equipment.

**Converted Roundhouses**

Many roundhouses have been converted to diesel repair and servicing facilities. The degree and extent of the diesel facility is predicated upon the structural restrictions of the roundhouse and the number and type of diesel units to be handled.

**Overnight Facilities**

In many instances small buildings are constructed at outlying locations to provide overnight and week-end parking storage and for light servicing. Usually these structures provide for protection of the units, addition of lubricating oil, where miscellaneous minor servicing and small part replacements may be cared for if mechanical forces are available. Shop facilities in these structures are not extensive but heating and ventilation requirements are relatively important.

**Heating**

While the problems involved in heating and ventilating diesel shops are closely related, each will be treated separately in this report. Each particular diesel shop should be studied in detail to determine the heating system required to maintain comfortable working zones in heavy repair, servicing, running repair and testing sections of the building.

Heat for the shop may be provided by use of several fuels. Selection of fuel is determined by availability, efficiency and costs.

Natural or manufactured gas requires a small amount of maintenance, is efficient, may be used with automatic controls and does not require storage facilities at the site.

Fuel oil, in the various grades, is an efficient and economic fuel and may be used with automatic controls. Availability depends on transportation and storage facilities.

Coal for fuel requires storage, transportation, ash handling, smoke control and labor to service coal-handling equipment.

The heavy repair section of a shop may be heated by any system that provides comfortable, draft-free temperatures.

A radiant system of wrought iron or copper pipes embedded in the concrete floor, utilizing circulated hot water as the heating medium, causes a continuous supply of warm air to rise from the concrete floors, thereby maintaining the entire working area at a comfortable temperature. The circulation of the hot water is thermostatically controlled. Water for the system may be provided by an automatic plant or heated by steam from a central power plant.

Radiation of the several standard types may be provided at walls with unit heaters to care for building heat losses.

Pre-heated air forced through ducts to working areas has been installed satisfactorily in several shops. In several cases pre-heating units are placed in exterior walls to supply heated air.

**Ventilation**

The major problem in ventilating diesel shops is in the removal of the exhaust gases from locomotives on test and the replacement of combustion air consumed by the engines with fresh air. Any method of exhaust-gas removal that expels a portion of the locomotive exhaust gases from the shop building while they are in concentrated form will reduce the air changes necessary to keep concentration requirements within recognized limits.

The U. S. Department of Interior, Bureau of Mines, conducted tests in the Cascade Tunnel of the Great Northern Ry. during October 1944. Data obtained in these tests are valuable in the calculation of the ventilating systems of diesel shops.
The ventilation system must satisfy either code regulations or accepted good practice. Good practice permits a 10-per cent exhaust gas concentration or 10 parts per million of oxides of nitrogen concentration. Dilution with fresh air of 10 times the exhaust volume is necessary to obtain this. It is, of course, necessary to furnish outside air for proper combustion and to replace the air exhausted.

Three methods of exhausting diesel fumes are in general use:

1) Roof ventilators to expel gases through roof with fresh-air heating units to provide tempered fresh air for replacing air exhausted and combustion air. It has been determined that approximately 15.5 cu. ft. per min. per horsepower must be exhausted to obtain the desired dilution of exhaust gases when the engines are running at full throttle. The roof ventilators should be located over the areas where diesel units are generally operated. Fresh-air heating units should be located in exterior walls and, if necessary, ducts to areas where air from heating units will pick up hot exhaust gases and move them through ventilating fans before the gases can cool and settle to the working levels. Care must be exercised in locating fresh air heating units to minimize fast moving air currents in the normal working areas.

2) Hoods over center line of track to trap the major portion of exhaust gases with centrifugal fans on roof to expel gases from hoods. Fresh air heating units are required to supply tempered fresh air replacing air exhausted and combustion air.

Most gases are trapped before they diffuse thus requiring less exhaust capacity. As in scheme one, the fresh air heating units must be properly located.

This method is not feasible where cranes are operated over the running tracks.

3) Provide telescopic hoods that can be lowered over exhaust ports on diesel locomotive with gases being expelled through the hoods by force of exhaust.

The fixed location of telescopic hoods will not permit flexibility in that exhaust ports on different models of diesels are at varied centers. Fresh air heating units are required to replace combustion air.

Filter-cleaning and parts-cleaning areas require approximately 50 air changes per hour while welding areas require about 10 air changes per hour. Special attention should always be given for ventilation problems in these areas.

Maintenance

Motors, fans, automatic control units, traps and valves require routine inspection to maintain the equipment in satisfactory and safe operating condition. Fans should be cleaned on a definite schedule.

Exhaust fans must be cleaned at frequent intervals to maintain operating efficiency and to reduce the hazard of fire. Diesel fumes contain a large amount of inflammable material which is deposited on surfaces on fans, hoods, ducts and the under side of the roof structure. The reduction of fire hazards demands that these surfaces be maintained as clean as possible.

Maintenance of the diesel shop is dependent to a large extent on the degree of housekeeping. The combination of a well-designed facility and one that is clean will give a facility requiring a relatively small degree of maintenance and one in which employees will take pride.

Summary

Several types of heating and ventilating systems may be used successfully for maintaining employees' comfort and efficiency. Each particular project should be studied to determine the most suitable system. It should be kept in mind that the proper removal of diesel exhaust fumes requires the exhaustion of a large volume of air which must be replaced with fresh air. This fresh air must be pre-heated where exterior temperatures are lower than those within the shop. Low installation costs should not be the governing factor in considering heating and ventilating requirements.

Discussion

J. F. Warrenfells (SAL) who sponsored this committee, presided during the discussion period.

Y. W. Hutchings (SP) asked if there was any material which could be used to undercoat ceilings of diesel shops to get rid of deposits of unburned fuel on the rafters. W. F. Armstrong (C&NW) said that his railroad had coated the ceilings of seven shops to reduce fire hazards and named two proprietary compounds which had been used as fire-resistant paints for coating the underside of roofs of C&NW roundhouses.

Mr. Hutchings asked if there was no such material which could be used for cleaning and stated that his railroad kept ceilings of diesel shops clean by spraying and washing down. Mr. Armstrong replied that there was nothing of this sort on the market and cei-
ings on the North Western were cleaned by steam and water spraying. He also mentioned the fact that this made a mess. He further stated that variations in kinds of diesel fuel resulted in variations in the quantities of residual matter given off and said that some fuels now in use gave off more of this residual matter than others previously used.

Mr. Warrenfells said that his railroad used light-gage aluminum sheets to coat the ceilings and that they rigged permanent scaffolds for cleaning work. This made cleaning comparatively easy. A. G. Humphries (SP) said that in his mind the question involved the disposal of exhaust fumes. He said that the heaviest deposits were made when engines were idling and he felt that removal of the fumes was the main question.

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**Use of Special Bolts in Structural Steel Work**

Report of Committee


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**H. M. Dick**  
Chairman

This report will deal with the type and use of special bolts for the connection of framed steel members, particularly as they may apply to bridge or building work on railroads. The report will briefly bring out some of the principles in connection with the use of these bolts. Detailed information is available in AREA publications and in literature that may be obtained from several manufacturers of the special bolts.

It could be safely said that every railroad has steel structures of some type, and in most cases the connecting fasteners in the joints of these structures are rivets. These rivets were usually driven while they were hot, and during this driving the shank of the rivet tended to fill the rivet hole as the head was formed on one end of the rivet. In fact, the expansion of the rivet shank and the filling of the rivet hole with this expanded rivet material has been the basis on which design practices have developed for framed structural members. The general method for computing the strength of riveted and bolted joints has been based on the use of appropriate unit stresses for the shearing of the fastener and the bearing of the fastener on the connected materials. All design engineers are thoroughly familiar with the principles and adherence to accepted practice and recognized design specifications has produced structures over the years that have been sound and adequate for intended use.

Many structures have been erected in which the fasteners in the connections of the members have been ordinary bolts. The design of these structures has been based upon essentially the same principles as those for riveted joints. Structures with ordinary bolts for fasteners have been limited to those not subject to the heavy impact loadings of railway equipment.

It was recognized and known at an early date that hot-driven rivets did not always completely fill the rivet holes of connected members. It was also recognized that, as the
heated rivets cooled after having been driven, there was shrinkage of the rivet and a resultant clamping action established between the connected members. It is now recognized that this clamping action is possibly the most beneficial in establishing the strength of the connection. Past experience has, therefore, developed information that we can now utilize in dealing with fastenings of connected steel members, and special bolts have been developed for our use.

Use of Rivet Bolts

The simplest special bolt has been developed to replace and duplicate some of the functions of the rivets. These bolts often have a rivet-shaped head. The shanks extending through the thickness of connected materials have ribs or other appurtenances that rather completely fill the rivet hole when the bolt is forced or driven into the hole. A threaded portion of the bolt shank extends beyond the surface of the connected materials to receive a fastening nut. The bolt may be heat treated so that the nut can be tightened sufficiently to duplicate the clamping action of hot driven rivets.

These bolts are commonly referred to as rivet bolts and they are manufactured by several firms. The bolt can be driven or forced into the rivet hole with hand sledges or rivet drivers and the nut can be tightened in place by using hand wrenches or power impact wrenches. Rivet bolts are very useful and are commonly used for new construction and maintenance repair of structures that are not subject to heavy impact loading. This report does not imply that special bolts of this type may not be used elsewhere, but the opinions and decisions of design engineers should govern their use. Rivet bolts are easily installed and require only a small work force and no special equipment. They are, therefore, an economical fastener to use for many types of new construction, and for maintenance repairs of most structures.

During recent years, engineering research has developed new materials and fabricating procedures. Investigators who were evaluating the capabilities, advantages, and limitations of the new materials and methods soon realized the valuable function that friction exerted in the action of connections for steel members. The high-strength bolt is a direct development of this research.

High-Strength Bolts

High-strength bolts are manufactured by several firms, and are now regularly stocked in most common sizes and are readily available. The bolt is forged from medium carbon steel, and is heat treated to the requirements of the American Society for Testing Materials A-325 Specification. The bolt head is hexagonal and usually has three diagonal lines and a symbol on the head. The bolt has very high ultimate, or breaking, strength. The nut conforms to requirements for heavy semi-finished hexagonal nuts. Two flat and smooth carburized circular washers are used with each bolt, one under the bolt head, and one under the nut.

Soon after these bolts were developed and experiments had shown that the bolt was workable, the Association of American Railroads requested several railroads to apply these bolts in bridge structures. More than 1300 high-strength bolts were placed in the connections of some members of twelve railroad bridges, and the performance of these connections was closely observed under actual service conditions. The use of high-strength bolts was proven to be practical, and now many railroads are commonly using these bolts in the maintenance repair of their steel railway bridges. The automobile industry and similar industries have also adopted high-strength bolts for many purposes, and we now have reliable information to guide us in their use. Many buildings have been fabricated and erected with high-strength bolts, and they are now commonly specified by design engineers wherever their advantages justify their use.

The principal feature of high-strength bolts is the high clamping force that they exert upon connected members. This clamping force sets up high friction resistance to movement between the surfaces in contact. A properly driven and formed hot rivet accomplishes this effect, but the clamping action of a high-strength bolt is actually greater than that of a rivet and the effect can be uniformly and accurately obtained. Substitution of high-strength bolts for rivets, one bolt for one rivet, and proper application of the bolt will give reasonable assurance that the working loads applied to the joint will be carried entirely by friction between the surfaces in contact, and that no slip will occur in the joint.

Some design engineers and maintenance men were hesitant to use high-strength bolts because of their opinion that the nuts would loosen. The high-strength bolt actually elongates slightly as it is tightened, and the resistance of the bolt to this elongation causes the threads of the bolt and the nut to bear against each other with great force. This
self-locking action permits the bolts to be used in joints subjected to impact loads and if the bolt is properly installed initially, there will be no tendency for the nut to loosen in service.

Several test installations have also been made with patented lock nuts, and the results have been entirely satisfactory.

Can Replace Rivets Anywhere
The members of this association are interested in how to use new products and how their use can make work easier and better. It is safe to say that a high-strength bolt can be used to replace a rivet in a structure wherever it is possible to insert the bolt and tighten it. This means that whenever a structure develops loose rivets or replacement of members or sections becomes necessary, the maintenance man can consider the use of this simple new product.

It is not necessary to field ream bolt holes as long as the bolt can be entered into the hole. However, as joints are assembled, drift pins may be required to line up the holes. It is essential that all steel parts in a joint be brought into solid bearing with each other. The high-strength bolt can be used initially as an ordinary fitting-up bolt while assembling the joint and bringing the parts into bearing. The balance of bolts needed to complete the joint are then inserted and properly tightened in place. The bolts initially used for fitting up the joint are loosened and then properly tightened as final joint bolts. Tightening and loosening the bolt does not impair its efficiency in finally tightened position.

The high-strength bolt is available to the maintenance man when only a few bolts are needed and special work forces and tools are not available. The bolt is also highly practical for extensive replacements where power equipment may be utilized. However, some simple guides must be available to assure that the bolts are properly tightened to obtain desired strength. These guides have been developed by AAR tests, and have been published in Bulletins of the AREA.

One Full Turn Recommended
It has been found that high-strength bolts inserted in holes through materials that are clamped together should be finger tightened in place and then given one-half turn of the nut to establish minimum required bolt tension. One full turn of the nut from finger-tight position will insure the minimum bolt tension needed for proper action of the bolt in the joint, and will not damage the bolt. In fact, more than one turn of the nut can safely be applied, but the bolt will fail by breaking the shank or stripping the threads some place between two and three complete turns of the nut from its initial finger-tight position. Practical application of the bolt should, therefore, be governed by the one turn of the nut rule. This rule is applicable even though the bolt size may vary from \( \frac{3}{8}\) in. to 1½ in. in diameter for bolts commonly used short lengths.

A force of approximately 470 ft-lb. is required to properly tighten a \( \frac{3}{8}\)-in. diameter high-strength bolt to the desired tension. Several hand torque wrenches are manufactured, and they will rather accurately measure the force exerted in tightening a bolt. If only ordinary wrenches are available, the workmen can revert to the one-full-turn-of-the-nut rule. A mark should be made on the nut head, and another opposite mark made on the joint material. The nut should then be turned one complete turn from the finger-tight position, and if possible, slightly more than one full turn. It should be kept in mind that this will be hard to do with only ordinary short wrenches. It will usually be necessary to put an extension on the wrench for average workmen. It would also be desirable to set up a test installation and let the men get familiar with the amount of force they must exert to sufficiently tighten high-strength bolts.

Use of Impact Wrenches
Several air-powered impact wrenches are on the market, and these tools are highly recommended for the installation of high-strength bolts. Six point sockets should be used on the wrenches to fit closely the hexagonal nuts and provide maximum bearing surface between the socket and the nut. The speed of these tools is governed by the air pressure applied to them, and they are rather sensitive to change in pressure. Each impact wrench seems to have slightly different characteristics, so it's impossible to arbitrarily say that one gage pressure should be used to assure the proper bolt tension. Therefore, some other practical measure must be available to the workman.

One of the large steel companies developed a calibrating device for determining the proper air pressure needed to operate a wrench to obtain proper bolt tension. It has been found that the wrench should be calibrated at the beginning and halfway through each work day or whenever the set-up beyond the pressure regulator was changed. The principal advantage in the use of this cali-
brating device is to give the wrench operator
the proper feel when correct tension has been
obtained. The tests with the calibrator also
serve warning to the maintenance man that
close attention must be paid to the condition
of the tools and to the work methods of the
men.

An operator of an air impact wrench can
become proficient in its use by applying some
simple measures in the operation. A painted
stripe should be made on the chuck of the
tool. A bolt should be inserted in a solid
plate and then finger tightened. Air pressure
to the wrench should then be adjusted until
the chuck will make one complete turn
of the nut in ten seconds. High air pressures
cause fast nut turning, and low air pressures
slow down the rate of turning. It is essential
that the wrench operator be able to watch
the mark on his chuck so that he may antici-
pate his wrench shut off at one turn of the
chuck. It will be found that the nut will
make one-half turn in two or three seconds,
and then the wrench chuck will slow down
and continue to turn at a slower rate of
speed. If air pressure is adjusted so that the
wrench will turn the one nut one complete
turn in ten seconds, it is unlikely that the wrench
will stall during further turning. It is,
therefore, unnecessary to calibrate impact wrenches
except as outlined above for all ordinary ap-
lications. It is also possible to vary the air
pressure applied to an impact wrench and
use this one wrench to apply different sized
bolts.

It was stated previously that it is imprac-
tical to say that a particular air regulator
pressure will assure proper operation of any
one wrench. It may be helpful to give an
indication of probable ranges that can be
used as a start in adjusting wrenches to the
one full chuck turn in ten seconds. A pres-
sure of 40 lb. for % in. bolts, 55 lb. for 3/4-
in. bolts, and 75 lb. for % in. bolts, and 80
lb. for 1-in. bolts, will provide a starting
point for adjusting the wrench.

We now have a new product and estab-
lished methods for its use that will appeal
to most maintenance men. One railroad has
recently installed over 8000 high-strength
% in. bolts in the replacement of cover plates
on a through truss bridge. Another railroad
will use several thousand % in. diameter
high-strength bolts in the renewal of cover
plates on a deck plate girder viaduct struc-
ture. Bolts are being used extensively for
stringer connections and bracket connections
in routine maintenance repairs. It is possi-
bile that high-strength bolts will eventually
replace hot-driven rivets in all field erection
work.

