

do not close the door on Theory, Practice or Experience. We can often adapt something that is extremely useful in connection with boiler work and combustion as it relates to locomotive smoke control from each or any of those above mentioned general reservoirs of information. The fundamental principles are natural laws which when properly fulfilled produce the same satisfactory results any time and in any place.

Thank you very much for the privilege of presenting the foregoing discussion.

President Heidel: Thank you, Mr. Brown. (Applause)

Any further discussion of this topic?

Mr. Christopherson: Before I left home I received a letter from a man who is quite an outstanding man on front-end arrangements and draft arrangements. As I understand him, the B. & O. has this equipment now on test. I wonder if there is anyone here from the B. & O. who could tell us a little bit about the outcome of that test.

President Heidel: It appears that there is no one here to answer your question. We will try to get that information and put it in the Proceedings.

Topic No. 1 is closed.

We will have a report now on "Advantages of Steam Space Spray Boiler Checks or Top Boiler Checks Versus Side Boiler Checks," by Mr. K. D. Relyea, Test Department, New York Central System.

Mr. Stiglmeier, will you introduce Mr. Relyea?

Secretary Stiglmeier: Gentlemen, the reason for having the Top Boiler Check report is due to the fact that the Mechanical Division, of the A.A.R., has asked this Association to appoint a committee on this most important subject, and present a report at this meeting, on the advantages and disadvantages of the Top Boiler Check, however, it really was too late to appoint such a committee to work up such a committee report on this subject. This was discussed with the Officers of the association. It was their opinion that the better procedure to follow would be to get someone to present an introduction of the top boiler check by some certain railroad or individual, and then for the year of 1950 continue on with a committee.

It was proposed to Mr. F. K. Mitchell, Manager of Equipment, of the New York Central System, to see if he had any objection to my asking our Test Department to submit a report on the results of the Top Boiler Check of the New York Central System. He gladly gave his approval, and our Mr. W. F. Collins, Engineer of Tests, selected a Representative of his Department, Mr. Relyea, to prepare such a report. It is my opinion that we should have much discussion on this subject, unless there is someone that has a certain question to ask, this in view of the fact that we are going to ask the Executive Board to make this a topic for the year of 1950.

It gives to me much pleasure to introduce Mr. Relyea, who will read his report on the observation that he has followed on the New York Central System, of the Top Boiler Check with spray nozzle. Mr. Relyea.

ADVANTAGES OF STEAM SPACE SPRAY BOILER CHECKS OR TOP BOILER CHECKS VERSUS SIDE BOILER CHECKS

Report by Mr. K. D. RELYEA
Test Department, New York Central System

The patching and renewal of Firebox Side Sheets has been a major item in boiler maintenance for many years and has been a subject of intense research by the members of this association.

The experience of the New York Central has not been materially different from that encountered on other roads. It had been necessary to renew firebox side sheets at every shopping period and a large number of our locomotives have had to receive large patches between shoppings.

In the years 1940 through 1944 we accepted delivery of 115 new Mohawk type locomotives, the majority of which were for combination freight and passenger service. The boiler construction was the same for all with slight variations in cylinder and wheel diameters. While firebox troubles had been with us for many years, this group of locomotives after a short time in service, developed early side sheet failures.

One locomotive of this class after accumulating approximately 28,000 miles of service since construction developed wavy side sheets and leaking bolts. Several others required patches well under 100,000 miles and practically all required new sheets at approximately 120,000 miles.

Metallurgical examination of many sections of these failed sheets usually revealed the same result, that failure was due to fatigue cracks, particularly in the fire region.

These side sheets were purchased by the A.A.R. M-115 specifications for firebox steel. We went back to the original analysis of the steels, the inspection reports, our water treatment, washout practices, the method of making the staybolt holes and cylinder and feedwater pump lubrication practices, all in an effort to determine, if possible, wherein lay the answer to these failures.

The subject was given much thought and study by our engineering and maintenance divisions in conjunction with the manufacturers of the feedwater equipment.

Three courses of action were decided upon:

- (1) The reduction of the amount of oil to the boiler by the strict regulation of the mechanical lubricators and the removal of the feedwater pump exhaust from the heater to the atmosphere on five locomotives.
- (2) A trial application of alloy steel firebox sidesheets, and
- (3) A trial application of a top boiler check and spray nozzle.

