

“The Test of Time”

How Manufacturers & Key Contributors
Helped Standardize an Industry

General Session Presentation

May 6th, 2019

Pat Becker - Pressure Vessel Design Engineering Technology



What to Expect...

1. Introduction
2. History – Lots of it - The Power of Steam
3. The Need for Change
4. A Common Cause – The People, Volunteers
5. Developing a Standard – One Code
6. The Early Years
7. From Testing Experience to Application – Implementing Rules
8. Working Together - Changes in Jurisdictional Requirements
9. Steady Progress – One Goal, Many Hands

Who is Pat Becker?

- ▶ **Sr. Technical Designer**

The Babcock & Wilcox Company

2006 – Present

Pressure Vessels (Headers & Drums)

- ▶ **ASME BPVC Section I**

Subgroups Fab & Exam

General Requirements & Piping

- ▶ **National Board Advisory Committee**

Representing Boiler Manufacturers

- ▶ **A Journeyman Patternmaker**

25 years making patterns for the Steel Industry



Patternmaker

1981 - 2006

History – The Power of Steam

- ▶ **Devastating Accidents involving Steam explosions were common in the Mid to Late 1800s**
- ▶ **Industry was booming...(no pun intended)**
- ▶ **Steam Engine and Boiler Design and Operation were not regulated**
- ▶ **There was A LOT of fear ...especially related to Travel**

THE HORRORS OF TRAVEL.

This graphic but by no means extravagant illustration was presented upon the or by mortality only the New

594

like; now it is a fire at sea; now the explosion of a locomotive, and then again the sudden precipitation of an entire train down a steep embankment and perhaps into some river. There has come to be a general feeling of insecurity and distrust, and every man or woman who steps out of a railway car or stands at the termination of their journey exerts due to with a feeling of anxious relief. It is a fact that more lives have been lost by accident this year than in some of the severest battles of the war. It would have taken a heavy battle to have such; in the darkness of death the fifteen hundred will be so easily dispatched thitherward by the explosion of the boilers. In most every case the disaster has been needless; it has arisen from carelessness in mechanics, employes, and directors, who should in every such case be responsible for the murders committed.

HARPER'S WEEKLY.

SATURDAY, SEPTEMBER 23, 1865.

In the Beginning...

(1865)



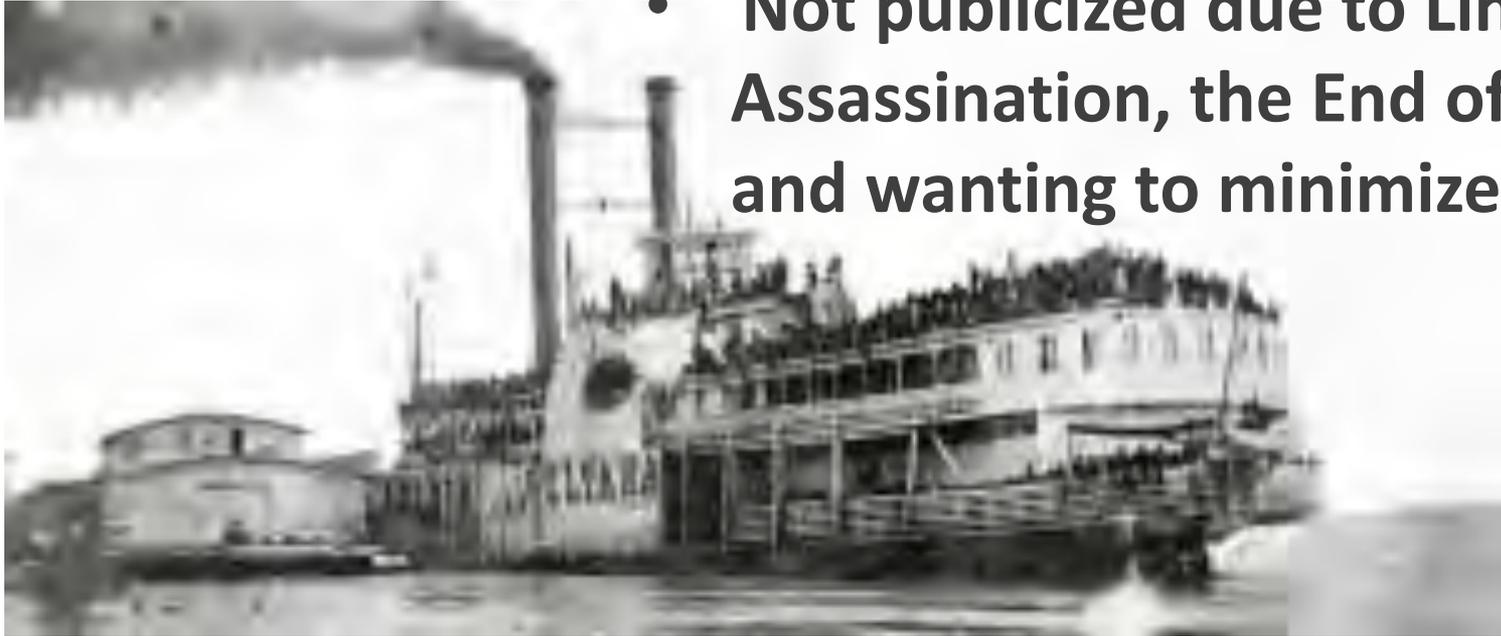
As industrial America sought to push its engines beyond their limits, fire-tube boiler explosions were frequent and tragic.