One man with an impact wrench and one
man with a backing-up wrench will install
and tighten up four high-strength bolts in
the time it takes four men to handle and
drive three rivets. This would indicate a
possible 50-per cent saving in labor by using
high-strength bolts in the field. Less equip-
ment is required, simpler scaffolding is used,
fire hazard is eliminated, less effort is required
on the part of the workmen, and noise is
considerably reduced.

Discussion

T. M. Cole asked what assurance there
would be of the continuance of the tightness
of the nuts and whether or not a locknut
should be used. Mr. H. D. Curie (C&O)
stated that a rivet does not actually fill the
hole, nor do the high-strength bolts, and
both depend upon the clamping action for
tightness of the joint. Mr. Short (MP) stated
that the locknut mentioned by the question-
ing member was not actually a locknut.

In response to a question made by Mr.
Dove (RT&S Cyclopedia) as to whether
there was any preference about the bolt being
applied head up or head down, Mr. Short
stated that there is no definite way of apply-
ing these bolts except if they should be ap-
plied directly to the slope of an I-beam where
the slope exceeded 1 to 5, in which case
tapered washers would be used under the
head of the bolt and the nut applied to the
horizontal plate member. Mr. Short stated
that the bolts were far superior to rivets and
are 3½ times stronger. Also, he stated, the
holes for the bolts would not have to be
reamed out unless fatigue was a stress factor,
in which case, they should be reamed to
eliminate any stress points.

L. Garis (C&NW) stated that rivets had
given very good service over the years and
that he thinks that the use of high-strength
bolts should be looked upon with askance.
In his whole life, he stated, he has never
found but a very few loose rivets. Any argu-
ment in favor of using bolts in lieu of rivets
might be because the railroads are finding it
difficult to obtain men who will do riveting
work. He stated that he does not believe
that contractors make any difference in their
biddings between bolts and rivets.

E. J. Ruble (AAR) stated that his investi-
gation had shown that more than 2 million
rivets loosened in a year, which he thought
to be an appreciable number. He has found
structures where the rivets had to be tight-
ened two or three times a year but, when high-strength bolts were applied, they resulted in tight joints and did not have to be tightened as frequently. It was his experience, he said that erection contractors will give you a better price in their bids for bolted joints than for riveted joints. An advantage of using bolts is that you can tighten either the head or the nut. He agreed with Mr. Short that where the bolts were applied to structural members having sloping flanges of 1 to 5, you might have to use a tapered washer, but with slopes of 1 to 20, which is more common, no such washer would have to be used because the tightening of the bolt would merely deform the head on its shank to make the slant of the head conform with the slope of the structural member. He stated that high-strength bolts should not be used where dynamic loads prevail, or in cold climates, because the static strength of the bolts is reduced under such conditions. He referred to the statement in the report where it is mentioned that bolts can be tightened in 10 seconds and pointed out that air pressures vary with the condition of the wrench. If it is in good condition, less air will be needed than for one which is in poor condition. In general, he found that the use of about 25 per cent of the bolts should be of the fitting-up type and then the others should be the high-strength bolts applied in final position, after which high-strength bolts are used to replace the fitting-up bolts.

Mr. Curie stated that surfaces of the members being bolted must be clean when using high-strength bolts, and even paint should be cleaned off to obtain a tight fit.

W. H. Huffman (C&NW) stated that he believed that the real utility of high-strength bolts is when they are being used to replace loose rivets.
Welding—Applications to B & B Work

Report of Committee


E. M. Cummings
Chairman

We have all come to realize the advantages of welding but it is questionable whether we in bridge and building maintenance work are using to the utmost advantage the services which may be secured through welding. There are various common applications of welding in the railroad field, such as when reinforcing existing bridges. Rather than dealing with these familiar applications the purpose of this report will be to bring out welding uses not now practiced by the industry.

One of the more recent developments is that of flame-shrinking loose eyebars to equalize stress in bridge members. The high rate of wear on pin-connected truss bridges caused by the operation of heavy locomotives at high speeds has, in a great many cases, caused some of the eyebars to carry very little of their original design load. To shorten these worn eyebars so that they will again carry their share of the load, the practice has frequently been either to cut the bar in two and weld the ends together again or to rivet plates to the bar so that turn-buckles may be applied. Correction by these procedures is quite costly as it will frequently require considerable temporary falsework or taking the bridge out of service for long intervals.

The shortening of eyebars by flame shrinking can be accomplished with the ordinary small B&B gang with little equipment necessary other than the standard oxyacetylene welding torch. The principles for this work were described several years ago in an AREA committee report. The member to be shortened is heated at one spot while at the same time pressure is exerted inward from each side of this point. The pressure for this work can be obtained by a yoke consisting of two cold-rolled steel bars threaded at both ends and attached to steel plates clamped to the bridge member on each side of the area to be heated. The heating should be done using two torches with single-flame tips. The members should be heated to 1600-1800 deg F, and the nuts on the rod of the yoke tightened. Generally one hour is sufficient for this procedure.

The welding of steel and iron piping has taken on increasing importance in recent years. Since joints in any piping installation are the weakest point, the use of welding produces a continuous pipe of uniform wall thickness available to withstand pressure. While both ferrous and non-ferrous materials may be welded; the method or welding procedure should conform with the conditions of the material being welded. For example, high-carbon steel with a carbon content exceeding 0.25 per cent should be pre-heated to avoid cracks adjacent to the weld.

The type of welded joint to be used should be given proper consideration. However, for the greater share of piping used in railroad work a square groove butt joint is employed where the wall thickness is less than 3/16 in.
while a single vee groove butt joint is used for wall thicknesses of 3/16 in. and greater. Use of the vee groove joint requires bevelling of the pipe ends, and a bevel angle of 37½ deg has been accepted by the pipe industry as standard.

If the pipeline is to carry high pressures, a heavy wall pipe may be called for, in which case experience has proved the single "U" groove butt joint is superior and the most economical for arc welding. This joint requires less weld metal and gives better control of the arc at the root of the joint. For oxyacetylene welding of heavy wall pipe a single vee butt joint with 30-deg bevels is recommended. A fourth type of welded joint not ordinarily used in railroad maintenance work is that of a single "U" groove butt joint with back strips on the inside of the pipe at the root of the vee. These back strips are advantageous in arc welding as they permit use of larger electrodes and faster welding speeds. However, oxyacetylene welding may tend to reflect the heat and reduce the welding speed.

Welding of galvanized steel pipe has not been very common because the heat of welding burns off the zinc coating adjacent to the weld, thereby allowing corrosion to take place at these points. This difficulty can now be overcome by use of a braze welding flux which is painted on the joint and when heated controls the volatilization of the zinc. The flux also reduces the porosity of the welded deposit so that the finished joint is equal in strength and corrosive resistance to that of the unaffected pipe.

Where pipe welding is performed, the various fittings which are almost always needed in any piping system should be specifically designed for welding to obtain the maximum benefits of welded piping. These fittings designed especially for welded pipe installations are available through various manufacturers but it should be kept in mind that a skilled welder should be able to fabricate a great many of these fittings on the job and thereby effect considerable savings. Where a large number of pipe fittings is to be used in an installation the use of templates is recommended to secure uniformity.

As in all welding, the degree of success of any welded-pipe installation is dependent upon the competency of the welder. Most of you are no doubt aware that welding in a flat position can be performed the fastest and produce the better quality weld and, for these reasons, will cost less. It is therefore desira-
ing. The wrought iron deck was also applied by welding. In a single-track bridge recently built by another road across a highway welding was used in fabricating various parts of the structure, including the main box-type girders.

The fabricating of special items in the building and water station departments is another possibility for welding service. Frequently the welder is called upon to assemble special items for the ever increasing diesel fueling and watering facilities. The assembling of repair platforms and locomotive washing racks is also included in this particular line of work.

The advantages of a welder located on a division are many but one job not often mentioned is that of equipment repairs. All maintenance-of-way departments are acquiring more and more power machinery. Off-track cranes, motor trucks, portable air compressors, portable electric generators are only a few. In addition, there are numerous track machines, such as power tampers, power wrenches, etc. These machines occasionally require repairs which, if not handled promptly, can cause costly delays to the railroad. Having available the service of a complete welding outfit and competent welder will often enable the machine to be repaired in a few hours so that the work will not be excessively delayed. While such service is of great value, its actual cost is very little.

In conclusion, it should be understood that the previously mentioned work merely scratches the surface of the possibilities of welding work which may be performed in the bridge and building department. The amount of work that may be accomplished does not depend exclusively upon the equipment and the operator but also to the extent to which the supervisor puts these into use.

Discussion

J. A. Jorlett (PRR) who sponsored this committee began this discussion by saying that the report was not to cover all items of welding as used in bridge and building work but only the unusual applications.

A. R. Harris (C&NW) stated that he had used welding on his railroad for turning out broken stud bolts; for welding shoes on the side of a water tank when erecting a new roof on the water tank; for lancing out rusted and broken anchor bolts; and for installing shims under stringers. In the latter case the brackets were welded to the stringers and to the stirrups, on which jacks were set for raising the stringers and then the shims were installed. When lancing out the rusted and broken anchor bolts, he stated that he heated the metal until it became liquid and then put in sulphur followed by the insertion of a rod. In answer to a question about this matter, he stated that he had no trouble from spalled concrete.

E. H. Barnhart (B&O) stated that he felt the report's mentioning of pipe railings was obsolete because the angle-type railings are now being used. Mr. Jorlett stated that the plans on his road still calls for iron pipe railing but they will get out a new plan.

L. Garris (C&NW) stated that he had found that some eyebars could not be shortened by the conventional method because of the kind of metal from which they were made. E. J. Ruble (AAR) stated that the only way to find out whether eyebars could be shrunk was to determine the metal by tests before undertaking any work. He stated that he prevailed upon a railroad to send in some eyebars that had been shortened and on which he made fatigue tests. He found that these were made of wrought iron and he could not tell the difference in his test between the wrought iron bar that had been shortened and those that had not as they produce the same results as steel eyebars.

R. A. Kelso (Sou) stated that he had shortened some eyebars that were made of wrought iron and that they later developed cracks.

When M. J. Hubbard (C&O) stated that he had been very successful in shortening eyebars, Mr. Jorlett asked him what he had used for determining the heat temperature. Mr. Hubbard stated he had used heat sticks and R. W. Jenkins (SL-SF) stated that he also used the tip sticks because they can be held closer than a pyrometer.

C. E. Garcelon (B&A) stated that he had used the cutting torch for cutting anchor bolts of 8 truss spans which had to be raised. He also used the cutting torch for obtaining steel clearances in the concrete backwall by applying the heat in cold weather which caused the stone and concrete materials to flake off to the desired depth.
Trends in B & B and Water Service Organizations

Report of Committee


V. D. Raessler
Chairman

The purpose of this assignment is to report on the changes in the working conditions and the problems that are confronting bridge and building and water service forces as a result of our changing times. The last few years have brought about many changes and in all probability even greater changes are impending.

In attempting to prepare a comprehensive report to cover this assignment in a manner that would pool the general knowledge and practices of as many of the members of this Association as possible, questionnaires were prepared and sent to key members in both the water service and bridge and building departments.

Your committee hereby gratefully acknowledges the detailed response to these questionnaires. Present practices and recommendations for improvements are reflected in the report.

Bridge and Building Forces

The widespread use of common and special trucks for carrying men, tools and material has influenced the size of bridge and building forces and the territory that they cover. We find from the overall reply to our questionnaire that trucks are now being used quite extensively in bridge and building work. There were only two cases reported where trucks were not being used in the place of motor cars and they have replaced motor cars in the various parts of the country within a range of 25 per cent to 100 per cent. Of course, motor cars are still being used in cases where work is inaccessible by trucks.

The trucks that are being used provide not only transportation for the men but are also used in hauling materials. In most instances many of the trucks are equipped with booms, various types of hoists and winch attachments, for use in performing various phases of work more efficiently and quickly.

There are a few cases where trucks have eliminated completely the necessity for camp cars and there are cases where a fewer number of camp cars is required. On the whole it has been found necessary to maintain camp cars for the use of the workmen. There is now being placed on the market several types of house trailers that are designed for the purpose of housing maintenance-of-way employees. It will take time and experience to completely determine the practicability of these trailers and how they can be used most efficiently and to the best advantage to fit working conditions and to evaluate the saving through eliminating cost of camp cars, their maintenance and handling.

Most railroads have found that due to better transportation and power tools, they are now able to finish work that was delayed by the war years, and in addition they have reduced the number of bridge and building crews.

Diesel engines in most areas have not been in use quite long enough to definitely determine the advantages or disadvantages in
maintenance of steel and timber bridges. However, it is the general feeling of all concerned that there will eventually be a decrease in maintenance expense. We all know the use of diesels reduces the deterioration caused by locomotive exhausts. Some roads report that they have noted that alinement of timber open-deck bridges is more easily maintained. Also, one of the major railroads in the extreme northwestern part of the country which has been operating diesels for a considerable length of time, reports that there is a definite reduction in the maintenance of steel and timber bridges.

It has been found that bridge and building and water service forces have readily adapted themselves to working with a greater variety and quantity of power tools. In most instances the men ask for these tools and take more interest in their work due to the fact that their duties are performed much more easily, which results in greater amount of work being accomplished. There are isolated cases where men do not like to use power tools and either resent or shy away from them. The explanation for this attitude lies in their inexperience in working with them and it is believed that this may be overcome by instruction of the men in their use.

It is desirable to allocate tools in such a manner as to promote the greatest degree of efficiency and where the greatest number of service hours can be obtained. The allocation of tools, as well as their proper care and maintenance, are to be considered as local problems. It has been found that, in practically all sections of the country, tools assigned to certain gangs receive better care than those that are used by first one gang, then another. On the majority of railroads it has been found that there will be one or more men in each crew who is mechanically inclined and can be assigned the responsibility of keeping the machines lubricated and in proper working condition.

Each division usually has one or more trained repairmen assigned who act as instructors in operating power tools and machines and generally take care of light and medium repairs. For overhauling and heavy repairs they are sent to central reclamation shops where they are inspected by competent authority and decisions are reached as to whether they will be repaired or replaced. Division repairmen can best take care of their assignments when provided with a suitable truck. Such a vehicle makes it possible for repairmen to give fast service and keep power tools and equipment in operation, thus eliminating many idle hours of valuable machines.

Even with the advent of power tools the bridge and building forces are fairly stable so there is not a large enough turnover of men to warrant a definite training program for new employees. Training of new men consists of on-the-job training under the care of the field foreman and leaders.

**Water Services Forces**

The use of diesel locomotives has made major changes necessary in water service installations. When the diesel electric locomotive made its appearance on the American Railroad scene it was generally assumed that the end was in view for the annoying problem of water treatment. This has proved to be an erroneous assumption. It is true that diesel locomotives do not require water in as large quantities as steam locomotives, but the water used must be of high quality and conditioned for use in steam generators and in cooling systems. Longer distances between initial and terminal stations with fewer intermediate stops, and construction of modern combination fueling, sanding, and washing platforms have resulted in great savings in water service installations, not only in equipment and labor required for service and maintenance, but also in increasing the effective range of operations of motive power.

Broadly speaking, there are three general types of water facilities required for operation of diesel locomotives, which are as follows:

**Cooling Water.** The amount of water required for cooling is small, and is applied at inspection points where trained personnel add necessary solutions for engine protection. Improper treatment will result in crankshaft replacements and other costly maintenance caused by corrosion and water leakage into the lubricating oil.

Water used in diesel cooling systems should be soft and substantially mineral free in order to eliminate scaling tendencies. However, regardless of the type of primary treatment, water used in diesel cooling systems must receive an application of approved corrosion inhibitor. An alkaline chromate inhibitor is the kind most extensively used. It has proved satisfactory when close supervision is maintained to assure proper chemical concentration. Water treatment for diesel cooling systems should be scheduled to eliminate the necessity for line-of-road attention, and experience has proved this quite satisfactory.

**Cleaning Water.** Wash racks should be combined with fueling and sanding platforms
where possible. The use of modern detergents correctly proportioned with hot water and applied by multiple sprays on bodies with high pressure jets used for underframes, result in maximum economy of time, labor and materials. Such facilities are located only at terminals where cleaning service is periodically accomplished.

Boiler Water. To meet the requirements necessary for steam on diesel units operating in passenger service the tankage capacity which has been incorporated in them is generally adequate for operation between terminals where scheduled stops of sufficient duration permit refilling. Due to the restrictive space and weight requirements a relatively small heating plant is used. From a practical standpoint, the unit generally employed is a "flash" boiler. It is fully automatic, forced-fed, oil-fired, and has several hundred feet of small diameter coiled tubing. These coils have proved exceptionally difficult to protect against failures resulting from scale formation and corrosion. It is essential to apply properly designed treatment to the feed-water and maintain accurate control of the chemical treatment to avoid scale deposits and coil corrosion which will result in the need for coil replacement.

The foregoing requirements for water service necessary for operation of diesel locomotives has resulted in retirement of wayside water tanks, stand-pipes, pumping stations, treatment plants, pipe lines and allied equipment with attendant savings in labor required for their maintenance and operation, and in tax benefits. In addition, the combination of washing facilities with fueling and sanding platforms has made it possible to more economically maintain the appearance and condition of equipment.