It was felt that these three approaches to the problem would yield the answer as to whether it was oil deposits in the boiler, firebox steel or coldwater entrance into the boiler.

The reduction of oil to the boiler gave some indication of improvement but was not the answer as patching and renewing of side sheets continued.

The application of alloy steel side sheets was made to ten locomotives of the "Mohawk" class in 1945. Application was made to alternate sides of the locomotives with the opposite sheet of standard A.A.R. M-115 steel. Four applications were made of manganese-vanadium to ASTM A-225-39T,

Of this group of 65 locomotives, 31 have been through one shopping and five through two shoppings without side sheet repairs. Two have exceeded 400,000 miles, four have exceeded 300,000 miles, 21 have exceeded 200,000 miles and 28 have exceeded 100,000 miles.

To date, we have applied top boiler checks and spray nozzles to approximately 500 locomotives. The same check has been used that was used for the side application and the spray nozzle has been welded to the steel ball ring. The nozzle assembly, see Figure 1, is fabricated at our shops in accordance with Worthington sketches. It has been necessary to relocate the sand box on some classes in order to locate the check in proper relation to the outlet of the dry pipe. The check has been located in the first course on top center. Deflector plates are necessary to keep the water from spraying directly upon the dry pipe.

As a large steam space is best adapted to top check applications some difficulty may be encountered in small boilers by the raising of water.

We have encountered complaints on our J-1 class of water carryover and have installed baffles in order to reduce this tendency. The J-1 or Hudson class has 143 cubic feet of steam space compared to 165 to 267 for other classes thereby making the condensation of steam more critical. In effect, a top check application makes it necessary for the locomotive to increase its rate of evaporation to compensate for the heat given up by the steam to the feedwater. Locomotives with ample steam space will not encounter any difficulty in this respect.

We believe the advantages of decreased firebox maintenance justifies the application of a top boiler check and spray nozzle to all classes of steam locomotives that are subject to repeated failures of their side sheets.

President Heidel: Thank you, Mr. Relyea.

Mr. Stiglmeier, have you a few words to say? We have a few minutes left.

Secretary Stiglmeier: Gentlemen, as I told you a few minutes ago, this is a preliminary report. I don't believe we should have any discussion. It only covers one Railroad. However, I believe it gives enough information for consideration to be given by other Railroads as to the application of top boiler checks, and, as stated, the executive board anticipates making this a topic for 1950. By that time we should be in position to get information from other railroads.

I move that the report as read by Mr. Relyea be accepted, Mr. Relyea be given a vote of thanks, and the Executive Board be instructed to make this a subject for the year of 1950.

The motion was seconded by Mr. Barrett.

President Heidel: It has been regularly moved and seconded that this report be accepted and that a topic be set up for next year's meeting. Any questions on the motion?

DISCUSSION

Mr. Fegan: I would like to ask the gentleman who has just spoken, since they have adopted this spray nozzle have they had any experience with the boiler shell cracking adjacent to the application?

Secretary Stiglmeier: Yes, we have had boiler shells cracking, that are equipped with the Top Boiler Check and Spray Nozzle, this is not a cure

all. Much stress for these shells cracking is laid to this so called alloy steels. Many of these boilers are being replaced with the all-welded shells of a different grade of steel, and the Top Boiler Check with the Spray Nozzle have given very satisfactory performance under those conditions. With this alloy steel that we had been using, I don't believe that a top boiler check is going to overcome cracked shells. The only thing that is going to overcome cracked shells is an all-welded shell.

President Heidel: Is there any question on the motion? All in favor will give the usual sign of raising the right hand; contrary the same sign. It is so carried.

This is the end of the morning session. This afternoon has been given over entirely to visiting of the Exhibits. We want everybody to take advantage of this opportunity. There are some new ideas there that we can take home and put into practice that will be beneficial to the Railroads we work for.

The meeting on Wednesday morning will begin promptly at nine o'clock. We will have an interesting program and I hope to see you all here on time.