“It is a fact that more lives have been lost by accident this year than in some of the severest battles of the war.”

B&W

The Sultana – Memphis, TN April 27, 1865...

- Had Safety Valves set at 150 psi
- Death Toll Estimated at 1500 - More lives than were lost on the Titanic
- Not publicized due to Lincoln's Assassination, the End of Civil War and wanting to minimize fear.



150 psi, not a lot? Some Perspective...



A can...
(350+ Miles)



A truck...
(800 ft.)



Not withstanding physics,
150 psi is enough energy
to send...



A 55 gal. drum...
(0.67 Miles)
(3500+ ft.)

The Need for Change... The 'Water Tube Steam Boiler'

B&W Contributes to Progress...

1860s

With a patent awarded in 1856 (S. Wilcox and O.M. Stillman), George Babcock and Stephen Wilcox joined forces to design and market a boiler that increased heating surfaces for better efficiency and was both effective and safe.



George Babcock

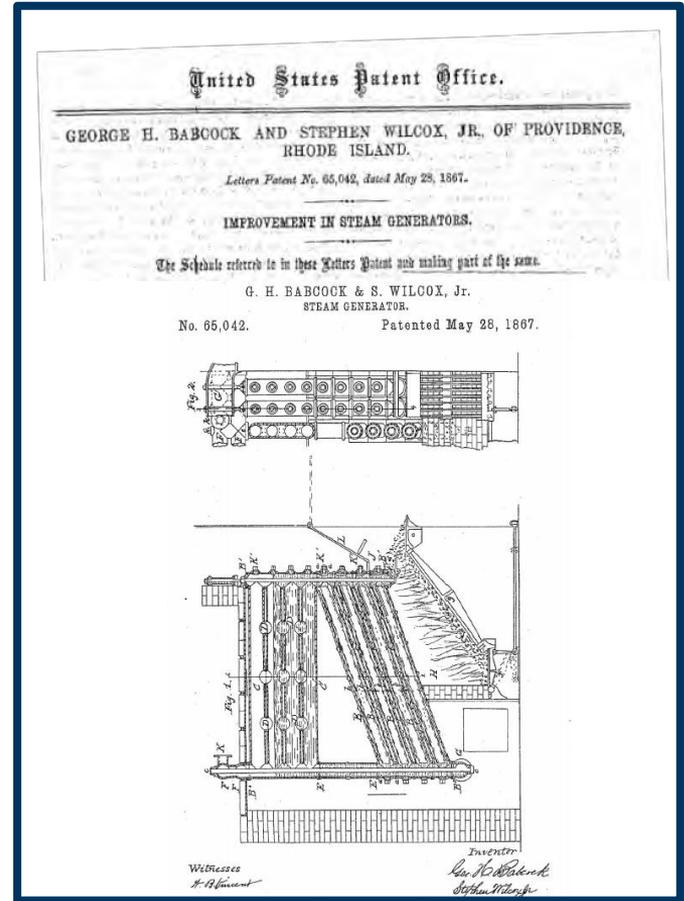
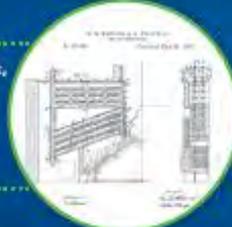


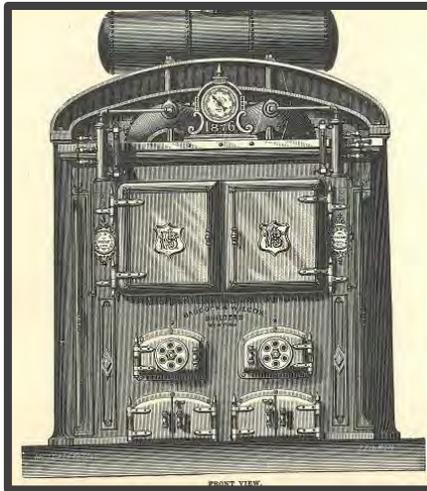
Stephen Wilcox

B&W is established in Providence, Rhode Island, when George H. Babcock, Stephen Wilcox, Jr., and Joseph P. Manton form Babcock, Wilcox and Company to manufacture and market a water-tube steam boiler. This invention patented by Babcock and Wilcox marks the beginning of and set the standard for safe, reliable steam-generated power.