From the above it can be seen that water service forces still play an important role in maintaining water facilities for diesel power. Though the number of stations has been radically reduced, the importance of those remaining is greater than ever before. Water stations for steam power were located as close as 10 or 15 miles apart in some instances. Thus a water station failure meant only a slight inconvenience. Water stations for diesel power are located 100 to 150 miles apart, and failures cannot be tolerated.

Handling Liquid Fuels

With the advent of diesel-electric locomotives came the problem of handling diesel fuel oil. This problem is somewhat similar to the one of handling liquid fuels used on oil-burning steam locomotives, and therefore was not entirely new to those railroads which used oil-fired steam power. It was, however, new to the railroads which were accustomed to using coal.

Generally speaking, facilities for handling diesel fuel oil consist of storage tanks, fuel pumps, distribution lines, unloading and fueling facilities.

The hazards from fire should be given due consideration when designing installations for handling liquid fuel. Passenger and some general-purpose locomotives are equipped with steam generators.

The exhaust from these generators is more of a fire hazard than the engines, and the generator should never be started in the shop under a timber roof. The inherent danger of fire at a diesel fueling station comes from the formation of flammable vapors which result from spillage or leakage of oil. The first measure, therefore, against fire must be the installation of the facility in a manner to curtail leakage and spillage. The location of storage tanks and the separation between tanks must be in accordance with governing fire regulations.

The fire hazard of the diesel locomotive in a converted frame roundhouse is the exhaust carrying oily residue or hot carbon impinging on a timber roof structure. A revved up motor may, if not clean, discharge incandescent carbon that will readily ignite combustibles, especially if oily condensate is allowed to accumulate on the overhead timber.

The recommended means of protecting the roof structure are: (a) Automatic spray sprinkler systems, (b) metal baffles near the roof over the exhausts, (c) a fire resistive coating applied to the under side of the timber structure, and (d) the replacement of all timber with fire-resistive pressure-treated timber or other non-combustible materials. Bridge and Building forces must be on the alert for evidence of fire hazards brought about by servicing of diesels in converted structures.

Water service forces, whose primary duties have been changed from water supply station work to plumbing and oil supply work, have been reduced in some instances from 10 per cent up to 75 per cent.

The necessity of regrouping personnel as a result of these changes has created only local problems. Some railroads are considering combining the supervision of water works and motor car shops and it is the opinion that this system could be worked out to be quite
satisfactory. The use of diesel engines has brought about the need of more skilled workmen for the purpose of servicing engines, handling of liquid fuels, water servicing and water treatment.

With the many changes that are daily occurring in modern railroading, we find that while the number of men working has been reduced, a greater amount of work is being accomplished with greater efficiency. It is the expectation that modern equipment, such as portable steam electric radiators that are now being used quite effectively, portable generators, heavy-duty electric drills, electric and pneumatic chain saws, impact wrenches, electric sump pumps, portable bench saws, etc., the use of motor trucks for transportation of men and materials more quickly to jobs, and other numerous modernized work materials and methods, will mean that more work can be accomplished more effectively and much cheaper with much less effort.

Discussion

E. R. Schlaf who was sponsor of this committee (IC) stated that there is some possibility of the water-service employees taking over vacated motor-car repair shops for their own water-service facilities. J. A. Jorlett (PRR) asked if it had been the experience of others that the water-service departments were taking care of their own trucks or whether or not truck repairs were handled in a work-equipment shop or a local garage. J. H. Stinebaugh (IC) said that these trucks were maintained by the mechanical department on his road. Sometimes they were taken to a commercial garage for minor repairs but that the water service forces were not permitted to repair these trucks because of labor agreements. J. W. Hutchens (SP) stated that the automobiles and trucks of the water-service forces on his road were taken care of by the superintendent of work equipment. He does not think that this work should be given to the water-service men as they have too large a territory to cover and keep them busy.

C. E. Garcelon (B& A) asked if the drainage of condensation from the bottom of fuel tanks gave anyone trouble. G. P. Smith (NP) stated that they drain overhead fuel tanks on his road periodically. Underground tanks were measured for water and were pumped out when necessary. Mr. Garcelon stated that they pump the water out on his road from these tanks at least once a month. A. G. Humphries (SP) stated that they checked tanks of 10,000 gallons capacity about once a week on his road. He has a moisture indicator of the consistency of a salve which is placed on the end of a stick and, when inserted, the salve took on a purple appearance. The color on the dip stick showed the depth of the water. Mr. Humphries further stated that they use filters on his road as the oil is pumped in and out of tanks and, as a result, have very little trouble with condensation. He has found, however, that sometimes in the 80,000-gal tanks ice crystals will clog in the screens and make the pumps work laboriously. But, such occurrences have been minimized by using the filters when pumping oil in and out of the tanks.

W. H. Huffman (C&NW) stated that on his road tanks are tested once a week for condensation and the accumulation of water. Some of the tanks on his road developed quite a bit of corrosion above the ground line and they are now using the cathodic type of protection for the interiors.

W. L. Short (MP) stated that most producers of fuel oil along the sea coast are adding rust inhibitors to the fuel to prevent corrosion on the interior of the tanks. He believed that cathodic protection will protect the exterior of the tank bottoms but does not believe it to be too effective for interior of the tanks because you must have water in order to make the cathodic type of protection work. Mr. Schlaf said that he believed that the additives that were introduced to the fuels are used to disperse the water in the oil but he did not think that this method was too effective because when a tank stands quietly for some time water will settle in the tank. He did, however, think that manufacturers might develop something to add to the fuel to prevent corrosion.

A. G. Humphries (SP) stated that he had observed no evidence of corrosion after 8 years of service in his fuel tanks. It was his contention that no trouble with water or corrosion would result if filters were used when pumping oil in and out of tanks. It is possible, however, he added, that with the use of cheaper fuels that more trouble might be anticipated. Mr. Schlaf said that he had noticed that a cheaper fuel was being used in order to keep the costs down and that he was sure that there was some relaxation from specifications when procuring fuel.
Construction and Maintenance of Roadway Signs

Report of Committee


Construction Materials

The type or kind of roadway signs used on our North American railroads is practically universal as to the purposes they serve and the requirements. However, there are many variations in design, placement and construction materials.

A survey of the larger railroads in the United States and Canada indicates there is a very definite trend to the use of metal and concrete in place of wood for the construction of signs. This is especially true with regard to post-type signs and the supports for others.

Mile posts and whistle posts are generally of metal or concrete but a few roads are still using wood. Of 51 roads reporting, there are 24 using metal for these signs; 19 are using concrete and 8 wood.

The metal signs are of cast iron with raised lettering, scrap boiler plate painted and stenciled, or thin gauge metal with baked-on enamel. These are usually supported on metal posts of scrap rail, boiler flues, pipe or channels set in concrete. In some cases the metal and wood signs are attached to telegraph poles, thus eliminating the post.

Bridge warning, no trespassing, yard limit, clearance and other similar signs are generally of a metal plate attached to posts of either concrete, light-weight rail, boiler flues or treated wood. A few roads, however, are still using signs constructed entirely of untreated wood.

Speed control signs are almost universally of metal, supported on metal posts. The shape of this type sign is variable on different roads, some use circular, others rectangular, triangular or hexagonal. Due to the importance of these signs in train operation they are usually reflectorized for night visibility. Methods of reflectorization will be discussed later on in this report as this feature applies to other signs as well.
Station signs usually are constructed of either wood or metal suitably attached directly to the station buildings or train shed. In some few instances station signs are supported on posts of wood, metal or concrete.

One of the most widely used signs common to all railroads is the so-called cross-buck for grade crossings. Its design varies only slightly as this feature is governed very closely by state laws. Until recent years these signs were constructed almost entirely of untreated wood for both the cross-buck and posts. This type of construction required heavy maintenance on the posts which deteriorated at the ground line. To overcome this condition many roads are now using posts of cast iron, scrap rail, boiler flues, concrete or treated wood. These have all proven satisfactory and have resulted in eventual savings in maintenance although the first cost is greater in some instances.

Central Sign Shops

Perhaps the most important advancement in connection with the construction and maintenance of roadway signs has been the advent of central sign shops. It is a comparatively new method but is rapidly gaining favor with railroad managements.

In the survey referred to above a questionnaire was sent to 65 of the larger railroads of North America which brought 51 replies. Of these 51 roads, 26 now have central sign shops and two others are considering their installation. This growing popularity is sufficient proof that the central sign shop provides a more efficient and economical means of producing certain types of roadway signs.

The basic need for the central sign shop lies in the increasing requirements for reflectorization. A few states now require by law that all cross-bucks be reflectorized. It also seems to be the universal practice to have all speed-control signs and many special signs reflectorized. Experience has proven that it is not consistent to carry out such work in the field because the necessary conditions for proper application cannot be met.

The advantages of the central sign shop are at least threefold. First, it is possible to produce signs for an entire system that are uniform in design and appearance. Secondly, because of mass production and efficient shop layout these signs can be produced at less cost than by the old methods. Thirdly, it is the only logical means of providing proper application of reflectorized material on signs to be produced in this manner.

One major railroad placed in operation its central sign shop in July 1951 and by the end of 1954 had fabricated and shipped out approximately 27,000 signs of various types. This road began its reflectorization program on speed control signs, followed by such signs as yard limit, railroad crossing, railroad junction and watchman at crossing signs. Between March 1953 and August 1954, all mainline highway cross-bucks on this entire system were reflectorized, involving some 8,700 sets of cross-buck signs. They are now engaged in a program of reflectorizing all main-line whistle posts for highway grade crossings and stations.

Central sign shops are designed for convenience and efficiency. Because of this a minimum labor force is required for operation of such shops. The usual number of men seems to vary from two to four including mechanics and helpers, and of course the actual number is governed by the scope of work attempted in each shop. In some shops the only work now being done consists of reflectorizing, and this can be accomplished with two men. In other shops where signs are also fabricated, at least two additional men are required. The layout of a central sign shop is flexible and can be designed to conform to the requirements of a particular railroad. For reflectorizing it is necessary to provide a vacuum applicator, vapor degreaser, power shear, metal punch and drill and the necessary tables and metal storage space. If wooden signs are to be produced also there should be the necessary woodworking tools such as bandsaw, rip saw and a small surface. A building 30 ft by 60 ft is about the minimum size for a reflectorizing shop and the size should be increased if additional fabrication is desired.

Maintenance of Signs

Roadway signs, to be effective and to serve their intended purpose, must be kept in good condition with the message to be conveyed clearly legible at all times. Therefore, it becomes necessary to repaint these signs at frequent intervals. Our survey developed that the average cycle for repainting is about three years but a few roads find it necessary to use a two-year cycle while others are able to use four and five years. Climatic conditions are the chief factors governing this situation.

The general practice followed by most roads involves the use of commercial paints for sign painting. Nine of the 51 roads reporting either mix their own paint or have it made to their particular specification by
commercial manufacturers. The other 42 roads use commercial paints at this time. It is interesting to note that quite a wide number of commercial products are being used and no one manufacturer has an undue share of this business.

From our survey it develops that not one of those roads reporting uses a maintenance and erection gang on a system basis. This work is handled on the division level by either track forces or bridge and building forces in the case of erecting new signs and of course by the latter in the case of repainting or other maintenance.

There is one significant trend along this line that has probably been brought about by the central sign shop. Several roads which have such shops have adopted the policy of replacing the signs in the field rather than to repaint them. They are shipped to the central shop where the repainting can be accomplished under more favorable conditions and at less cost. This plan requires that a certain number of extra signs be kept in a pool for shipment to the desired territory. In following this plan it is important that the signs be so constructed that they can be easily detached from the posts as in most cases it is not practical to return the posts to the sign shop. It is a very quick and simple operation to apply a coat of paint to the post at the time the sign is replaced. No comparative costs are available but it would seem that this method of replacement might be slightly more economical than performing the entire operation in the field.

The labor cost to repaint roadway signs in the field is extensive because it is necessary to go over the same territory at least three times in order to produce satisfactory results. It has been proven that the work can be accomplished at less cost by the use of a light motor truck than by the use of rail motor cars. One road expended $2,066 in labor to repaint the signs on a certain subdivision using a motor car. The same territory was repainted three years later using a motor truck at a cost of $1,623, which reflects a saving of approximately 22 per cent on the operation.

In connection with field painting, one of our large mid-western roads did some experimenting along this line which, if found to be practical, will greatly reduce the labor cost.

The experiment was used exclusively on highway cross-buck signs. A commercial fast-drying exterior grade white enamel was sprayed on for the background. This paint in warm weather dries to touch in about 10 min. Therefore at crossings where there were two signs the first was ready to receive the lettering by the time the second had received the background.

Special metal stencils were used for the lettering which was also sprayed on and the total elapsed time for each completed sign was 20 min. This operation required the use of a truck, a small air compressor and spray equipment operated by a two-man crew.

The experiment was conducted two years ago and the signs are still in good condition.

It is apparent that each railroad has its own signs standardized on a system basis. In practically all cases these stencils used for producing these signs are prepared on a system basis, thus assuring uniformity on all divisions of that particular system.

Reflectorization

The need for reflectorizing railroad signs began with the necessity of making speed control signs visible at night and during adverse weather conditions. This feature has contributed much towards the safe operation of our high-speed passenger trains and time freights. The success of this step has led many roads to reflectorize other important roadway signs. In a few states it is required by law that the cross-bucks of highway grade crossing signs be reflectorized. In many other instances it is desirable from a safety standpoint that these signs be made visible at all times to motorists and pedestrians.

There are three types of reflectorizing materials which can be used on roadway signs.

1. Small reflector buttons each of which is a reflective unit and is placed on the sign individually to mark the letters or other characters in the sign's message. These are usually made of transparent plastic or glass of a desired color or without color.

2. A sprayed-on reflective coating in which a binder coat is first applied and then very small, specially made clear beads are sprayed or otherwise applied to the binder coat. About half their diameter is embedded in the binder with the exposed half giving a reflective property to the sign.

3. A sheeting of reflective material which is applied to the sign by the adhesive method. This material is obtainable in a variety of bright colors or white with transparent overlays to form letters or designs.

The reflector-button type was probably the first to be introduced and has been used quite extensively in reflectorizing speed control signs especially. The first cost is compara-
tively high but these buttons have a long life period except that they do lend themselves to vandalism by juveniles testing their marksmanship.

The sprayed on type has received only limited use in the railroad field thus far. It is more difficult to apply properly than other types and hence is used only occasionally. Application is generally confined to shops where the proper facilities are available.

At the present time many roads are engaged in reflectorizing programs and without exception the sheeting type is being used. It is claimed that such signs are plainly visible at night for at least 1/2 mile or more by locomotive headlight even in heavy rain. All central sign shops have been constructed to provide for the application of reflective sheeting which requires certain pieces of special equipment previously mentioned in this report.

Various methods are being used in applying reflective sheeting to the signs. It has been proven that it is not practical to make the application directly on wood. The adhesive qualities of the sheeting seem to have a greater affinity for metal and therefore application is universally being made to some type of metal surface.

A few roads are using the overlay panel method. This consists of applying the sheeting to 20-gauge bonderized steel plate or aluminum which has been previously sheared to size and punched for mounting. These panels are then mounted on the wood board of the original sign with galvanized screws. One road reports very satisfactory results from the use of bonderized steel and has had no difficulties from corrosion as yet. Other roads prefer aluminum which is corrosion resistant and is slightly higher in cost. This method lends itself very readily to the practice of removing and replacing the signs in the field for shipment to a central sign shop for re-finishing.

Other roads are using steel plate of the self-supporting type in which the metal is usually 10 or 12 gauge thickness.

Still others are using cast iron designs made in their own foundry shops. Metal of these types requires primer and finish coat of paint before application of the reflective sheeting.

Another southeastern road, which has recently installed a central sign shop, reflectorized 315 cross-buck signs on both sides at a cost of $24.88 each. For reflectorizing 112 of the same type signs on one side, the cost was $15.24 each.

Many roads are making an effort to reflectorize all of their highway cross-buck signs. This item constitutes the largest program of reflectorization throughout the entire country. For the cross-bucks several roads are using a self supporting extruded aluminum panel to which is applied the reflective sheeting. The cost of this material is less than wood with the overlay panel of either aluminum or bonderized steel.

The photo shows two reflectorized cross-buck signs complete with post produced at the central sign shop of an eastern railroad. The sign on the right is constructed of extruded aluminum cross-bucks on wood post and cost $33.00 complete with reflectorized sheeting. The sign on the left is constructed entirely of wood but with reflector buttons instead of sheeting. This sign cost $70.50. The same sign with reflectorized aluminum overlay panel on wood cross-bucks cost $42.00.

The cost of reflectorizing alone one set of cross-bucks using the sheeting method with black plastic letters on metal overlay panels averaged $10.03 a set for 91/2-in. by 60-in. blades which approximately 2,000 sets were produced on one order. Blades 91/2 in. by 72 in. cost $12.00 to produce in the same shop. This information was furnished by a large midwestern road and does not cover shipping and erection costs.

Experience has proven that normally the reflective sheeting if properly applied has a life of approximately six years or more although one road found it necessary to renew about 75 per cent of a large cross-buck installation after four years. In other words, the sheeting will usually last through at least two average painting cycles of three years each. In this case, cost records show there is a saving of approximately 12 per cent on the reflective sheeting over two cycles of painting.