If there is no further business, I declare this morning's session adjourned. . . . The session adjourned at eleven-fifty o'clock . . .

NATIONAL LOCOMOTIVE HOT WATER WASHOUT and FILLING SYSTEMS



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its ability to develop economically high H.P. at high speed. In this type of locomotive power generated by a steam turbine is passed through gears directly to the wheels. While only one of these units has been built, it served a very useful purpose in that it demonstrated that a high speed turbine is a suitable form of power for railroad work.

The Norfolk and Western have just recently placed an order on the Baldwin Locomotive Works for a coal burning, steam turbine, electric driven locomotive. The design is somewhat similar to Chesapeake and Ohio Locomotive except for the higher steam pressure 600# P.S.I., length overall 148 ft., 16,000 gal. tender, 20 ton coal, total weight 475 ton, 12 traction motors, 4500 H.P.

These new type or design of steam locomotives will require special advanced training or supervision.

We do not ask you to concur in all the findings and recommendations of the various committees. We do however, want your constructions to augment your considered opinions, personal experience and observations to augment the committee reports. It is my firm belief that any member who takes part in the work of the Association and who participates in the discussions, will find himself increasing in capacity as a leader and will be fitted to do a better job for his railroad. We want to express our sincere appreciation to the speakers who have honored us by attending our convention and to thank them for their time and effort in preparing outstanding papers.

I personally want to express my appreciation to the chairman and committee members for their splendid contributions to the topic reports, which are of excellent quality.

As a boilermaker, I want to speak to you on our relations with the Interstate Commerce Commission Locomotive Inspectors, a number of whom are in attendance at this convention. Both the master boilermaker and the federal inspector are working toward the same end, namely to see that locomotive boilers are safe and suitable for service at all times, that none but the best material and workmanship enter into the original construction of the boiler and that the boiler be adequately maintained at the proper factor of safety throughout the life of the boiler while in service. Let us co-operate with the federal inspectors to the best of our ability in order that our mutual interests will be best served.

The President's address would not be complete without acknowledging the splendid cooperation of our good friend and secretary Mr. Albert Stigmeier whose untiring efforts in behalf of our Association have done much to keep it one of the outstanding mechanical department associations.

In conclusion let me express the Association's appreciation to the members of the Advisory Board and to the Executive Board members with whom it has been a pleasure to work during the years. And now gentlemen, let us get on with the work of the Association. I thank you.

President Heidel: We have a speaker next on the program, Mr. H. J. Burkley, Superintendent of Motive Power, Baltimore & Ohio R.R. Mr. Burkley was one of the gang, he has had many years of experience, he came up the hard way. He thought the machinist trade was pretty good, but then he thought that shoveling coal was better. In those days the stokers were not as dependable as they are today and the coal had to be put in the firebox by hand, so it got to be quite a job. He saw some other jobs with possibilities in them and he started up. He took advantage of every opportunity and by progressive steps he advanced to the position of Superintendent of Motive Power of the Baltimore & Ohio R.R. Mr. Burkley.

MESSAGE BY MR. H. J. BURKLEY

Supt. Motive Power, Baltimore & Ohio R. R.

Mr. President, Officers, Members and Guests of the Master Boilermakers' Association:

Am keenly sensitive of the honor you have bestowed upon me in inviting me here to talk to you today.

The subject as assigned is: "Benefits of Minor Railway Mechanical Associations."

One thing I would like you to remember, gentlemen, this great America of ours is the only country where Associations, or Organizations of subordinates, such as these holding meetings here this week, can assemble for general discussion, and improvement of the product we represent, that is, the Motive Power of our American Railroads, the first line of defense of our Nation.

Am sure you are all aware of the trend of the times, and the disturbing elements at work in our country today, putting forth every effort to discourage, in general, our American way of life. What the eventual outcome may be, if those against us are ever successful, no one knows. So lets keep our eyes open to our surroundings, and fight, and fight hard, to retain the Freedom and Liberty we have all known since the birth of our Nation, and which, by our God given right, and free enterprise system of Government, has protected our American Railroads, and permitted them to become the greatest, and most efficient all year around transportation agency in the World.