1867

B&W sells its first boiler to Carpenter & Cross





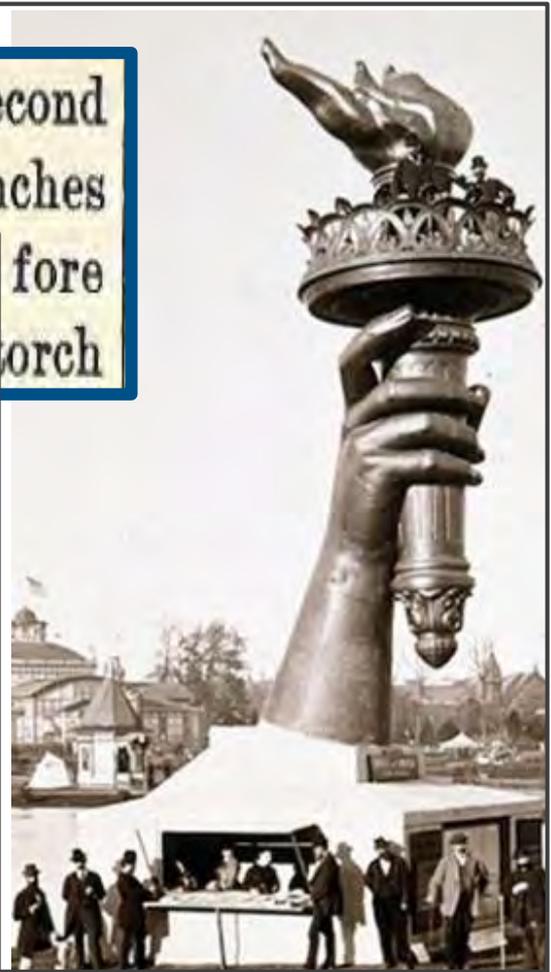
1876 World's Fair *Philadelphia, PA*

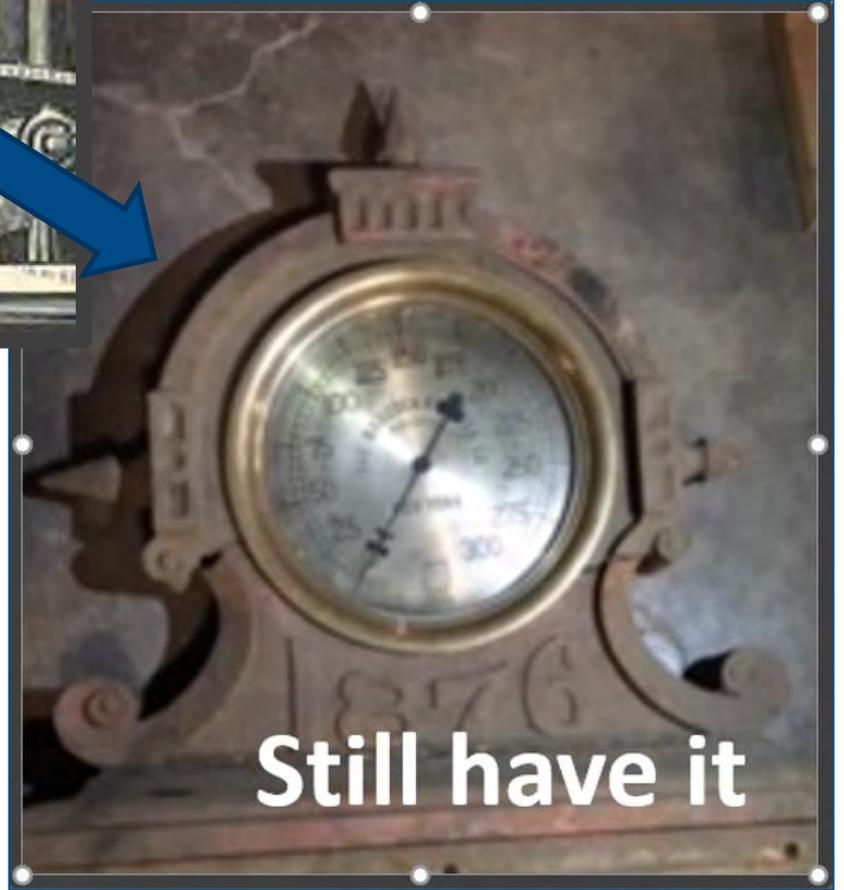
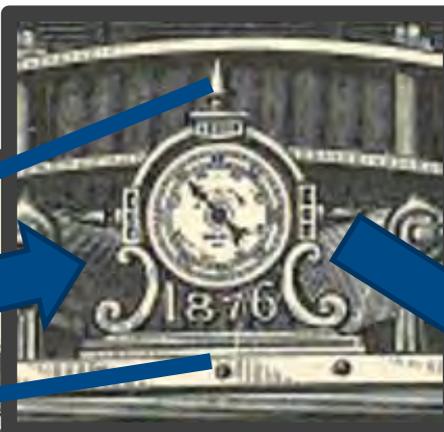
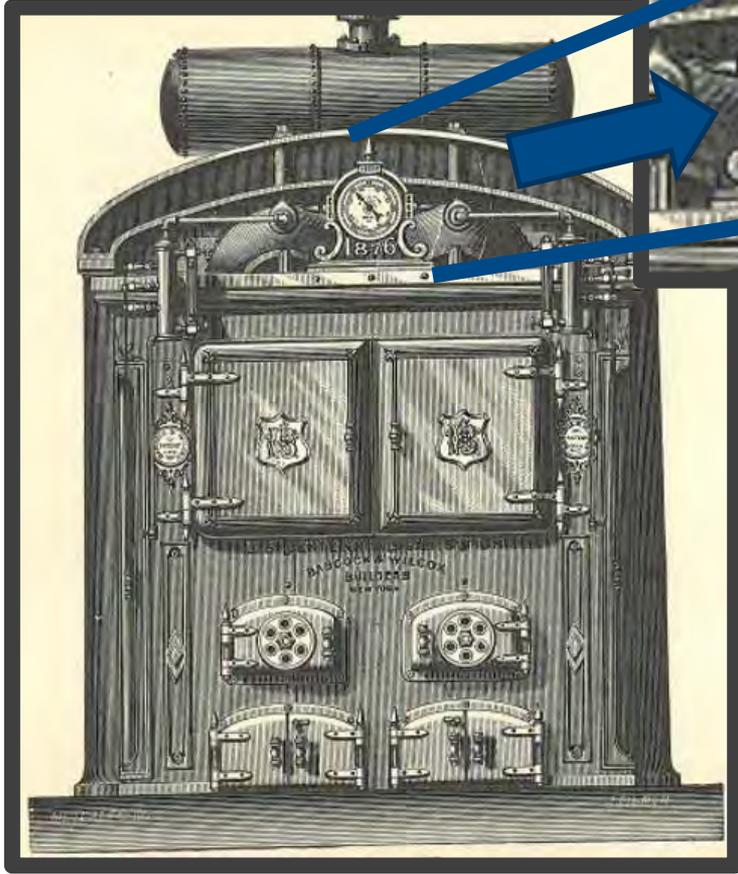
- Demonstration of Full Size *B&W Centennial* Boiler
- Captivated Attendees
- 150 Horsepower