Your committee would hesitate to make any definite recommendations to individual roads with respect to the materials they should use in construction of roadway signs or how they should maintain them. We have endeavored to point out in a general way the practices being followed along these lines by our North American railroads. However, the scope of this report does not permit a complete analysis of costs versus service life as it applies to these various materials and methods.

It is evident that there are wide differences in the design, size, and materials of roadway signs throughout the country yet they are
serving the same purpose and conveying the necessary message at their respective locations. For those reasons it does not seem practical at this time to give any consideration to standardization of roadway signs on a national basis.

Central sign shops have proven to be a practical and economical investment for those roads which have installed them, especially if any reflectorization is to be undertaken. Since their worth has been proven, we believe that many more of our larger railroads will find it practical to make such an installation in the near future.

Some form of reflectorization for roadway signs is becoming more and more a requirement in recent years both from the standpoint of safety and to meet the provisions of local ordinances and state laws. We predict this tendency will increase in the years to come.

Discussion

W. H. Huffman (C&NW) who sponsored this committee, opened the discussion.

He stated that the use of reflective sheetings on signs was comparatively new having been introduced in 1951. However, the use of this material is now becoming generally universal in so far as highway signs are concerned. Some states have passed legislation making the use of reflective materials mandatory. Mr. Huffman went on to state that central sign shops are becoming general on the railroads and that the C&NW has recently put such shops in service.

Mr. Huffman also stated that extruded aluminum is cheaper than sheet aluminum for the making of cross-buck signs. This is because a thinner sheet is used with extruded aluminum. Sheet aluminum should be 0.125-in thick for a 4-ft blade while the extruded aluminum for such a 4-ft blade would be only 0.091 in thick. The letters themselves are not reflective but these non-reflective letters are placed on a reflective background.

Mr. Huffman went on to state that it was presently not possible to standardize the cross-buck signs because of diversified state laws and stated that uniform state laws were needed. He cited as an example differences in length of blade and background colors. For instance Michigan uses a yellow background with reflective letters while other states use a white reflective material as a background with non-reflective letters.

J. A. Jorlett (PRR) said that the Signal Section AAR and Committee 9 AREA were working on the signs jointly, in order to coordinate the specifications of the various state highway departments and attempt standardization of signs.

Mr. Huffman said that similar metal should be used for fastening the signs to the pole or support as that of the sign material, that is aluminum should be used with aluminum sheets.

C. E. Garcelon, (B&A) asked if the letters were transferred to the sign by overlay or by the silk-screen process. Mr. Huffman replied that he preferred the overlay method. The letters could be applied from the heat of a finger and then the sign could be placed in the vapor applicator for setting. Mr. Garcelon asked if this method was cheaper and Mr. Huffman said that he could not answer this question. Mr. Etchison said that there was not much difference in cost.

H. F. Lucas (CMStP&P) said that when considering overall cost his railroad had found the overlay method less expensive than the silk-screen method because of the greater labor expense connected with the latter process. He went on to state that the overlay process was not very complicated and required little technical skill.

A statement was made to the effect that 46 states had now approved reflectorized red backgrounds on octagonal stop signs and that Michigan and Illinois were the only states not so approving.

Mr. Lucas stated that they programmed all signs, with reflective material, on his railroad. He said that this eliminated 100 per cent of field painting. They are now working on reflectorizing switch targets between Chicago and Omaha and eliminating switch lamps. Mr. Garcelon said that the Boston & Albany has eliminated switch lamps on branch lines and parts of the main line and were using reflector buttons. Mr. Huffman said the North Western was using reflectorized buttons on tangent track where they could be seen for a thousand feet. He also suggested that another item which could be standardized between railways were wayside signs so that rates could be secured on standard aluminum sheets.

G. E. Smith (MP) said that his railroad was using a facsimile reflectorized lamp on main-line switches. This is a mirror reflecting lens. Mr. Lucas stated that this had been tried on the Milwaukee in 1937 and said that the difference between lenses and Scotchlite was in favor of the Scotchlite because there was more reflection from Scotchlite than from any other type.
Sanding Facilities for Diesel Locomotives

Report of Committee


R. H. Patterson
Chairman

Again the rapid and still mounting replacement of steam motive power by diesel power is generating changes in bridge and building work.

The advent of diesel locomotives caused considerable change to be made in the methods of sanding locomotives. Formerly, the steam engine would usually go to the roundhouse upon arrival at a terminal, except for through passenger engines, and thus it was necessary to have extensive sanding facilities only at the roundhouse locations. With the advent of diesel locomotives it has become necessary to construct diesel servicing facilities at new locations since diesels seldom go to roundhouses or repair shops except for repairs, and since it is not necessary to sand diesels except when servicing the units, sanding facilities were placed at these service tracks. Of the railroads reporting, none has sanding facilities for diesel units except on service tracks. A more flexible sanding arrangement was desired since freight and passenger diesels in through service, local freight and switching diesels generally cannot be sanded alike.

The supply of sand used in the sanding facilities of the diesel locomotives is the same in most instances as the supply used with the sanding facilities of the steam locomotive. The source of supply and costs vary, of course, with the geographical sections of the country and with the different railroads.

Some railroads own their own pits or purchase green sand from industries located along their lines. A southwestern road advises it is buying sand at the pit for 70 cents per ton, loaded in cars. To unload into bins, dry and convey to elevated sand towers is costing about $7.50 per ton, making a total cost of $8.20 per ton. This sand is being unloaded by hand labor, dried in a rotary-type gas-fired dryer, with capacity of 2½ tons per hour, and blown to the tower with air. The above costs include fuel, power, depreciation and maintenance.

Other railroads are purchasing their sand kiln-dried from outside sources, the cost of this sand being about $1.80 per ton loaded into cars.

The committee studying the problem of sanding locomotives and diesel units on a western road has proposed a method of buying kiln-dried sand, loading into moisture-proof metal tank cars and shipping to various locations where needed. The sand will be unloaded by an air-operated sand ejector of their design. It is estimated that it will cost 25 cents per ton to unload sand in this manner. The sand will be unloaded directly into dump trucks for distribution into the dry sand storage facilities. The cost of kiln-dried sand on this same road is $2.40 per ton, as compared to $1.80 per ton for wet sand. The cost of handling and drying sand is considerably more than the 60 cents per ton difference.

The general practice of the railroads that
dry their own sand is to haul the sand in open gondolas from the pits to the drying facility and dump the wet sand into bins or pits. This sand is then placed in the hopper of the sand dryer by mechanical elevator or conveyor. The sand feeds in to the dryer by gravity. Most railroads are using the rotary type sand dryer; however, there are a few of the stove-type dryers still in service. After the sand is dried it is either blown by air pressure, hauled by mechanical elevator or endless belt conveyor to the dry sand storage tank. In this type of arrangement one laborer can do all the work and can unload, dry and place 100 tons of sand in the dry storage bin per five-day week. This amount of sand is adequate for most terminals or yards.

It has been determined that about one-half to one-third less sand is required for diesel units than with steam engines. This is because steam engines used a large portion of their sand to clean flues, and that due to the differences in the characteristics of the steam locomotive and diesel units less sand is required when starting the pull of a train with the diesel units. Also, diesel units perform some of their braking with dynamic brakes and sand is not required.

There are several types of sanding facilities now in use on the various railroads that will meet the individual requirements. Some of these facilities were designed, constructed and installed by the individual railroads using company forces. Some are improvised steam-locomotive facilities and others were purchased from outside companies that construct sanding facilities. These companies will study the requirements of the railroad involved and will construct and install a complete facility, if desired. Of the various types of sanding facilities in use the more common ones are: Gravity sanding, pressure sanding, truck sanding, portable bin sanding and hand sanding.

Gravity Sanding

The gravity supply system consists of receiving dry sand in a sand storage tank by means of a mechanical sand elevator or air pressure system. The storage-tank capacity is determined by the quantity of sand used in the individual yard. The sand is then blown by air through a pipe line to the sand delivery tank.

The sand delivery tank is located at the point of engine servicing and the engine must be spotted at this location in order to take sand. There are several companies that make gravity sanding systems of this type; however, some railroads have designed and constructed their own.

Gravity systems for road locomotives usually can sand one box on each side of the locomotive at a time, but with a delivery tank 40 to 50 ft above the top of rail it is possible to serve diesel units simultaneously on either of two parallel tracks. The sand spouts for those locomotives with overhead loading ports are suspended from vertical drop pipes. These spouts, one on each side of the tank, have a pulley and counterbalance for holding them at suitable overhead clearance when not in use. The spouts for sanding locomotives having side ports are suspended from sloping drop pipes and the ends of the pipes are usually supported by posts. These hose spouts are counterbalanced by cables and weights to permit easier handling of the hose filled with sand as the cut-off valves are usually located at the outlet end of the hose. A four-unit diesel can be sanded in about 15 min. with this system; however, it requires the services of a hostler.

Another road has a gravity supply system that is used to service 122 diesel units. This system has a 10-ton delivery tank 42 ft above top of rail, and can service units on either of two tracks with its eight sanding spouts. Approximately 100 tons of dry sand are used per month in this facility.

Pressure Sanding

This method of sanding also uses the overhead dry-sand storage tank. The sand is then transported through a pipe to small pressure tanks (about 8 cu ft capacity) which are located along a pipe line between or adjacent to the diesel servicing tracks. These tanks are filled by means of a 2 or 2½ in extra-heavy steel pipe which passes completely through each drum near the top. The bottom half of the pipe is cut away inside of each drum. Sand is blown through the pipe under pressure (20 to 40 lb per sq in) and will fill the first drum by dropping through the cut away section of the pipe. When the sand reaches the level of the pipe in the first drum, the air pressure in the pipe will carry the sand along to the second drum in line.

This process is repeated until all the drums in the line are filled, after which the valve at the end of the pipe is closed so that the drums can be pressurized for delivery of sand to the locomotives. The sand is fed into the engine sand boxes through flexible rubber hoses connected to the bottoms of the 8-cu ft drums. The cut-off on the hose is at the outlet end. A four-unit diesel can be sanded in about 20 min with the above system, all sanding being done by one man.
Truck Sanding

A southern system uses the truck-sanding system quite extensively because of its obvious advantages. This mobile method of servicing locomotives is best utilized in a large city, railroad yard or industrial area which requires a number of switch engines operating at widely scattered points. It is more desirable to take sand and fuel to the locomotive in this situation than to bring all the locomotives to a central servicing point.

This unit consists of a truck which is similar to an ordinary fuel truck. The diesel fuel storage tanks are located directly back of the cab and a 1-cu yd dry-sand storage tank is in the extreme rear of the truck. Dry sand is fed into this tank by gravity or by air pressure, and is filled at the dry sand storage tank. When this truck is servicing a diesel the sand is blown into the locomotive boxes through a flexible rubber sand hose which is part of the truck sanding equipment. This hose has a cut-off at the outlet end. The air for this purpose is supplied through an air hose from the locomotive being serviced.

This mobile unit costs no more to operate and very little more to maintain than an ordinary truck. One man who is on the same pay rate as a pump repairman is used to operate this unit, and in addition to performing the fuel and sanding operations, is responsible for the condition of the fuel and sanding systems. This unit can sand and fuel a 1000-hp diesel switcher in about 15 or 20 min and this work is usually performed during the switch-engine crew’s lunch period in order to minimize the dead time for the switch engine.

Portable Bin Sanding

This type of sanding is very flexible and is used to sand locomotives while they are at the servicing track, thus eliminating hostler service. The equipment required is an automotive lift truck and a water-tight metal delivery bin usually of 2-cu yd capacity. The metal bins are loaded by gravity at the sand storage tank or in some instances they are loaded by a dump truck, then the bin is picked up by the automotive lift truck and transported to the engine to be sanded; the lift truck hoists the box high enough to allow the sand to flow by gravity into the locomotive sand boxes through flexible rubber sand hose that is attached to the bottom of the metal bin. The sand valve is located at the outlet end of the hose, and the hose is hooked up out of the way when not in use.

The area adjacent to the servicing track should be paved for this type of operation to permit accessibility at all times.

Hand Sanding

At stations where only one or two engines are sanded, it is the common practice of most railroads to ship a supply of dried sand in water-tight metal containers to this point from a terminal where drying facilities are available, or ship dry sand in cars to be unloaded into a small sand-storage building or bin. This sand is ordinarily placed in buckets and poured directly into the sand boxes of the diesel unit. While the cost of sanding per unit is greater than at terminals where other systems are available, it is considered cheaper than constructing a facility to sand one engine. A laborer is usually available at these points to perform this work without interfering with his other duties.

In the systems described above that use a flexible hose to direct the sand into sanding ports, most are equipped with a sand valve located at the outlet end of the hose—this to permit complete filling of sand boxes and to eliminate sand spillage. However, there is a remote controlled valve on the market which can be operated by the attendant who is filling the sand box. This valve closes the supply of sand at the inlet of the flexible line and with practice can be operated so that the sand box will be full but the flexible line will be left empty. This is desirable as the flexible line can be handled much easier when empty.

Also, in the systems described above, the sand used is at one time or another transported through a pipe with air pressure as the motive force. This sand with air pressure behind it has a sand-blasting effect on the pipe and causes excess wear and heavy maintenance on the carrier pipes. Some of this maintenance can be eliminated by using wye connections or sweep bends to gradually change the direction of the flow of sand instead of sudden 90-deg turns. These wye connections should be 30-deg angles and three of them used for a 90-deg bend. The straight leg of the wye should be closed with a clean-out plug. This permits sand to close up this straight leg and act as a buffer at the point of turning, and the clean-out plug permits access to the line when cleaning becomes necessary.

The pipe line carrying the sand should be as straight as possible and should rise slightly in the direction of flow in order to increase the volume of sand moved. The air pressure should be kept to the minimum that will
move the quantity of sand desired; and the best results are obtained, when moving the sand several hundred feet, by installing booster jets at intermediate points in the line. This permits a lower air pressure to be used and thus reduces the abrasive action of the sand on the conveyor. While some railroads are using all-welded sand-transmitting lines, others are using lines with flanged joints with gaskets—the latter method has the advantage of providing accessibility for renewal of any portion of the pipe system when lines are subject to excessive wear. All sand-transmitting lines must be air tight.

Sand storage and delivery tanks should be properly vented to prevent condensation, and these tanks, if filled by line using air to move the sand, should be provided with a dust arrestor or air sand separator to minimize the sand dust escaping into the air, because this dust is very harmful to diesel engines.

Because of the affinity of sand for water, and to keep as much moisture out of the sand lines as possible, a condensation tank and water trap should be installed between the sand storage tank and the terminal compressed air supply, and both of these moisture collection units should be drained daily. As blown sand has a tendency to compact and move through a pipe in masses instead of by particles, lump break-up devices are sometimes installed in lines exceeding 200 ft in length to prevent these lumps from closing the line.

Discussion

W. H. Bunge (MP) who sponsored this committee presided during this discussion.

A. G. Humphries (SP) explained the operation of the Clementina sanding equipment which is automatic and is used to sand diesels on the Southern Pacific. He described the effect of reduction of air pressure from 100 lb to 40 lb and said that the sand moved faster with practically no wear and that the equipment had been used with great success. He said that the cost was low and that they were transferring dry sand from a bin on a lift truck with the aid of a Clementina sand truck which sits on the ground beside the unit to be serviced. Mr. Humphries went on to say that the two outlets on each side of each unit of a three unit diesel were serviced in 10 min. while the units were taking fuel and water at the same location. He explained that this equipment handles sand in much the same way as water would be handled. He stated that they used 1/4-in. pipe booster because it gave better results.

A member (NYNH&H) said that they used a long drag of 21/2-in pipe all welded and there was considerable wear from sand about 200 ft from the sanding facilities.

Mr. Bunge asked about critical air pressures on sand lines. N. H. Williams (D&H) said that they considered 80-lb pressure critical. They used a 21/2 in rubber-lined pipe for their sand supply and had little trouble. He further stated that this pipe lasted about three times as long as ordinary pipe.
New and Improved Tools for B & B Work

Report of Committee


Vibrator—A self-contained, portable vibrator for concrete work has appeared featuring the 6-hp air-cooled motor, flexible shaft driven with improved power take-off. It develops frequencies up to 7,500 vibrations per minute and is adaptable to wet or dry concrete rubbing and drilling. Vibrators and compactors have shown considerable improvement generally and can be operated from portable plants found on most roads.

Rock Jack—There is a hydraulic rock jack on the market which is very useful in demolishing mass concrete or stone structures in instances where dynamite or ball drop is prohibited or impractical. It consists of a hand-operated hydraulic pump which is hose connected to the jack. The latter is made up of 10 small cylinders spaced vertically in a straight line, each capable of exerting 15 tons pressure for a total of 150 tons pressure.

The operation consists of drilling one or more straight 3 1/2-inch diameter holes in the masonry 2-ft deep. The jack is inserted together with an equalizing shim or feather. Pressure applied by the pump forces the break.

Sander—Another new tool of interest to B&B men is the new straight-line action sander recently developed. This machine has a heavy-duty powerhouse and is the first motor sander to use straight-line action. This machine also features the easy-on, easy-off removable pad that simplifies paper changes. The weight of this sander is 5 1/4 lb and it is equipped with a 24-sq in sanding pad.