The success of our railroads, in turn, has made these annual meetings possible, where so many railway representatives can come together in one common brotherhood, to exchange greetings, expression of thought, ideas, etc., with the view of bettering, in general, the great industry we all serve.

Now, to reminisce a little. Let's Stop, Look, Listen, Think and Consider for a moment, the stride, or improvements made in American Railroadng as a whole in the past 50 years. I do not consider myself a boy any more, nor do I feel that I am an old man, however can remember well the "Camel" engine; the American 8-wheel passenger engine (both large and small) the first Mallet locomotive ever built in this or any other country, and on down the line up to the present day. The old Link and Pin days before the advent of the automatic coupler; the old steam jam before the day of air brakes; the pump connected to the rear crank pin before the days of the injector; gauge cocks only, without either water glass, or water column, to determine water level in locomotive boilers. 165 lbs. steam pressure as against the high pressures of today; wood pilots, hand sanders, wood boiler lagging, etc.

Boiler gadgets, such as flue plugs, (many of these plugs carried in tank boxes, and used by crews on line of road for plugging burst flues, and many others driven in by shop forces at terminals for the same purpose. Have seen as many as 25 flues plugged in one boiler by this method when I was a boy, and no tie rods in them either.) Soft plugs, many of which were plugged by enginemen on line of road with a rat tail file, after same had fused, account of low water. Patch bolts, and rivets driven by hand throughout the entire boiler, and fire box. Copper plugs for lacing cracks in side sheets and flue sheets. Spark boxes at the bottom of the smokebox for sparking front ends. Sectional sheet iron convey pipes, crown bar boilers, button head crown bolts, staybolt iron issued from bar stock cut to length, and ends squared in the smith shop, threaded in bolt cutters, and that, without any tell tale holes whatever.

Arch tubes, and brick arches, siphons and circulators were unheard of. Water treatment was unknown, and for leaky fire boxes, mud rings, etc., in those days, manure, saw-dust, rice, blue vitrol and brown paper, all had their part to play in leak stoppage, and materially assisted in getting locomotives over the railroad.

Have often wondered about the poor old boilermaker "hot man" and how he ever lived through it. Have seen hot men go into fire boxes and disappear in a cloud of steam from leaking conditions, eventually he would dry up enough bolts that his torso was again made visible from the deck. From then on it was in and out of the fire box. In as long as the human body could stand the heat, then out for a breath of air, and a cooling off period, then back in again. This procedure being repeated until the leaks were dried up, and fire box made ready for another trip, at the end of which the same ordeal for another of the craft assigned to handle this character of work.

Why don't these same conditions exist today? Because you boilermakers, Boiler Foremen, and General Boiler Foremen, through your local meetings, district meetings, general meetings and conventions such as this, these many years, have kept insisting that improved means and methods should be developed, and suggestions offered whereby the conditions as mentioned, could be improved upon, and as a consequence, from year to year, through continued persistence, conditions gradually improved, thus the hazard from boiler and fire box failures and appurtenances, injury to employees, was greatly lessened.

The enactment of our present boiler laws, with their demand for a higher standard of boiler maintenance, improvements in design, and use of better materials, further improved the general situation.

Then came the development of chemical compounds for boiler water treatment; the greatest single aid of the age, in my opinion, for boiler and fire box protection, and steam locomotive performance.

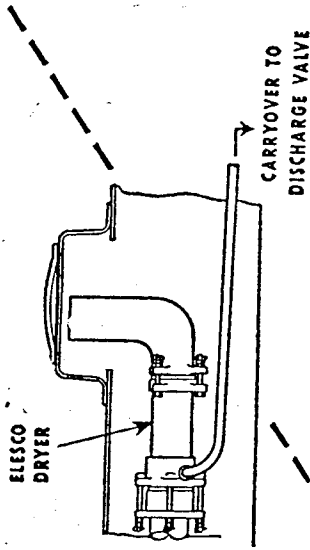
The inauguration of air tools, together with improvements in other boiler tools, and machinery, have also played their part in improving the boilermaker's profession, and increased his efficiency.