- Gold Medal Winner
- Orders began to pour in...

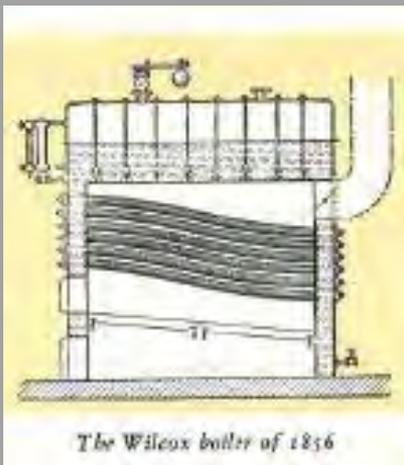


length of hand and wrist is about eleven feet, the second finger is six feet long, and the thumb nail is thirteen inches square. The circumference of the fore arm is sixteen feet six inches. The torch

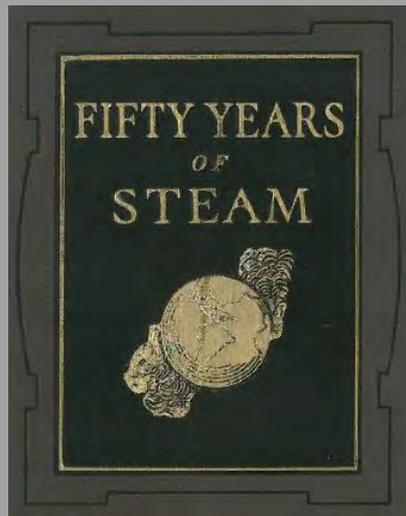
Also
at the
Fair...