Cleaning Tool—Another recent development is a cleaning tool for steel bridges preparatory to painting. This tool can be obtained for use with air or electrical power. It consists of a floating rotor about 3 1/2 in. in diameter with several small shafts affixed to its periphery. On these small shafts are mounted, loosely, several small wheels with
geared teeth. As the cylinder revolves, the toothed wheels, being loosely mounted, are centrifugally forced outward. When pressed against the metal to be cleaned, a remarkable job is accomplished, even in pitted areas, due to the loose fit of the wheels. This tool is light and is very easily handled. Replacement heads can be obtained at nominal cost. Forty-two cubic feet of air per minute are required under maximum load for the air version of this tool.

Paint Spray Machine—New developments in spray paint equipment include a machine designed and built by one of the major railroads, principally for applying anti-rust materials to steel, and spraying fire-coating materials to bridge decks. The machine is mounted on a self-propelled car and has an ample material supply tank. From this tank the material is pumped directly to guns for application by an improved rotary pump. The four spray guns, when used below deck, are so mounted and spaced that when they are lowered to the desired elevation, they produce a uniform covering. The guns are raised and lowered by a hydraulic ram between the ties. The nozzles can be varied to suit the application desired. This road reports a saving of 80 per cent over other methods of application.

Improved Tools and Machines

Spike Puller—An improved hydraulic spike puller features the quick activating source of power at the touch of the controls and pulls spikes most efficiently and economically. Its use can be extended to pulling drift and anchor bolts. It is said that in the future the railroads can expect a dual or quad head incorporated into this machine, thus enabling one man to do the work of two or four during the same allotted time.

Cranes—One manufacturer has answered the ever-increasing demands of the railroads for off-track equipment with a wide-gage, pneumatic-tired diesel crane. This machine is very versatile since the wide gage of the wheels permits it to straddle the rails when working on the track, and it can, as well, be used for work completely off the track. One attachment available is the grapple which simplifies tie removals and renewals. Its use in placing trestle components is another advantage plus the fact that train clearing time is greatly reduced when it is working over the track.

Another development of interest is the heavy-duty track car used for transporting crawler cranes on the rails. The crane can propel itself off or on the side of this car in less than five minutes. When in position on the car, a gear attachment is connected from the crane engine for propelling along the track. Much time can be saved in loading and transporting cranes from one job to another in this manner, and in this one machine there is the advantage of on-track and off-track work.

Pile Drivers—The old steam pile driver still works fine, but is costly. Most roads have revamped these machines with modern oil burner, flash-type boiler, ample fuel and water supply, with diesel motor for propulsion. Fast steam supply without the aid of a fireman is hereby accomplished. Less trips for water and fuel realize a great saving, and with the all-around revision, the cost is returned in a short time.

The single cylinder, self-contained diesel pile-driver hammer is still undergoing extensive tests and some of the difficulties experienced with the earlier models have been corrected. It is the opinion of the committee that this type hammer will, in due course, be perfected to the point where its use for railroad work will be very satisfactory.

Different sizes of the diesel hammer are now available, producing from 4,300 ft-lb per blow to 16,000 ft-lb per blow, which can be attached to regular leads.

Several railroads have recently purchased cranes to serve the dual purpose of crane or pile driver. Folding leads are an attachment which can be installed or removed from the boom in a short time, making this a versatile and satisfactory machine. A flash boiler is, in some instances, installed in the cab of the crane to furnish steam for the hammer. Other railroads install this boiler on a separate car.

At least one railroad has this power plant installed on the forward 10 feet of a cut-back tank car with a bulkhead in the tank which provides capacity for fuel in one end and water in the other, making this a very compact unit.

Air Compressors and Generators—An air compressor that is claimed to have superior qualities was presented this year and its main features are that it can be easily mounted on tractor or trailer wheels, uses no valves or clutch, is of the rotary type and is a two-stage compression unit with oil injection cooling, driven by a diesel engine. The air-discharge temperature of below 200 deg is maintained. Separate cooling systems for the engine and compressor enable uniform operation. Sizes
available are the 600 cfm, 315 cfm, 210 cfm, and the 105 cfm.

High-cycle generators are replacing the older type units, and one of the recent developments in this field has been the manufacture of a unit 25 in long, 18 in wide and 20 in high. At full load, this generator operates for 1 hr 45 min on one gallon of gasoline, producing 2500 watts or 180 cycles, 3-phase, 230-volt ac., as well as 2500 watts of 110-volt dc. Its weight is less than 125 lb and can be used for high cycle tools or direct lighting.

**Power Tools and Accessories**—In conjunction with the above mentioned power plants, it is now consistent to mention accessories. One-hand-operated pneumatic drills are now available and weigh about 7½ lb. Holes up to 1½ in can be drilled with this unit and it is noted for working ideally in awkward spots. Improved rotary air augers, air impact wrenches of all sizes, air hammers and brushes are being presented to the market all along the line. About the only noticeable improvement, however, is the more durable light construction.

The electric chain saw is being improved and the most recent one available weighs less than 20 lb. It is noted for its use in close and precision work. This machine features a narrow, special-toothed chain to produce accurate cuts. The electric high-cycle circular saw is relatively new and has numerous attachments. An attachment to the 12-in saw of interest is the dado 1 in wide and 8 in in diameter for dapping ties in the field. It has adjustment for cutting daps up to 2½ in deep and results in 50 per cent labor saving over hand methods. This attachment can be operated on the pneumatic circular saw also. Where work is to be done under water, the air circulator saw is preferable.

In the electric field also comes a recent compact portable plane which cuts to a depth of ¹/₈ in, 3 in wide and is graduated to ¾ in. This machine is driven from a sprocket-type belt operating at 13,500 rpm. A special chip deflector is also available.

The electric reciprocating saw is also relatively new in this field and produces smooth cuts, as does the air version of this tool. The hoop-type chain saw is noted for clearing small trees.

Gasoline chain saws are widely used because of the self-contained operation. On the market there appeared just recently, a light saw perfected for faster cuts, featuring the 360-deg swivel and an automatic chain oiler.

A 50 gpm at 125 psi pump is one of the recent attachments available for use on the chain saw engine.

The committee wishes to place emphasis on the importance of utilizing present-day tools to the fullest extent, for it has been said and proven that a tool or machine is no better than its operator.

For progress, it is necessary that the supervisor take precaution in presenting a new tool to his men; equally important is the proper instruction and follow-up in its use. New and improved tools are reaching the market each day and most of them get to the attention of a railroad employee. It is suggested that by attending industrial, textile and trade shows, tools can be found that would be applicable to railroad work. More thought should be given to shop prefabrication. A well-equipped shop with proper number of employees can accomplish great savings in prefabrication of bridge and building needs.

**Discussion**

J. M. Lowry (SLSW), who sponsored this committee, began the discussion by saying that he believed that a subject of this kind is a continuing one and could be reported on each year to bring out the new developments as they are made.

John Cannon (NYNH&H) wanted to know if other members were obtaining good clean cuts with the gasoline type of chain saw. He stated that the new ones he has used are just as bad as the old ones in obtaining a good clean cut. In response to this question, C. B. Foster (Sou) stated that precision blade saws were available that would make a very good cut and they were of both the chain-type saws and of the reciprocating type.

G. P. Smith (NP) stated that he has been using chain saws for seven years and has obtained very good results from them—so good, in fact, that he can slit a pencil mark with them. This was verified by J. W. Hutchens (SP) who stated that he had been using chain saws for twelve years and that he has found that the man who files the saw teeth has a great deal to do with the results. If the blade is filed correctly, good results will be obtained.

C. E. Garcelon (B&A) stated that he has been using both the air and electric-driven chain saws, as well as the self-contained reciprocating saw which has a stroke of 1½ in, can be operated in any position, and the blade changed in 20 seconds. He felt
that anyone could do a good job of cutting by filing the blades correctly.

C. C. Green (B&O) stated that the reciprocating-type saw was very good but it did require a lot of oil and air to make it operate efficiently. On chain saws, he stated, the tension must be kept tight but not too tight or the chain would break. Chain saws will do a good job if properly maintained and used, he said. Mr. Cannon stated that the guides on chain saws sometimes prevented satisfactory use of the saw, but perhaps the fault lay more with the operators. Mr. Green stated that he thought that the electric chain saw was fast for staging work.

H. O. Adkins (D&RGW) stated that he believed there were three important items for obtaining the best results with a chain saw. He felt: (1) That an electric saw-filing device was necessary, (2) that a saw guide should be used, and (3) that a saw of larger capacity than needed for a shorter blade should be used. He wondered if any manufacturer had given thought to using a small conveyor for depositing and conveying concrete instead of the conventional buggies. W. G. Burres (Portland Cement) said that chutes and the Pumpcrete method are the only types of equipment, aside from the buggies, for placing concrete that he was aware of and that a conveyor might lead to a separation of the materials in concrete mixtures.

Past Officers

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<tr>
<td>7th V.-Pres.</td>
<td>J. S. Ekey</td>
<td>P. N. Nelson</td>
<td>J. E. King</td>
<td>J. E. King</td>
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</table>
### Past Officers

<table>
<thead>
<tr>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
<th>Year 5</th>
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<tr>
<td>1934-35</td>
<td>1935-36</td>
<td>1936-37</td>
<td>1937-38</td>
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<tr>
<td>President</td>
<td>H. L. Benjamin</td>
<td>T. H. Strate</td>
<td>E. C. Neville</td>
<td>C. M. Burpee</td>
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<tr>
<td>1st V.-Pres.</td>
<td>T. H. Strate</td>
<td>E. C. Neville</td>
<td>C. M. Burpee</td>
<td>F. H. Masters</td>
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<tr>
<td>Sec.-Treas.</td>
<td>C. A. Lichty</td>
<td>R. P. Luck</td>
<td>T. P. Soule</td>
<td>F. H. Cramer</td>
</tr>
<tr>
<td>Directors</td>
<td>C. M. Burpee</td>
<td>W. H. Best</td>
<td>W. R. Roof</td>
<td>R. E. Dove</td>
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<td>Treasurer</td>
<td>W. A. Batye</td>
<td>C. A. Lichty</td>
<td>T. P. Soule</td>
<td>E. R. Dove</td>
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<td>1938-39</td>
<td>1939-40</td>
<td>1940-41</td>
<td>1941-42</td>
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<tr>
<td>President</td>
<td>Armstrong Chinn</td>
<td>A. E. Bechtelheimer</td>
<td>H. M. Church</td>
<td>R. E. Dove</td>
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<tr>
<td>2nd V.-Pres.</td>
<td>A. E. Bechtelheimer</td>
<td>H. M. Church</td>
<td>F. A. Southill</td>
<td>G. S. Crites</td>
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<tr>
<td>3rd V.-Pres.</td>
<td>H. M. Church</td>
<td>R. E. Dove</td>
<td>A. M. Knowles</td>
<td>A. M. Knowles</td>
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<td>Sec.-Treas.</td>
<td>C. A. Lichty</td>
<td>C. A. Lichty</td>
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<td>Directors</td>
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<tr>
<td>Secretary</td>
<td>L. G. Byrd</td>
<td>B. R. Meyers</td>
<td>N. D. Howard</td>
<td>R. E. Caudle</td>
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<tr>
<td>Treasurer</td>
<td>W. R. Ganser</td>
<td>W. Walkden</td>
<td>L. G. Byrd</td>
<td>I. A. Moore</td>
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<td>1942-43</td>
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<td>1944-45</td>
<td>1945-46</td>
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<tr>
<td>President</td>
<td>G. S. Crites</td>
<td>J. L. Varker</td>
<td>J. L. Varker</td>
<td>N. D. Howard</td>
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<tr>
<td>1st V.-Pres.</td>
<td>R. E. Caudle</td>
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<td>R. E. Caudle</td>
<td>J. S. Hancock</td>
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<tr>
<td>2nd V.-Pres.</td>
<td>A. M. Knowles</td>
<td>N. D. Howard</td>
<td>J. S. Hancock</td>
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<tr>
<td>3rd V.-Pres.</td>
<td>N. D. Howard</td>
<td>F. G. Campbell</td>
<td>Elise LaChance</td>
<td>Elise LaChance</td>
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<tr>
<td>4th V.-Pres.</td>
<td>J. L. Varker</td>
<td>J. S. Hancock</td>
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<tr>
<td>Secretary</td>
<td>A. G. Shaver†</td>
<td>Elinor V. Heffern</td>
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<tr>
<td>Treasurer</td>
<td>Lorene Kindred†</td>
<td>Elinor V. Heffern</td>
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<tr>
<td>Treasurer Emeritus</td>
<td>F. E. Weise</td>
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<td>Directors</td>
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<tr>
<td>Secretary</td>
<td>M. Meyer</td>
<td>C. R. Knowles</td>
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<tr>
<td>Treasurer</td>
<td>L. E. Peyser</td>
<td>F. E. Weise</td>
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<tr>
<td>Emeritus</td>
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<tr>
<td>President</td>
<td>F. G. Campbell</td>
<td>J. S. Hancock</td>
<td>E. H. Barnhart</td>
<td>W. F. Martens</td>
</tr>
<tr>
<td>1st V.-Pres.</td>
<td>J. S. Hancock</td>
<td>E. H. Barnhart</td>
<td>W. F. Martens</td>
<td>W. A. Huckstep</td>
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<tr>
<td>3rd V.-Pres.</td>
<td>W. F. Martens</td>
<td>W. A. Huckstep</td>
<td>L. C. Winkelaus</td>
<td>Guy E. Martin</td>
</tr>
<tr>
<td>Secretary</td>
<td>Elin LaChance</td>
<td>Elise LaChance</td>
<td>L. C. Winkelaus</td>
<td>Elise LaChance</td>
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<td>Treasurer</td>
<td>C. R. Knowles</td>
<td>Elise LaChance</td>
<td>Lee Mayfield</td>
<td>Elise LaChance</td>
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<tr>
<td>Directors</td>
<td>Guy E. Martin</td>
<td>Elin LaChance</td>
<td>Lee Mayfield</td>
<td>Elise LaChance</td>
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<tr>
<td>Emeritus</td>
<td>L. E. Peyser</td>
<td>L. C. Winkelaus</td>
<td>Leon Mayfield</td>
<td>L. C. Winkelaus</td>
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</tbody>
</table>
### Past Officers

#### 1950-1951
- **President:** G. V. A. Huckstep
- **1st V.-Pres.:** Guy E. Martin
- **2nd V.-Pres.:** F. R. Spofford
- **3rd V.-Pres.:** Lee Mayfield
- **4th V.-Pres.:** H. M. Harlow
- **Secretary:** Elise LaChance
- **Treasurer:** L. C. Winkelhaus

#### 1951-1952
- **President:** F. R. Spofford
- **1st V.-Pres.:** Guy E. Martin
- **2nd V.-Pres.:** Lee Mayfield
- **3rd V.-Pres.:** H. M. Harlow
- **4th V.-Pres.:** J. A. Jorlett
- **Secretary:** Elise LaChance
- **Treasurer:** L. C. Winkelhaus

#### 1952-1953
- **President:** Lee Mayfield
- **1st V.-Pres.:** F. R. Spofford
- **2nd V.-Pres.:** H. M. Harlow
- **3rd V.-Pres.:** J. A. Jorlett
- **4th V.-Pres.:** R. R. Gunderson
- **Secretary:** Elise LaChance
- **Treasurer:** L. C. Winkelhaus

#### 1953-1954
- **President:** J. A. Jorlett
- **1st V.-Pres.:** R. R. Gunderson
- **2nd V.-Pres.:** H. M. Harlow
- **3rd V.-Pres.:** W. H. Huffman
- **4th V.-Pres.:** Elise LaChance
- **Secretary:** L. C. Winkelhaus
- **Treasurer:** L. C. Winkelhaus

#### 1954-1955
- **President:** H. M. Harlow
- **1st V.-Pres.:** J. A. Jorlett
- **2nd V.-Pres.:** R. R. Gunderson
- **3rd V.-Pres.:** W. H. Huffman
- **4th V.-Pres.:** M. H. Dick
- **Secretary:** Elise LaChance
- **Treasurer:** L. C. Winkelhaus

### Directors
- **1950-1951:** L. C. Winkelhaus, M. H. Dick, R. R. Gunderson, J. F. Warrenfells
- **1951-1952:** L. C. Winkelhaus, M. H. Dick, R. R. Gunderson, J. F. Warrenfells
- **1953-1954:** L. C. Winkelhaus, M. H. Dick, R. R. Gunderson, J. F. Warrenfells
- **Secretary:** Elise LaChance
- **Treasurer:** L. C. Winkelhaus

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- Philadelphia, Pittsburgh, Boston, Chicago, Dallas, Salt Lake City, Washington, D.C., Montreal, Canada, Panama City, Panama

### Dealers in Principal Cities
CONSTITUTION

ARTICLE I.

NAME

Section 1. This association shall be known as the American Railway Bridge & Building Association.

ARTICLE II.

OBJECT

Section 1.** The object of this association shall be the advancement of knowledge pertaining to the design, construction and maintenance of railway bridges, buildings, water service facilities, and other structures, by investigation, reports and discussions.

Section 2. The association shall neither indorse nor recommend any particular devices, trade marks or materials, nor will it be responsible for any opinions expressed in papers, reports or discussions unless the same have received the endorsement of the association in regular session.

ARTICLE III.

MEMBERSHIP

Section 1. The membership of this association shall be divided into five classes, viz: Members, life members, associate, honorary and junior members.*

Section 2.** A member shall be a person in a position above rank of gang foreman in connection with railway bridge, building and water service work. Any person desirous of becoming a member shall make application upon the form prescribed by the executive committee, setting forth his name, age, residence and practical experience. He shall furnish at least three references to whom he is personally known. Applicants may be voted into membership at any regular executive meeting or by letter ballot of the executive committee, a majority vote being necessary in either instance.