The process of welding by use of the electrode, the idea of burning and cutting by use of the acetylene torch have further made yours a craft of genius. Therefore, down through the years, by "bull dog" tenacity, and determination on the part of you boiler men, and those of your craft gone on before you, you have by your fighting spirit greatly assisted in the development of the modern locomotive of today, with its more than a million pounds in weight, and a boiler and firebox of the last word in material, and construction, and a piece of motive power par excellence, surpassing by far any locomotive of any other nation in the world.

Master Boilermakers, your organization, and the Association of American Railroads, has every right to be proud of you, and am sure that the individual railroads that you represent, admire you for your accomplishments.

The first Mallet locomotive ever built, and to which I have referred in my remarks, was built for the Baltimore and Ohio by the American Locomotive Company at Schenectady Works in 1904, and the shop number was 2400.

This locomotive was an 0-6-6-0 articulated compound with 2-20 x 32 HP and 2-32 x 32 LP cylinders and carried 235 lbs. steam pressure with 72 square feet of grate area and 220 square feet of fire box heating surface, with 71,500 lbs. tractive effort and weighed 334,500 lbs. Quite a locomotive for 45 years ago, don't you think.



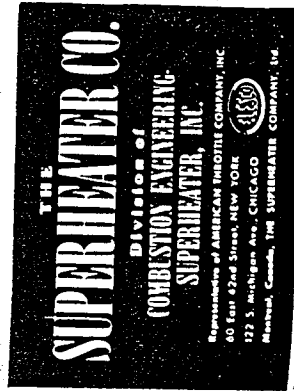
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The designing and engineering of this locomotive was largely taken care of by Baltimore and Ohio personnel, and was quite a pioneering feat for that day when consideration is given to boiler design, dimensions and general construction, as against the largest of other types of locomotives in existence at that time.

This, gentlemen, was the origin of the Mallet locomotive, of which so many of you are familiar today, and it was my thought these details might be of interest to you in mentioning.

Vice President E. H. Gilley (Gen. Boiler Foreman, Grand Trunk R.R., Battle Creek, Mich.): Mr. Burkley, it is indeed an honor and a pleasure to me to be able to respond to your very fine address. The fact that you are Superintendent of Motive Power on the region on which I served my apprenticeship makes it doubly so. Your talk was very inspiring and instructive to us and I am sure that each one of us present will be greatly benefited by your remarks. On behalf of the officers and members of the Master Boiler Makers' Association, I wish to extend to you our thanks and appreciation for your coming here and addressing us today, and it is our hope that you will attend future meetings of this Association.

Thank you. (Applause)

President Heidel: We will now have a report on Topic No. 2—"Recommended Practices for Staybolt Application and Maintenance." This covers (a) Staybolt threading standard, staybolt threads, tapped holes, thread gauges, taps, dies and chasers, (b) Application, (c) Seal Welding of Staybolts, and (d) Maintenance. Dr. G. R. Greenslade is Chairman; Mr. S. E. Christopherson is Vice-Chairman.

This is the third of the papers on this topic. The information that has been gathered together is of much value. We hope that we are setting a standard of staybolt threading taps and dies. Dr. Greenslade.

Dr. Greenslade (remarks in preface to reading of the prepared report): Mr. President, Members of the Master Boiler Makers' Association, and Friends: In starting out I am going to discuss briefly the unified thread. This subject has been introduced as a sort of preface to the final report concerning staybolt threading standards—a subject that has been under discussion at the two annual meetings prior to this. It is not proposed that the remarks concerning the unified thread are to form a part of the threading standards which follow. They are included as a matter of record inasmuch as the unified thread design may, at some time in the future, modify our boiler shop practice.

During the last world war, when machinery, guns, and all types of mobile equipment were supplied to the Allied armies by the United States, Britain and Canada, a great deal of trouble was experienced due to the fact that at one location they might have American guns, tanks, and trucks, while the bolts and other threaded parts available were of British manufacture with Whitworth threads. Many times they were slowed down considerably because these threaded parts were not interchangeable. For this reason the governments of Britain, Canada, and the United States have gotten together and have signed an agreement, or accord, proposing and describing a unified thread.

I will read parts of the paper only, as our time is short.

... Dr. Greenslade read the first portion of the paper entitled, "The Unified British-Canadian-American Screw Threads."

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