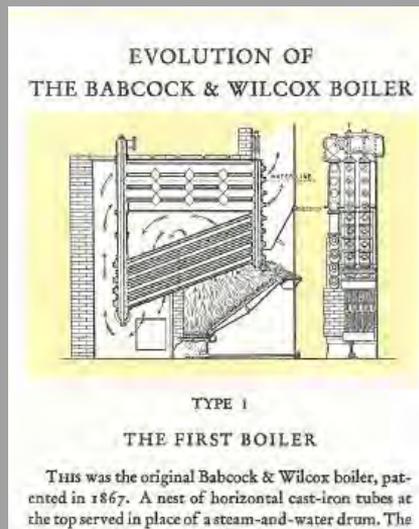




The Wilcox boiler of 1856



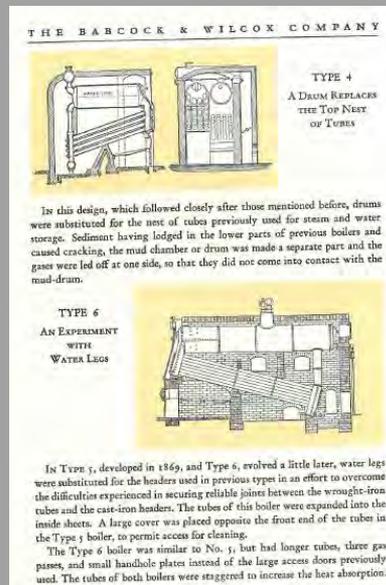
From:
50 Years of Steam
1931



EVOLUTION OF
THE BABCOCK & WILCOX BOILER

TYPE 1
THE FIRST BOILER

THIS was the original Babcock & Wilcox boiler, patented in 1867. A nest of horizontal cast-iron tubes at the top served in place of a steam-and-water drum. The



TYPE 4
A DRUM REPLACES
THE TOP NEST
OF TUBES

In this design, which followed closely after those mentioned before, drums were substituted for the nest of tubes previously used for steam and water storage. Sediment having lodged in the lower parts of previous boilers and caused cracking, the mud chamber or drum was made a separate part and the gases were led off at one side, so that they did not come into contact with the mud-drum.

TYPE 6
AN EXPERIMENT
WITH
WATER LEGS

In Type 5, developed in 1869, and Type 6, evolved a little later, water legs were substituted for the headers used in previous types in an effort to overcome the difficulties experienced in securing reliable joints between the wrought-iron tubes and the cast-iron headers. The tubes of this boiler were expanded into the inside sheets. A large cover was placed opposite the front end of the tubes in the Type 5 boiler, to permit access for cleaning. The Type 6 boiler was similar to No. 5, but had longer tubes, three gas passes, and small handhole plates instead of the large access doors previously used. The tubes of both boilers were staggered to increase the heat absorption.

Evolution of Boiler Design



EXTRA.

ALL WANT ADS
Classified Today on
Pages 10 and 11.

THE EVENING REPOSITORY.

ALL WANT ADS
Classified Today on
Pages 10 and 11.

REPOSITORY ESTABLISHED 1838.

CANTON, OHIO, TUESDAY, MAY 11, 1910.

ONE CENT—NO. 3073

25 OR 30 DEAD IN EXPLOSION AT SOUTH

80 OR 90 MEN REPORTED INJURED; SEVEN BOILERS LET GO AT ONE TIME

Catastrophe Probably The Worst In
Canton's History; Bodies Are Strewed
Over Territory For Yards Around

WOMEN IN ANGUISH SEEK
LOVED ONES AMONG VICTIMS.

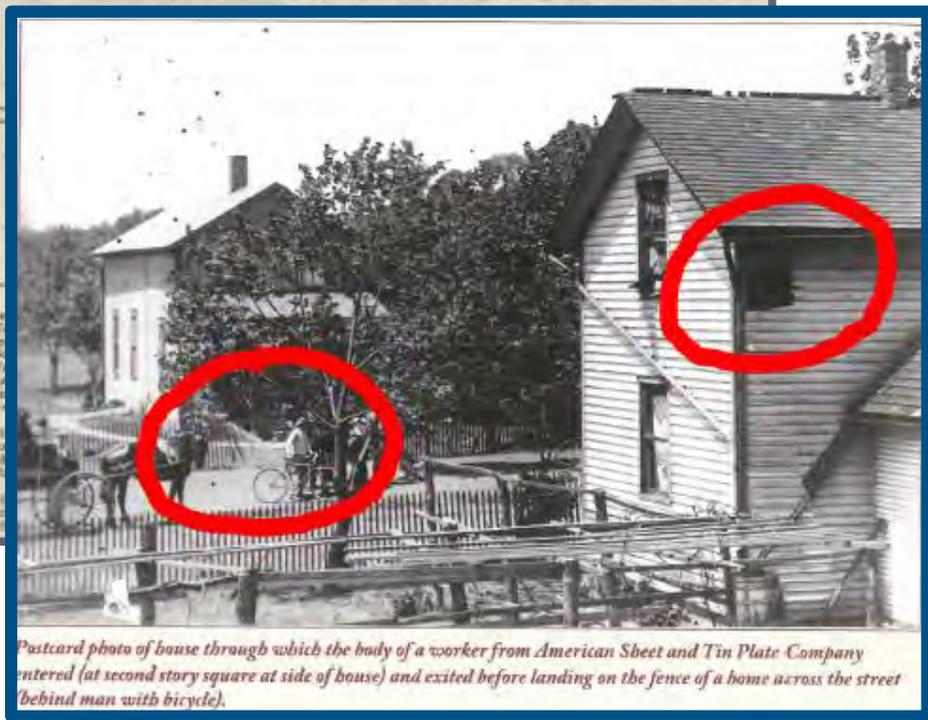
One Body Is Blown Entirely Through
House Block And Half Away; An-
other Lands Near Sinken Plant