Section 3.** To be eligible for a life membership a member must have belonged to the association for at least twenty years and in general must have retired from active railway service due to age or physical disability. He shall have all the privileges of active membership, except the holding of office, and shall not be required to pay annual dues. The transfer from membership to life membership shall be made in the same manner as the election of members, as prescribed in Section 2, of this Article.

Section 4. Associates shall be responsible persons who are not eligible as members, whose pursuits or attainments qualify them to co-operate with members in the study and development of improved practices in the construction and maintenance of bridges, buildings and water facilities. They shall have all the rights of members except of voting and holding office. They shall be elected in the manner prescribed for members, in Section 2, of this Article.

Section 5. Honorary members shall be chosen from persons who have attained acknowledged eminence in some branch of engineering or railway service. Their number shall be limited to ten. Honorary members shall be proposed by not less than six active members and shall be elected by the unanimous vote of the members present at a regular meeting. They shall have all the rights of active members except that of holding office and shall be exempt from the payment of dues.

*Amended October 16, 1941.
**Amended September 20, 1948.
Section 6. A junior member shall be a person who is a graduate of a recognized engineering school, or who has been employed for at least two years in the design, maintenance or construction of railway bridges, buildings or structures. Applicants shall be at least 21 years of age and they shall be elected in the manner prescribed for members, in Section 2 of this article. Juniors shall have all the rights of members except that of holding office. When the attainments of a Junior are such as to qualify him as a member, he may apply for promotion and the Executive Committee shall authorize such promotion when qualifications warrant the action. Unless a Junior is promoted, his membership shall cease automatically when he becomes 28 years of age.*

Section 7. Any member guilty of conduct unbecoming to a railroad officer and a member of this association, or who shall refuse to comply with the rules of this association, shall forfeit his membership on a two-thirds vote of the executive committee.

Section 8. Membership shall continue until written resignation is received by the secretary, unless member has been previously expelled, or dropped for non-payment of dues in accordance with Section 1 of Article VII.

Section 9.** Only active members shall hold office in this association, and only active and life members shall be entitled to vote in the election of officers.

ARTICLE IV.
OFFICERS

Section 1. The officers of this association shall be a president, four vice-presidents, a secretary, a treasurer and six directors who with the most recent past president shall constitute the executive committee.

Section 2. The past presidents of this association, previous to the most recent past president, who continue to be members, shall be privileged to attend all meetings of the executive committee, of which meetings they shall receive due notice, and be permitted to discuss all questions and to aid said committee by their advice and counsel; but said past presidents shall not have a right to vote, unless called upon to fill a quorum.

Section 3. Vacancies in any office shall be filled for the unexpired term by the executive committee without delay.

ARTICLE V.
EXECUTIVE COMMITTEE

Section 1.** The executive committee shall manage the affairs of the association and shall have full power to control and regulate all matters not otherwise provided for in the constitution and by-laws and shall exercise general supervision over the financial interests of the association, and make all necessary purchases and contracts required to conduct the general business of the association, but shall not have the power to render the association liable for any debt beyond the amount then in the treasury plus accounts receivable and not subject to other prior liabilities. All appropriations for special purposes must be acted upon at a regular meeting of the association.

Section 2. Meetings of the executive committee may be called by a majority of the members of the committee, providing 10 days' notice is given members by mail.

Section 3. Five members of the executive committee shall constitute a quorum for the transaction of business.

ARTICLE VI.
ELECTION OF OFFICERS AND TENURE OF OFFICE

Section 1. Except as otherwise provided, the officers shall be elected at the regular annual meeting of the association and the election shall not be postponed except by unanimous consent of the members present at said annual meeting. The election shall be by ballot, a majority of the votes cast being required for election. Any active member of the association not in arrears for dues shall be eligible for office, but the president shall not be eligible for reelection.

*Amended October 16, 1941.
**Amended September 20, 1948.
Section 2.† The president, four vice-presidents, secretary and treasurer shall hold office for one year and the directors for two years, three directors being elected each year. All officers retain their offices until their successors are elected and installed.

Section 3.† The term of office of the secretary and the treasurer may be terminated at any time by a two-thirds vote of the executive committee. Their compensation shall be fixed by a majority vote of the executive committee.

The secretary shall also serve as secretary of the executive committee.

Section 4. The secretary and the treasurer shall be required to give bond in an amount to be fixed by the executive committee.

ARTICLE VII.
MEMBERSHIP FEE AND DUES

Section 1.† Every member upon joining this association shall pay to the secretary an entrance fee and dues as prescribed by the executive committee. No member in arrears for annual dues shall be entitled to vote at any election and any member more than one year in arrears may be stricken from the list of members at the discretion of the executive committee.

ARTICLE VIII.*
LOCAL SECTIONS

Section 1.** Upon the application of ten or more members of the association residing in the same geographical district, or having offices therein, the executive committee shall organize a local section for that district, to which all members in that district shall be eligible. Such local section shall admit to active membership only members in good standing. It shall hold not less than two meetings each year, and shall be governed by such constitution and by-laws not inconsistent with the constitution of this association as the section membership may adopt and the executive committee of the association approve.

Section 2. The parent association shall not be put under any obligation, either financial or in the matter of policy or opinion, by any local section.

ARTICLE IX.
AMENDMENTS

Section 1. This constitution may be amended at any regular meeting by a two-thirds vote of the members present, provided that notice of the proposed amendment or amendments has been sent to the members at least 30 days previous to said regular meeting.

BY-LAWS

TIME OF MEETING

1.** The regular meeting of this association shall convene annually during the month of September, the exact date to be fixed by the Executive Committee.

PLACE OF MEETING

2.** The place of holding the annual convention shall be Chicago, Ill.

3. It shall lie within the power of the executive committee to change the location or time of the meeting if it becomes apparent that it is for the best interests of the association.

QUORUM

4. At the regular meeting of the association, 15 or more members shall constitute a quorum.

†Amended October 17, 1940.
*Article adopted 1922.
**Amended September 20, 1948.
5. The annual dues, for the fiscal year ending August 31, and payable in advance, shall be as follows:*  
Members, $5.00; Associate Members, $4.00; Junior Members, $2.50.

DUTIES OF OFFICERS

6.† The president shall have general supervision over the affairs of the association. He shall preside at all meetings of the association and of the executive committee; shall appoint all committees not otherwise provided for, and shall be ex-officio member of all committees. He shall with the secretary sign all contracts or other written obligations of the association which have been approved by the executive committee. He shall render a detailed report at least three times during the year to the members of the executive committee, showing the financial condition of the association and its activities.

At the annual meeting the president shall present a report containing a statement of the general conditions of the association.

7. The vice-presidents in order of seniority shall preside at meetings in the absence of the president and discharge his duties in case of a vacancy in his office.

8.† It shall be the duty of the secretary to keep a correct record of the proceedings of all meetings of this association, and of all accounts, between this association and its members; to collect all moneys due the association, and deposit the same in the name of the association. He shall pay all bills when properly certified and approved by the president and the treasurer, and make such reports as may be called for by the executive committee. He shall also perform such other duties as the association may require.

9.‡ The treasurer shall have charge of the funds, check all deposits as made by the secretary, sign all checks after they have been approved by the president, and invest all funds not needed for current expenses as directed by the executive committee. He shall report at each annual meeting on the condition of the finances.

NOMINATING COMMITTEE

10.‡ After each annual meeting the president shall appoint a committee consisting of five members. Two Past Presidents shall be members of this committee, one of whom shall act as Chairman. No other officers of the Association shall be appointed to this committee. This committee shall prepare a list of names of nominees for officers to be voted on at the next annual convention in accordance with ARTICLE VI of the Constitution, said list to be read at the business session of said convention. Nothing in this section shall be construed to prevent any member making further nominations.

AUDITING COMMITTEE

11.‡ Prior to each annual meeting the president shall appoint a committee of three members, not officers of the association, whose duty it shall be to examine the accounts and vouchers of the secretary and the treasurer and certify as to the correctness of their accounts.

COMMITTEE ON SUBJECTS FOR DISCUSSION

12. After each annual meeting the president shall appoint a committee whose duty it shall be to prepare a list of subjects for investigation to be submitted for approval at the next convention.

COMMITTEE ON INVESTIGATION

13. After the association has adopted the list of subjects for investigation the president for the succeeding year shall appoint the committees who shall prepare the subjects for report and discussion. He may also appoint individual members to prepare reports on special subjects, or to report on any special or particular subject.

†Amended October 17, 1940.
‡Adopted October 17, 1940.
*Amended October 16, 1941.
**Amended September 20, 1948.
‡Amended December 4, 1950.
14. After each annual meeting the executive committee shall appoint a publication committee consisting of three active members whose duty it shall be to cooperate with the secretary in the issuing of the publications of the association. The assignment of this committee shall be such that at least one member shall have served on the committee during the previous year.

ORDER OF BUSINESS

15.† Call to order by president.
    Opening prayer or invocation.
    President’s address.
    Report of secretary.
    Report of treasurer.
    Appointment of special committees.
    Reports of standing committees and presentation of papers.
    Unfinished business.
    New business.
    Election of officers.
    Installation of officers.
    Adjournment.

DECISIONS

16. The votes of a majority of the members present shall decide any questions, motion or resolution which shall be brought before the association, unless otherwise provided. Unless specifically provided herein otherwise, all discussions shall be governed by Robert’s rules of order.

AMENDMENTS

17.† The By-Laws can be amended by a two-thirds vote of those present at any regularly called Executive Committee Meeting.

†Amended September 20, 1948.
Koppers supplies cross ties...

PLUS!

From 33 plants across the country, Koppers supplies pressure-treated cross ties to railroads. Our in-transit service is second to none.

But that's only the beginning. Koppers also supplies treated car lumber, grade crossings, piles, poles, posts, platform lumber and just about every other pressure-treated wood product you can name.

Call on Koppers for cross ties and for all other high-quality pressure-treated wood products.

KOPPERS COMPANY, INC.

KOPPERS PRESSURE-TREATED WOOD

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DIRECTORY OF MEMBERS

as of March 1, 1956

(Figure after each name indicates year when member joined the association)

HONORARY MEMBERS

Bechtelheimer, A. E. (Retired) Br. Engr., C. & N. W., Chicago, Ill. (1920)
Budd, Ralph, (Retired) President, C. B. & Q., Santa Barbara, Calif. (1927)
Chinn, Armstrong, Pres., T. R. R. Asso. of St. L., St. Louis, Mo. (1930)
Vandenburgh, E. C., (Retired) Ch. Engr., C. & N. W., Chicago, Ill. (1925)

ACTIVE MEMBERS

A

Aaron, J. L., B. & B. Insp., W. M., Cumberland, Md. (1954)
Alley, F. T., Asst. B. & B. Supvr., St. L. S. W., Tyler, Texas (1955)
Anderson, A. C., Gen. B. & B. For., D. M. & I. R., Two Harbors, Minn. (1952)
Armstrong, W. F., Arch'l. Engr., C. & N. W., Chicago, Ill. (1947)

B

Baker, R. C., Engr. of Struc., C. & E. I., Danville, Ill. (1940)

Barranco, S. J., Asst. Supv. Struc., Penna., Cincinnati, Ohio (1951)
Beck, R. F., Asst. Engr., E. J. & E., Joliet, Ill. (1952)
Beringer, M. A., Br. Insp., I. C., Chicago, Ill. (1929)
Billmeyer, E. D., Brdg. & Str. Eng., W. M., Baltimore, Md. (1955)
Block, M., Asst. to Ch. Engr., I. C., Chicago, Ill. (1948)
FOR A LONGER-LASTING PAINT JOB

...specify Flame-Cleaning

Thorough cleaning and drying of steel surfaces is assured when LINDE's flame-cleaning method is used. In this procedure, high-temperature oxy-acetylene flames are passed over the work, dislodging dirt and soot, evaporating all moisture, and causing scale and rust to expand and pop off. The surface is then wire-brushed and painted while warm. This provides a more lasting paint job than when other metal-cleaning methods are used, for paint bonds tighter, spreads more evenly, and dries more quickly when applied to warm, dry metal.

The ease of applying LINDE's flame-cleaning... plus the high quality of the results obtained... have led to the use of this method to clean and dry all types of structural steelwork — train sheds, bridges, pipe, tanks, rail that is to be covered, and rolling stock of all kinds. Ask LINDE for information regarding a demonstration of this fast, efficient method for preparing steel surfaces for painting.
Bowden, W. F., Jr., Asst. Arch., Sou., Knoxville, Tenn. (1953)
Bredfeldt, C. Ch. Drafts., C. M. St. P. & P., Chicago, Ill. (1955)
Bright, B. L., Asst. to Engr. Bldgs. A. C. L., Wilmington, N. C. (1953)
Brown, L. W., B. & B. Supv., C. & O., Peru, Ind. (1951)
Bunch, A. H., Br. Inspr., St. L.-S. F., Springfield, Mo. (1951)
Burkel, J. N., Draftsman, M. P., St. Louis, Mo. (1951)
Bush, R. H., W. S. Supv., T. & N. O., Ennis, Tex. (1952)

C

Cameron, W. M., Ch. Carp., C. M. St. P. & P., Madison, Wis. (1955)

Carothers, M. D., Asst. Ch. Engr., G. M. & O., Bloomington, Ill. (1956)
Carter, T. S., Ch. Engr., M. K. T., St. Louis, Mo. (1954)
Chamberlain, P. C., Asst. to Engr. of Struc., Erie, Cleveland, Ohio (1941)
Cheney, R. R., Ch. Carp., C. M. St. P. & P., Marion, Iowa (1953)
Collier, P. B., Supv. of Scales, M. P., St. Louis, Mo. (1938)
Collings, J. E., Ch. Carp., C. M. St. P. & P., Savannah, Ill. (1953)
Collum, R. L., Mast. Carp., S. A. L., Jackson ville, Fla. (1941)
Colvin, C. S., Asst. Engr. of Str., I. G. N., Houston, Tex. (1951)
Converse, D. W., Br. Engr. A. C. & Y., Akron, Ohio (1940)
Cox, R. C., B. & B. Supw., W. P., Sacramento, Calif. (1950)
Croft, P. H., Asst. Engr. M. of W., I. C., Memphis, Tenn. (1947)
Slash your tie costs 50% with BIRD
SELF-SEALING TIE PADS

You can extend the service life of your bridge timbers 50% by using BIRD Self-Sealing Tie Pads which form a water-proof, dustproof seal on the tie.

This seal protects the vulnerable area under the plates and around the spikes. Mechanical wear and plate penetration are eliminated.

So slash your tie costs 50% by using Bird Self-Sealing Tie Pads on

- New and Old Bridge Decks
- Pile Cut-offs
- Caps Under Stringers

Two new products of Bird & Son, inc. are on the market:

1. Rubberized Tie Coating
2. Bird Tie Caulk

These materials, together with Bird Self-Sealing Tie Pads, are another answer to extended tie life and reduction of future maintenance costs.

Write now for further information to
BIRD Tie Pads, Dept. HBB, East Walpole, Mass.