CANTON MAN HURT IN INDIANA CRASH

Driver For Circus Wagon
That Is Hit By
Tramcar.

Charles Schaeffer, of Mahoning
town, this city, after an hour
with two children, struck the
tramcar, which was westward.
Rearward light, which a street car

Canton, OH
May 11, 1910



Postcard photo of house through which the body of a worker from American Sheet and Tin Plate Company entered (at second story square at side of house) and exited before landing on the fence of a home across the street (behind man with bicycle).

Picture Courtesy of:
Blowback
Author
Paul Brennan
(NBIC)



THE JOURNAL OF
THE AMERICAN SOCIETY OF
MECHANICAL ENGINEERS

(Including Transactions)

Volume 36

FEBRUARY 1914

BINDING THE JOURNAL

At the end of the year an index will be issued to these sections of The Journal containing the Transactions and the review of periodicals, with directions for binding, and members may follow any one of four plans as best suits their taste:

- (1) Covers of a standard design will be supplied to members by the Society for use by a local binder, at the rate of \$1.25 for half morocco, and 75 cents for buckram, prepaid.
- (2) The Journal may be bound by a local binder, using such a cover as the individual member may desire.
- (3) If copies of The Journal are sent to the Society, prepaid, the Transactions and the review sections will be bound and returned prepaid, at the rate of \$2.25 for half morocco and \$1.25 for buckram.
- (4) The Society will have a limited reserve stock of printed sheets and can sell bound copies to members outright, at the rate of \$4.00 for half morocco and \$3.00 for buckram. As the reserve supply is not large, it is imperative that members wishing to follow this plan should inform the Secretary at once.

Prices to members abroad will be as above, with additional charge for carriage if such is necessary.

The volume of Transactions will be issued in its old form this year as usual and will contain papers and discussion given during the year 1913. This will be Volume 35 of Transactions and following its publication a complete index of the series, including Volumes 1 to 35, will be printed.

It is intended that Volume 35 of Transactions, to be published this year, shall be the last of the old series, and that dependence shall thereafter be placed upon The Journal for the records as well as for the news of the Society.

The Journal in its new form contains a complete record of the Society's activities, and every member who desires to have such a record in his own library should preserve his copies for binding. The Journal will contain a much more thorough presentation of the techni-

cal matter given at the meetings of the Society, which could heretofore be included either in the Transactions, or in both combined. Owing to the necessity for limiting Transactions to a certain number annually, it has recently been possible to publish only the papers and discussions presented at the Annual and Spring Meetings.

Under the new plan of publication, the Transactions are included in permanent form for binding, and papers and discussion of the Annual and Spring Meetings, but reports of the meetings held during the year are now organized in twelve cities; and a review of engineering literature, containing publications which come to the attention of the Society, from every part of the world, is included in the Foreign Review, which has been recently received, augmented by a review of the transactions of engineering societies in different parts of the world.

In other words, under the present plan, the Society will concentrate on The Journal and the Transactions, and its membership a vastly improved service, which will meet the needs of a rapidly growing engineering profession. Such a development, however, can be accomplished only by an avoidance of the wasteful and expensive publication of printed matter in The Journal and in the annual volume of Transactions.

This is one of the important considerations which has led the Council and Publication Committee to combine Transactions and The Journal.

SPRING MEETING

The local committee in St. Paul and Minneapolis have been advancing the preparations for the coming Spring Meeting, to be held in these cities from June 16 to 19, and have tentatively arranged a program with provision for the entertainment of their guests and with opportunities for inspection of the many engineering features of that part of the Northwest. The Committee on Meetings have also mapped out the professional sessions for this meeting, the subjects for which are announced in this issue. The program as arranged follows:

Transactions of the ASME 1914

THE JOURNAL OF
THE AMERICAN SOCIETY OF
MECHANICAL ENGINEERS

(Including Transactions)

Volume 36

FEBRUARY 1914

Number 2

**B&W has maintained the History
by retaining the Minutes and
Transactions of the ASME.
From 1914....to the Present.**

B&W

It's the People. Then...

Dr. Jacobus (David Schenk)

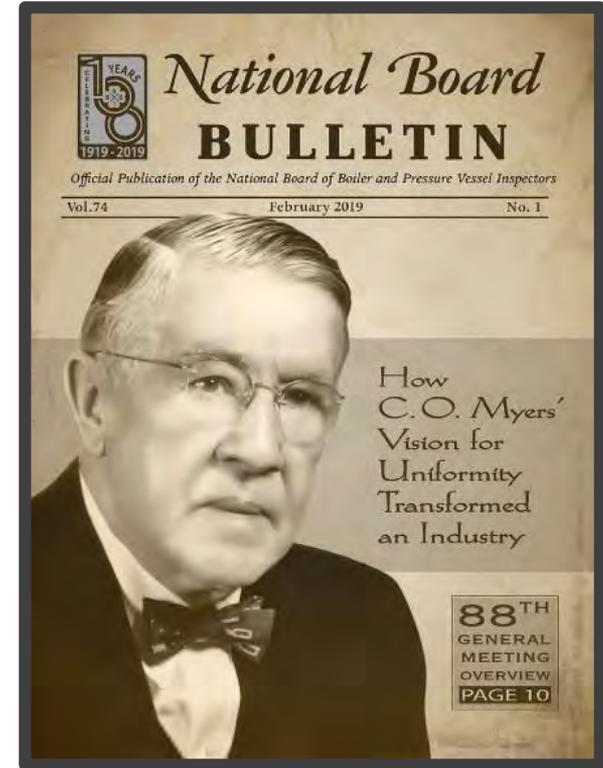
During a career at B&W that spanned 35 years, D.S. Jacobus was solely or jointly responsible for 192 patents, more than anyone else in the Company's history. Jacobus, who came to Babcock & Wilcox in 1906 from the faculty of the Stevens Institute of Technology, acquired patents for his advances in boilers, furnaces, superheaters, steam purifiers, and other power plant equipment. Aside from his technical exploits, Jacobus provides an excellent example of the traits we highly value in people. "The Doctor," as he was known to friends, had a reputation for being practical, diplomatic and approachable—always willing to help younger colleagues with problems or questions. His spirit of teamwork and cooperation helped to make Babcock & Wilcox a superior organization.



D.S. Jacobus

Babcock & Wilcox

C.O. Myers (Carl Owen)



An excerpt from the Transactions...

OPERATION OF LARGE BOILERS

NOTES ON THE FURTHER OPERATION OF LARGE BOILERS OF THE DETROIT EDISON COMPANY

BY J. W. PARKER, DETROIT, MICH.
Junior Member of the Society

AT the December 1911 meeting of the Society, Dr. D. S. Jacobus presented a paper¹ giving the results of the first performance tests on the 2365-h.p. Stirling boilers at the Delray generating plant of the Detroit Edison Company. At the time of his tests three of

these boilers were in service, one having been run about 18 months and the others nine months. Since that time six more of the type have been installed at the rate of two a year, the last two in the autumn of 1913. It is the object of this paper to present some report of the everyday experience in operating all

Reliability. That a boiler unit can be relied upon to run continuously for long periods of time has been the experience of the Detroit Edison Company with the 2365-h.p. Stirling boilers installed at Detroit. Table 1 shows the performance of six of these units during October and December of 1912. This period was chosen as being the time when reliability was most in doubt on account of the heavy load of the plant. The plant load conditions are shown in Fig. 2. The boiler shown in Fig. 2 is typical. It is compulsory to put a boiler out of commission at any time when the load of the plant is heavy, from four o'clock to six o'clock in the afternoon. Of the 215 hours the three Stirling boilers were taken out of commission during the five peak days, Monday to Friday. This time was employed in cleaning furnaces, repairing stokers and in other work. The boilers themselves proved to be 99 per cent reliable.

Possible Cause of Trouble. The cause of the trouble which has led to the taking of boilers out of commission at times when they are needed for service, are being eliminated. There are three sources from which to expect trouble: (a) the

periodical external inspection of the front tubes during furnace repairs. The other tube was in the back row and was spoiled by a mishandled turbine tube cleaner. Its condition was discovered while the soot was being blown from the heating surfaces by hand blowers. However, the leak was very slight and the boiler was not cut out of service until night.