BUY THE BEST — BUY BIRD

Cruikshank, A. W., Gen. Plumb. For., D. & H., Green Island, N. Y. (1950)

Cummings, C. P., Asst. Engr., M. K. T., St. Louis, Mo. (1948)


Curie, H. D., Mast. Carp., B. & O., Garrett, Ind. (1942)

---

D


Davis, R. E., Supv. of Str., D. & R. G. W., Salt Lake City, Utah (1954)


DeMape, M. A., Str. Engr., St. L. S. F., Springfield, Mo. (1955)


Derryberry, J. T., Gen. B. & B. Inspr., W. M., Cumberland, Md. (1955)


Dick, H. M., Supvr. of Struc., Penna., Harrisburg, Pa. (1942)


Dilworth, R. W., Drafts., N. Y. C., Detroit, Mich. (1953)


Dunnagan, J. P., Engr. of Br., S. P., San Francisco, Calif. (1943)


---

E


Eble, A. E., Const. Engr., St. L. S. W., Naples, Tex. (1953)


Eichenlaub, C. M., Res. Engr., S. D. & A. E., San Diego, Calif. (1943)


Ellis, P. O., Engr. Maint. of W., M. K. T., Dallas, Tex. (1954)


Erickson, H. G., Ch. Engr., L. A. J., Los Angeles, Calif. (1953)

Erickson, O., Asst. B. & B. Supvr., S. P., Sacramento, Calif. (1950)


---

F


Ferry, M. H., Mast. Carp., Erie, Hornell, N. Y. (1952)


Fox, J., B. & B. Mast., C. P., Farnham, Que., Canada (1955)


---

G

Gabrio, C. W., Engr. of Str., Virginian, Norfolk, Va. (1947)


Garcelon, C. E., B. & B. Supt., B. & A., Houlton, Me. (1945)
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Directory

Gilmore, R. W., Gen. Br. Insp., B. & O., Cincinnati, Ohio (1943)
Glander, A. M., Ch. Carp., C. M. St. P. & P., Austin, Minn. (1936)
Gossard, J. T., Supv. B. & B., W. M., Hagerstown, Md. (1952)
Gunderson, R. R., Eng. Maint. of W., W. M., Baltimore, Md. (1947)
Gustafson, J. M., Br. Engr., M. & St. L., Minneapolis, Minn. (1949)

H

Hamilton, C. W., Engr. of Design, Wabash, St. Louis, Mo. (1950)
Hanna, V. C., Ch. Engr., T. R. R. A. of St. L., St. Louis, Mo. (1953)
Harper, W. B., Supv. Trk., I. C., Vicksburg, Miss. (1953)
Harris, A. R., Engr. Br., C. & N. W., Chicago, Ill. (1940)

Hazer, W. V., Asst. Engr., M. P., St. Louis, Mo. (1954)
Hedley, W. J., Asst. Ch. Engr., Wabash, St. Louis, Mo. (1950)
Hefte, A., Asst. B. & B. Supv., N. W. P., San Rafael, Calif. (1952)
Hemstad, B., Mast. Carp., G. N., Willmar, Minn. (1937)
Hickok, B. M., Supv. B. & B., N. Y. C., Cleveland, Ohio (1951)
Hillman, W. C., Mast. Carp., Clinchfield, Erwin, Tenn. (1953)
Hodgson, A. W., Ch. Carp., C. M. St. P. & P., Sioux City, Iowa (1953)
Holmes, E. J., Mast. Carp., Erie, Huntington, Ind. (1952)
Hopton, J. P., Engr. of Maint., C. U. T., Cincinnati, Ohio (1955)
Hotard, A. E., Res. Engr., L. & N., Bay St. Louis, Miss. (1953)
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Humphreys, R. W., Off. Eng., N. P., St. Paul, Minn. (1947)
Hutchings, V. W., B. & B. Supvr., S. P., Bakersfield, Calif. (1941)

I

J
Johnson, A. C., Asst. Ch. Engr., E. J. & E., Juliet, Ill. (1944)
Johnson, E. A., Engr. of Br., I. C., Chicago, Ill. (1953)
Johnson, G. C., B. & B. Supvr., C. & N. W., Green Bay, Wis. (1955)
Johnson, I. K., Ch. Carp., C. M. St. P. & P., Milwaukee, Wis. (1953)
Jones, A. C., B. & B. Supvr., Southern, Birmingham, Ala. (1938)
Jones, F. Gen. For. B. & B., W. S., St. L. - S. F., Chaffee, Mo. (1952)

K
Kaullen, W. C., B. & B. Supv., M. P., Kansas City, Mo. (1953)
Kelly, J. R., B. & B. Supv., Southern, Lexington, Ky. (1952)
Kendall, J. T., Gen. Fore. B. & B., P. R. R., Indianapolis, Ind. (1949)
Knapp, P., Mast. Carp., Erie, Jersey City, N. J. (1951)
Kvenberg, S. E., Asst. Engr., C. M. St. P. & P., Chicago, Ill. (1932)

L
Lamport, L. R., Ch. Engr. Mtce., C. & N. W., Chicago, Ill. (1935)
Lane, H. W., Rdm., E. J. & E., Joliet, Ill. (1952)
Layman, D. C., Gen. B. & B. Fore., I. C., Memphis, Tenn. (1952)
LeClaire, N. C., Supt. B. & B., T. R. R. A., of St. L., St. Louis, Mo. (1952)
Little, H. C., Supv. of W. S., I. C., Vicksburg, Miss. (1948)
When Hurricane Diane's disastrous floods swept down the Delaware Gorge in August 1955, among the many washed-out bridges was the 100-year-old stone arch on the mainline of the Erie RR over Panther Creek at Shohola, Pa. The wreckage was so complete that restoration seemed months away.

An inspection of existing foundations revealed that they were adequate to support a modern steel girder bridge. Verbal orders and specifications for replacement plans were received at the Ambridge works of American Bridge on August 31st. The fabricating shops were ready to begin work when the blueprints arrived two days later, although some of the steel for the 50-ton girders was yet to emerge from the open hearths and rolling mills.

Using every means at its command to speed fabrication, American Bridge was able to ship the two 109-foot girders in a record 8 days. The job was completed at the site at 8 A.M., September 10th, thus enabling the Erie to resume traffic over its mainline in just 9 days after American Bridge first received specifications for the big girders.
Lowry, J. M., Ch. Engr., St. L. S. W., Tyler, Tex. (1950)
Luce, W. L., Mast. Carp., Erie, Youngstown, Ohio (1952)
Luck, R. P., Draftsman, C. & N. W., Chicago, Ill. (1920)
Lyman, V. W., Supv. B. & B., C. V., St. Albans, Vt. (1953)

Martin, J. D., Ch. Carp., C. M. St. P. & P., Butte, Mont. (1955)
Mason, S. K., Ch. Engr., T. M., Laredo, Tex. (1950)
Mathis, R. C., Br. Insp., I. C., Memphis, Tenn. (1947)
Meredith, W. E., Supv. Struct., Penna., Indianapolis, Ind. (1950)
Merrill, B. W., Supv. B. & B., N. Y. C. & St. L., Conneaut, Ohio (1936)
Messman, D. V., Engr. of Bldgs., Southern, Knoxville, Tenn. (1955)
Meyers, B. R., Ch. Engr., C. & N. W., Chicago, Ill. (1930)
Midkiff, R. B., Ch. Engr., M. W. & S., Sou., Knoxville, Tenn. (1953)
Miesenhelder, P. D., Concrete Engr. Research Staff - A.A.R., Chicago, Ill. (1952)
Montague, C. F., Eng. Str., P. R. R., Cincinnati, Ohio (1953)
Moore, I. A., Ch. Engr., C. & E. I., Danville, Ill. (1937)
Moore, J. D., Engr. Str., P. R. R., Indianapolis, Ind. (1953)

Mc

*McCallum, S. L., Arch. Designer, M. C., Detroit, Mich. (1952)
McCollum, P. K., Bldg. Insp., I. C., Memphis, Minn. (1955)
McDermott, A. A., B. & B. Supv., S. P., Dunsuir, Calif. (1945)
McFadden, W. E., Ch. Carp., C. M. St. P. & P., Chicago, Ill. (1955)
McGrew, B. H., Supv. B. & B., St. L. S. W., Tyler, Tex. (1951)
McKibben, D. H., Supwr. Str., P. R. R., Columbus, Ohio (1951)
McLeod, C. A., Asst. Supt., St. L. - S. F., Newburg, Mo. (1953)
McNally, P. F., B. & B. Supv., S. P., Ogden, Utah (1948)

M

Madson, H. C., Designer, C. & N. W., Chicago, Ill. (1940)
Manley, B. F., Supv. B. & B., P. E., Los Angeles, Calif. (1943)

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Bureau of Water

BALTIMORE, Maryland
Bureau of Water, Dept. of Public Works

BOSTON, Massachusetts
Public Service Dept., Water Division

BOSTON, Massachusetts
Boston Water & Sewerage Commission

BOUND BROOK, New Jersey
Public Service Electric & Gas Co.

BRIDGEPORT, Connecticut
Bridgeport Gas Light Company

BUFFALO, New York
Department of Public Works, Division of Water

CHARLESTON, South Carolina
South Carolina Electric & Gas Co.

CHICAGO, Illinois
Peoples Gas Light & Coke Company

CHICAGO, Illinois
Water Works Department

CINCINNATI, Ohio
Cincinnati Gas & Electric Co.

COLUMBIA, Pennsylvania
Columbia Water Company

DETROIT, Michigan
Board of Water Commissioners

DETROIT, Michigan
Michigan Consolidated Gas Co.

ELENTOWN, Pennsylvania
Municipal

FREDAVILLE, Indiana
South Shore Indiana Gas & Electric Company

FALL RIVER, Massachusetts
Fall River Gas Works Company

FREDERICK, Maryland
City of Frederick Water Dept.

FREDERICK, Maryland
Frederick Gas Company, Inc.

CITY OF FREDERICKSBURG, Virginia
Gas Department

HARRISON, New Jersey
Public Service Commission, Public Water Supply

HARTFORD, Connecticut
The Hartford Gas Company

HARTFORD, Connecticut
Water Bureau of the Metropolitan District

HUNTINGTON, Alabama
Municipal Water Works

INDIANAPOLIS, Indiana
Citizens Gas & Coke Utility

LANCASTER, Pennsylvania
Bureau of Water

LOUISVILLE, Kentucky
Louisville Gas & Electric Co.

LYNCHBURG, Virginia
City of Lynchburg Water Department

MIDDLETOWN, Connecticut
Natural Gas Service, Inc.

MINERSVILLE, Pennsylvania
The Municipal Authority of the Borough of Minersville

MOBILE, Alabama
Mobile Gas Service Corp.

MOBILE, Alabama
Mobile Water Works Company

MONTREAL, Quebec
Quebec Hydro-Electric Commission

MONTERAL, Quebec
Public Works Dept., Water-Works & Sewerage Division

NASHUA, New Hampshire
Pennichuck Water Works

NASHVILLE, Tennessee
Waterworks Department

NEW HAVEN, New Jersey
Public Service Electric & Gas Co.

NEW HAVEN, Connecticut
New Haven Gas Company

NEW ORLEANS, Louisiana
New Orleans Public Service, Inc. (Gas)

NORTH WILDERNESS, New York
Public Service Electric & Gas Company

NEW YORK, New York
Department of Water, Gas & Electricity

NOBLESTOWN, Pennsylvania
Philadelphia Electric Co., Gas Dept.

PAINEVILLE, Ohio
City of Painesville, Gas District Department

PEORIA, Illinois
Central Illinois Light Company

PHILADELPHIA, Pennsylvania
Department of Public Works, Bureau of Water

PHILADELPHIA, Pennsylvania
Philadelphia Gas Works Co.

PITTSBURGH, Pennsylvania
Bureau of Water, Department of Public Works

PLYMOUTH, Massachusetts
Plymouth Gas Light Company

POTTSTOWN, Pennsylvania
Pottstown Water Company

PROVIDENCE, Rhode Island
Providence Gas Company

QUEBEC, Canada
Quebec Power Company, Gas Division

READING, Pennsylvania
Reading & Lackawanna Water

RICHMOND, Virginia
Department of Public Utilities (Gas)

RICHMOND, Virginia
Department of Public Utilities (Water)

ROCHESTER, New York
Rochester Gas & Electric Corp.

SACRAMENTO, California
Division of Water & Sewers

ST. LOUIS, Missouri
Public Service Commission, Water & Sewerage Department

ST. LOUIS, Missouri
Department of Public Utilities, Water Division

SACRAMENTO, California
Division of Water & Sewers

SALEM, Massachusetts
North Shore Gas Company

SPRINGFIELD, Illinois
Central Illinois Light Company

SYRACUSE, New York
Water Division, Department of Engineering

TORONTO, Ontario
The Consumer's Gas Co. of Toronto

TROY, New York
Department of Public Works

UTICA, New York
City of Utica, Board of Water Supply

WHEELING, West Virginia
Wheeling Water Department

WILMINGTON, Delaware
Wilmington Water Department

WINCHESTER, Virginia
Water Department

WINSTON-SALEM, North Carolina
Water Gas Company

YORK, Pennsylvania
York Water Company

ZANESVILLE, Ohio
Water Department
Morgan, J. H., Engr. M. of W., F. E. C., St. Augustine, Fla. (1948)
Morrison, R. H., Ch. Engr., B. & A., Houlton, Me. (1941)
Moser, C. A., B. & B. Supvr., S. N., Sacramento, Calif. (1951)
Myers, R. L., Supvr. W. S., I. C., Clarksdale, Miss. (1950)

N
Neal, G. W., Supt., Chattahoochee Valley, West Point, Ga. (1948)
Norris, J. M. W., B. & B. Supvr., D. & H., Oneonta, N. Y. (1952)
Nuckols, L. T., Ch. Engr., C. & O., Richmond, Va. (1951)

O
Olson, O. D., B. & B. Supvr., C. & N. W., Chicago, Ill. (1953)
Olson, V. E., B. & B. Supvr., M. St. P. & S. S. M., Stevens Point, Wis. (1948)
Ostrom, W. D., Ch. Carp., C. M. St. P. & P., Miles City, Mont. (1954)

P
Pahl, W. H., Jr., Supvr. Str., P. R. R., Cleveland, Ohio (1950)
Park, E., Jr., Draftsman, M. P., Houston, Tex. (1948)
Patterson, R. H., B. & B. Supvr., St. L. S. W., Pine Bluff, Ark. (1955)
Peden, J. S., W. S. Supvr., T. & P., Big Spring, Tex. (1953)
Peterson, H. R., Ch. Engr., N. P., St. Paul, Minn. (1953)
Peterson, J. C., Sr. Asst. B. & B. Supvr., S. P., Sacramento, Calif. (1950)
Peterson, N. E., Ch. Engr., C. & I. M., Springfield, Ill. (1938)
Pfeiffer, A., Asst. B. & B. Supvr., S. P., Sacramento, Calif. (1939)
Piepmeier, A. L., Br. Engr., C. G. W., Oelwein, ia. (1953)
Pound, E. R., Mast. Carp., B. & O., Newark, Ohio (1952)
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R

Raessler, V. D., Supv. B. & B., I. C., Memphis, Tenn. (1951)
Raver, H. E., Engr. B. & B., L. I., Jamaica, N. Y. (1952)
Roberts, H. L., Br. Insp., C. & O., Royal Oak, Mich. (1952)

S

Salmon, J. M., Jr., Ch. Engr., Clinchfield, Erwin, Tenn. (1938)
Sarris, P. T., Asst. Supt., Southern, Jacksonville, Fla. (1955)
Sathre, C. O., B. & B. Supv., C. & N. W., Madison, Wis. (1950)
Saunders, T. D., Ch. Engr., O. N., North Bay, Ont., Can. (1930)
Sawyer, J. H., Jr., Ch. Engr., C. G. W., Oelwein, la. (1951)
Schneider, J. C., B. & B. Supv., T. & N. O., Victoria, Tex. (1950)
Schoeder, A. W., Pres., M. & St. L., Minneapolis, Minn. (1949)
Shepley, S. H., Ch. Engr., E. J. & E., Joliet, Ill. (1945)
Short, W. L., Br. Insp., M. P., St. Louis, Mo. (1951)
Slagle, G. P., Ch. Carp., C. M. St. P. & P., Milwaukee, Wis. (1948)
Smith, E. L., B. & B. Supv., Southern, Hattiesburg, Miss. (1952)
Smith, J. B. & B. Supv., S. P., Sacramento, Calif. (1943)
Smith, L. L., Asst. B. & B. Supv., S. P., Dunsimuir, Calif. (1948)
Snyder, E. F., Asst. to Ch. Engr., I. C., Chicago, Ill. (1948)
Spofford, F. R., Asst. to Ch. Engr., B. & M., Boston, Mass. (1940)
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Stevens, C. M., B. & B. Supv., S. P., Portland, Ore. (1950)
Stinebaugh, J. H., Supv. W. S., I. C., Carbondale, Ill. (1951)
Sumner, J. W. S. For., St. L. - S. F., Springfield, Mo. (1948)

T
Templin, R. S., For. Carp., Reading, St. Clair, Pa. (1947)
Thelander, P. V., Asst. Ch. Engr., C. & N. W., Chicago, Ill. (1939)
Todd, D. C., Engr. Str., P. R. R., Pittsburgh, Pa. (1942)
Trulove, J. D., Sr. Asst. B. & B. Supv., S. P., Ogden, Utah (1945)
Tyckoson, E. G. Jr., Drafts, C. M. St. P. & P., Chicago, Ill. (1955)

V


W
Wall, R. E., Supv. B. & B., Southern, Selma, Ala. (1948)
Warfield, H., Jr., Insp. M. of W., Penna., New Brunswick, N. J. (1952)
Warfield, W. B., Supv. Str., Penna., Pittsburgh, Pa. (1951)
Webber, G. R., Ch. Carp., C. M. St. P. & P., Spokane, Wash. (1948)
Welch, J. W., Supv. B. & B., F. E. C., St. Augustine, Fla. (1943)
Williams, D. R., Brdg. Insp., C. & E. I., Danville, Ill. (1956)
Williams, L. L., B. & B. Supv., L. & N., Birmingham, Ala. (1953)
Wilson, H. M., Asst. Supv. Struc, Penna., Columbus, Ohio (1953)
Wintoniak, S. G., Supv. of Struc, Penna., Altoona, Pa. (1953)
Woodward, J. D., Supvr. Str., P. R. R., Camden, N. J. (1952)
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Wray, H. O., Sec. & Ch. Engr., T. C. Term., Texas City, Tex. (1939)

Y
Yaw, D. M., Mast. Carp., Erie, Buffalo, N. Y. (1951)

Yewell, J. E., Ch. Engr., B. & L. E., Greenville, Pa. (1941)

Z

LIFE MEMBERS


Batey, W. A., (Ret.), Const. Engr., U. P., 4303 South St., Lincoln Neb. 1918
Benjamin, H. I., (Ret.), Vice Chair. Sys. Com. on Ins., S. P., San Francisco, Calif. 1922
Bost, M. A., (Ret.), Asst. Engr., C. M. St. P. & P., Mason City, Iowa 1935

Clark, W. A., (Ret.), Off. Engr., D. M. & I. R., 2718 E. 5th St., Duluth 5, Minn. 1908
Cota, G. M., (Ret.), Ch. Clk. Engr. Dept., C. of V., Box 114, St. Albans, Vt. 1913

Deck, H. H. (Ret.), Engr. of M., C. & N. W., 2915 Ingersoll Ave., Des Moines, Ia. 1908

Eisele, C., (Ret.), Asst. Engr., N. Y. C., Cleveland, Ohio 1930
Engman, V. E., (Ret.), Ch. Carp., C. M. St. P. & P., 3429 - 17th Ave., So., Minneapolis 7, Minn. 1920

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Gerst, H. A., (Ret.), Asst. Engr., G. N., 748 Aldine St., St. Paul 4, Minn. ............... 1917

**H**

Hand, G. W., (Ret.), Asst. to Pres., C. & N. W., 412 Courtland Ave., Park Ridge, Ill. ... 1909
Harman, W. C., (Ret.), Supvr. B. & B., S. P., 656 Cedar St., San Carlos, Calif. ........ 1911
Heisenzbuttel, H., (Ret.), B. & B. Supvr., C. & N. W., 808 So. 3rd St., Norfolk, Neb... 1917
Hillman, F. W., (Ret.), Asst. Eng. M. of W., C. & N. W., 1452 Oak Ave., Evanston, Ill. ... 1917
Huntsman, F. C., (Ret.), Asst. Eng., Wabash, 7421 Bruno Ave., St. Louis 17, Mo. ....... 1922

**J**


**K**

Koch, H. L., (Ret.), Supvr. B. & B., N. Y. C. & St. L., 637 Main St., Conneaut, Ohio .... 1922

**L**

Lacher, W. S., (Ret.), Secretary, A. R. E. A., 407 E. Fuller Rd., Hinsdale, Ill. ........ 1922
Lacy, W. J., (Ret.), Supvr. B. & B., M. P., 4370 Swan St., St. Louis, Mo. ............... 1911
Lampson, W., (Ret.), Supvr. B. & B., M. C., 170 Caleb St., Portland, Me. ............... 1930
Larsen, H. C., (Ret.), Str. Iron Fore., C. St. P. M. & O., 1084 Sims Ave., St. Paul 6, Minn. ................................................................. 1928

**Mc**

McMahon, T. D., (Ret.), Arch., G. N., 223 Lake Avenue, White Bear Lake 10, Minn. ... 1918

**M**

Mellgren, J., (Ret.), Fore. W. S., C. & N. W., 523 N. Cadwell Ave., Eagle Grove, Ia. ... 1913
Merwin, P. B., (Ret.), Asst. Engr., C. & N. W., Rte. 2, Box 565, Washougal, Wash. ... 1929
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Sparrows Point Spur, Baltimore, Md. 3 Bridges
North Point Road, Baltimore, Md. 1 Bridge
Middle River, Maryland 1 Bridge
Queen Anne, Maryland 1 Bridge
Chester, Pa. 1 Bridge
Northampton, Pa. 1 Bridge
Linden, N.J. 1 Bridge
Mulberry St., Baltimore, Md. 1 Bridge
King of Prussia, Pa. 1 Bridge
Paoli, Pa. 1 Bridge
Jersey City, N.J. 3 Bridges
Exton, Pa. 2 Bridges
Wilmington, Del. 1 Bridge

Wrought Iron Deck Plates Increase the Life-Span of These Pennsylvania Railroad Bridges

The latest count shows that 21 Pennsylvania Railroad bridges in the Eastern Region are decked with wrought iron plates. A listing of these bridges, and two typical installations are shown above.

The selection of wrought iron plate for this service is sound engineering. Plates are subject to vibration and severe corrosive attack from coal and refrigerator car drippings and runoff water. The use of ballast makes it difficult for regular inspection and maintenance. It all adds up to the need for a material that can withstand corrosion forces and fatigue stresses. And wrought iron plate has a proved record of durability under these conditions.

Write for our bulletin, Wrought Iron in Bridge Construction.

<table>
<thead>
<tr>
<th>Name</th>
<th>Position</th>
<th>Location</th>
<th>Joined In</th>
</tr>
</thead>
<tbody>
<tr>
<td>O'Brien, W. J.</td>
<td>Dist. Carp., C.M.St.P. &amp; P., Juneau County, Necedah, Wis.</td>
<td>1919</td>
<td></td>
</tr>
<tr>
<td>Parker, W. V.</td>
<td>Gen.Fore.B &amp; B, St.L.S.W., 683 Berclair Rd., Memphis 12, Tenn.</td>
<td>1911</td>
<td></td>
</tr>
<tr>
<td>Patenaude, E.</td>
<td>B. &amp; B. Mast., C. P., 133 John St., Sturgeon Falls, Ont., Can.</td>
<td>1930</td>
<td></td>
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<tr>
<td>Piccone, C.</td>
<td>Br. Engr., Nat.Rys. or Mex., Monte Everest 210, Lomas de Chapultepec, Mexico City, Mex.</td>
<td>1923</td>
<td></td>
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<tr>
<td>Reece, A. N.</td>
<td>Asst. to Pres., K. C. S., 2808 Verde Vista Dr., Santa Barbara, Calif.</td>
<td>1922</td>
<td></td>
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<tr>
<td>Roof, W. R.</td>
<td>Br. Engr., C. G. W., 7728 So. Yanes Ave., Chicago 49, Ill.</td>
<td>1927</td>
<td></td>
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<tr>
<td>Rowland, O. F.</td>
<td>Asst. Engr., D. &amp; H., c/o Berkshire Industrial Farm, Canaan, N. Y.</td>
<td>1923</td>
<td></td>
</tr>
<tr>
<td>Smith, C. E.</td>
<td>Vice Pres., N.Y. N.H. &amp; H., 282 Prospect St., New Haven, Conn.</td>
<td>1911</td>
<td></td>
</tr>
<tr>
<td>Tattersonall, E. R.</td>
<td>Supvr. of Mtce. Equip., N.Y.C., 21 Coy St., Malone, N. Y.</td>
<td>1913</td>
<td></td>
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<tr>
<td>Von Schrenk, H., Cons. Tbr. Engr., M. P., 289 St. Denis St., Florissant, Mo.</td>
<td>1916</td>
<td></td>
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<tr>
<td>Wait, R. E.</td>
<td>Supv. B. &amp; B., Wabash, 1638 N. Maple, Decatur, Ill.</td>
<td>1923</td>
<td></td>
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<tr>
<td>Walden, W. H.</td>
<td>Rdm., Southern, 1012 Porter St., Richmond 24, Va.</td>
<td>1920</td>
<td></td>
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<tr>
<td>Whitehouse, B. M.</td>
<td>Ch. Fire Insp., C. &amp; N. W., 2008 Isabella St., Evanston, Ill.</td>
<td>1927</td>
<td></td>
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<tr>
<td>Winkelhouse, L. C.</td>
<td>Asst. Arch. Engr., C. &amp; N. W., 6921 Oriole Ave., Chicago 31, Ill.</td>
<td>1934</td>
<td></td>
</tr>
<tr>
<td>Womeldorf, C. F.</td>
<td>Div. Engr., C. &amp; N.W., 111 No. 12th St., Norfolk, Nebr.</td>
<td>1917</td>
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<tr>
<td>Wright, C. W.</td>
<td>Mast. Carp., L.I., 67 Nassau Pkwy., Oceanside, N. Y.</td>
<td>1908</td>
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A

B
Baker, D. L., Vice Pres. & Treas., Baker & Hickey Co., P.O. Box 5008, Tri Village Sta. Columbus 12, Ohio 1946
Bauman, K. E., Vice Pres. - Sls., Warren Tool Corp., Warren, Ohio 1946
Boulton, C. R., R. R. Contractor, 10 E. Town St., Columbus 15, Ohio 1946
Brennon, L. D., M. of W. Instr., Air Reduction Sales Co., 620 King Drive, Pine Lake, Ga. 1950
Bruce, W. O., Sales Eng., Orton Crane & Shovel Co., 608 S. Dearborn, Chicago, Ill. 1955
Bryant, C. E. Jr., Johns-Manville Sls. Corp., 22 E. 40th St., New York, N. Y. 1951
Burkey, J. R., Const. Engr., The Union Metal Mfg. Co., 2421 Plymouth Ave., Columbus, Ohio 1942
Burpee, C. M., Director, American Wood Preservers Institute, 111 W. Washington St., Chicago 2, Ill. 1930

C
Clapp, K. J., Asst. Sls. Mgr., Homelite Corp., Port Chester, N. Y. 1946
Clark, H., Jr., Mgr. R. R. Sls., Armco Drainage & Metal Products Co. 20 N. Wacker Dr., Chicago, Ill. 1953
Clarke, R., Res. Mgr., Massey Concrete Products Co., 111 W. Washington St. Chicago 2, Ill. 1948
Collette, D. W.,Fld. Engr., H. H. Robertson Co., 221 N. LaSalle St., Chicago, Ill. 1953
Cottier, E. F., Sls., Pacific Coast Borax Co., Box 871, Auburn, Ala. 1953
Cox, T. M., Vice Pres., Barnard Chemical, 224 So. Michigan Ave., Chicago, Ill. 1955

D
Davidson, T., Asst. Mgr., Globe Chemical Company, 80 E. Jackson Blvd., Chicago, Ill. 1955
Detzel, G. E., Geo. E. Detzel Co., 2303 Gilbert Ave., Cincinnati, Ohio 1945

E
Eisenberg, A. H., Universal Engineering and Waterproofing Service, 82 Waverly Ave., Newark, N. J. 1953

F
Fields, P., Detroit Graphite Div., Certain-Teed Products Corp., 17th & Broadway, E. St. Louis, Ill. 1946
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Filkins, A. J., Pres., Filkins & Son, Co., 9 So. Clinton St., Chicago 6, Ill. 1927
Bldg., Cleveland, Ohio 1946
Flanagan, J. J., Pres., Filkins & Son, Co., 9 So. LaSalle St., Chicago, Ill. 1931
Fletcher, R. L., Struct. Engr., Timber Engineering Co., 1319 18th St., N. W.,
Washington, D. C. 1947

G

Gibboney, J. L., Vice Pres., Nat'l. Aluminate Corp., 422 No. Dover St.,
La Grange Park, Ill. 1949
Giles, J. M., Spl. Repr., Off-Track Equip., Caterpillar Tractor Co., Peoria 8, Ill. 1938
Baltimore, Md. 1950

H

New York 16, N. Y. 1951
Harding, C. R., Pres., The Pullman Co., Merchandise Mart Plaza, Chicago, Ill. 1924
Hickey, J. F., Pres., Baker & Hickey Co., P. O. Box 5008, Tri-Village Sta.,
Columbus 12, Ohio 1946
122 So. Michigan Ave., Chicago 3, Ill. 1949
Hoffman, T. E., Factory Rep., Zone Co., 804 East 17th St., Falls City, Nebr. 1949
Holderman, H. L., Sls. Repr., Bird & Son, Inc., 203 S. West Ave., Elmhurst, Ill. 1951
Holmberg, V. V., Vice Pres., The Ellington Miller Co., 25 E. Jackson Blvd.,
Chicago 4, Ill. 1942
Holstein, F. W., Vice Pres., The Rails Co., 115 Observer Highway, Hoboken, N. J. 1948

J

Chicago, Ill. 1950

K

Kalinka, J. E., Pres., Roberts & Schaefer Co., 130 N. Wells St., Chicago 6, Ill. 1946
Kiester, R. S., Slsman., Pacific Coast Borax Co., 503 Southern Standard Bldg.,
Houston 2, Tex. 1950
Kirk, M. G., Salesman, Pittsburgh Screw & Bolt Corp., P. O. Box 1708,
Pittsburgh 30, Pa. 1948

L

Chicago 1, Ill. 1946
Wabash Ave., Chicago 2, Ill. 1946
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Lofteffler, J. S., R. R. Sales Mgr., Armco Drainage & Metal Prod., Inc.,
43435 Lyndale Ave. No., Minneapolis, Minn.................................. 1955


Birmingham 3, Ala.............................................................. 1948

Detroit 26, Mich............................................................. 1945

Mc

McDaniel, W. L., Vice Pres., Massey Concrete Prod. Co., 111 W. Washington St,
Chicago 2, Ill................................................................. 1945
McMahon, R. D., Sales Engr., Fabreeka Prod. Co., 325 W. Huron St., Chicago, Ill............. 1955

M

Mann, E. A., Pres., Champion Transportation Sls., Inc., 222 W. Adams St,
Chicago 6, Ill................................................................. 1951

Maurer, S. S., Western Div. Mgr., Fabreeka Prod. Co., 325 W. Huron St,
Chicago 10, Ill............................................................... 1952

40 Rector St., New York 6, N. Y........................................... 1950

Mero, C. V., Mastercraft Tile & Roofing Co., No. 1 - 20th St., Richmond Calif.................. 1949

Chicago 16, Ill............................................................... 1952

N


P

Patterson, R., Vice Pres., Intrusion Prepakt, Inc., 80 E. Jackson Blvd., Chicago 4, Ill........ 1946


Phillips, R. O., Sls. Mgr., R. R. Div., The Zone Co., P.O. Box 789, Fort Worth, Texas........ 1956

R

Redding, G. H., Pres., Massey Concrete Prod. Co., 111 W. Washington,
Chicago 2, Ill................................................................. 1946

Richter, R. W., Sales Engr., Armco Drainage & Metal Prod., Inc,
20 N. Wacker Drive, Chicago 6, Ill..................................... 1953

Ruhl, D. A., R. R. Engr., Ordnance Corps, U. S. Army, Joliet, Ill................................. 1948

S

Scott, J. M., Sls., The Arco Co., 614 Delaware St., Scranton 9, Pa................................. 1945

Cleveland 3, Ohio............................................................ 1954

Smith, F. C., R. R. Dept., Marsh & McLennan, Inc., 231 S. LaSalle St, Chicago 4, Ill........ 1948

Smith, W. T., Gen. Supt., Geo. E. Detzel Co., 2303 Gilbert Ave., Cincinnati, Ohio........... 1950

Southwick, C. E., 114 Halstead Circle, Alhambra, Calif............................................. 1945
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<th>Company</th>
<th>Address</th>
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<td>Spietz, W. P.</td>
<td>Monarch Painting Serv.</td>
<td>5621 N. Glenwood Ave., Chicago 40, Ill.</td>
<td>1950</td>
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<tr>
<td>Swallow, O.</td>
<td>Pres., Utilities Div.</td>
<td>The Zone Co., P. O. Box 789, Ft. Worth, Texas</td>
<td>1956</td>
<td></td>
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<td>Thomas, P. E.</td>
<td>Thomas Construction Engineers</td>
<td>3300 Vanderbilt Rd., Birmingham, Ala.</td>
<td>1953</td>
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<td>Thompson, N.</td>
<td>Vice Pres., Homelite Corp.</td>
<td>Port Chester, N. Y.</td>
<td>1946</td>
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<td>Thoresen, H. B.</td>
<td>Sales, Globe Chemical Co.</td>
<td>80 E. Jackson Blvd., Chicago, Ill.</td>
<td>1955</td>
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<tr>
<td>Truss, F. W.</td>
<td>Mgr., R. R. Sls.</td>
<td>Armco Drainage &amp; Metal Prod. Inc.</td>
<td>10 S. Brentwood Blvd., St. Louis 5, Mo.</td>
<td>1946</td>
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<tr>
<td>Walters, W. R.</td>
<td>1535 Rand Tower, Minneapolis, Minn.</td>
<td>1949</td>
<td></td>
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<tr>
<td>Wicker, W. S.</td>
<td>Ch. Engr., Transportation Mutual Insurance Co.</td>
<td>150-10th Street, N.E., Atlanta 5, Ga.</td>
<td>1953</td>
<td></td>
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<tr>
<td>Williams, C. B.</td>
<td>Pres., Ever Tight Bolt Assembly Co.</td>
<td>238 Lincoln Ave., Council Bluffs, Ia.</td>
<td>1954</td>
<td></td>
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<tr>
<td>Williams, G. S.</td>
<td>Supt., Southern Amesite Asphalt Co.</td>
<td>3401 5th Ave. No., Birmingham, Ala.</td>
<td>1956</td>
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<td>Young, R. W., Jr.</td>
<td>R. W. Young Mfg. Co.</td>
<td>20 No. Wacker Dr., Chicago 6, Ill.</td>
<td>1946</td>
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- Heck, J. E.
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- Hubbard, M. J.
- Hull, F. G.
- Hutcheson, F. W.
- Hutcheson, W. A.
- Jones, E. B.
- Koehler, P. L.
- Marshall, R. B.
- Mitchell, D. N.
- Morrissey, J. K.
- Nicely, O. P.
- Nuckols, L. T.
- O'Brien, J. B.
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- Hillman, F. W. (Ret.)
- Huffman, W. H.
- Johnson, D. H.
- Johnson, G. C.
- Womeldorf, C. F. (Ret.)

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<td>Lamport, L. R.</td>
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<td>Vandenburgh, E. C. (Ret.) (Hon.)</td>
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<td>Winkelhaus, L. C. (Ret.)</td>
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### Chicago & Western Indiana

- Ebbens, J.
- Hillman, A. B.

- Murray, D. J.
- Perrine, D. E.

- Peterson, J. E.

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- Cramer, F. H. (Ret.)

- Hemmer, A. F.
- Landstrom, C. A. (Ret.)
- Oest, W. C.
- Pearson, A. H.
- Phillips, B. C.
- Phillips, E. L.

- Seley, L. L.

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