OPERATION OF LARGE BOILERS, J. W. PARKER

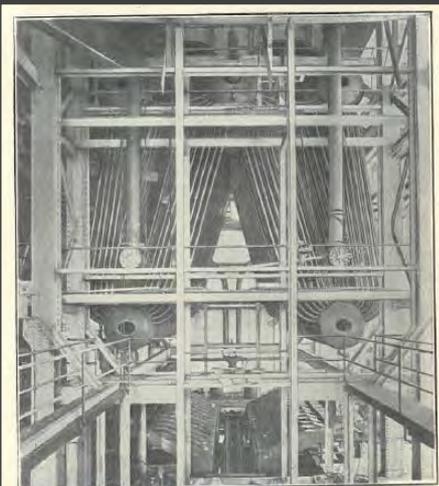
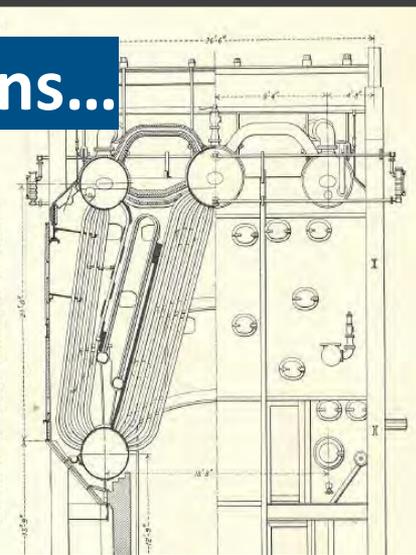
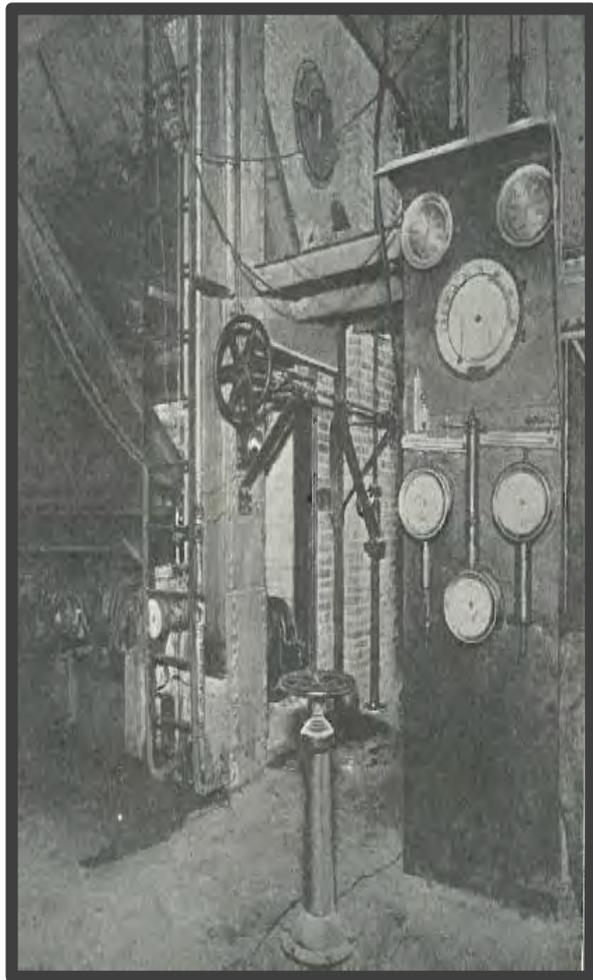


FIG. 1 GENERAL VIEW OF 2365-H.P. BOILER AND STOKER BEFORE BEING BRICKED UP

AT the December 1911 meeting of the Society, Dr. D. S. Jacobus presented a paper¹ giving the results of the first performance tests on the 2365-h.p. Stirling boilers at the Delray generating plant of the Detroit Edison Company. At the time of his tests three of

FIG. 1 GENERAL VIEW OF 2365-H.P. BOILER AND STOKER BEFORE BEING BRICKED UP



A paper detailing performance experience gained from the operation of the Detroit Edison boilers was shared at Code...

Pilot Steam Gage and Indicators. At the end of each firing aisle is mounted a large pilot steam gage. The dial is graduated in divisions of $1\frac{1}{2}$ in. on its circumference but with no figures, and each scale division registers 1 lb. per sq. in. It is found and marked at just what point on this sensitive gage the boiler safety valves will lift and the steam pressure is carried accordingly. On the same gage board with the pilot gage

Regarding the Information Presented by Dr. Jacobus paper on the Edison Boilers...

REGINALD P. BOLTON said that these boilers were a wonderful exhibition of what might be expected in the future construction of boilers intelligently designed to give the gases a chance to burn themselves out, giving complete combustion before the gases got out of the boiler. Another lesson to be learned from these boilers was the effect which such large power uses had in improving the morale and the conditions of the working forces.

Cost of Firing a 12 Boiler Plant in 1914?

TABLE 2 LABOR COST OF FIRING A 12-BOILER PLANT

Maximum load.....	120,000 kw.	12 boilers at 191 per cent
Minimum load.....	20,000 kw.	4 boilers at 96 per cent
Monthly load factor (November).....		46 per cent
Operators employed—		
Morning shift 6.30- 2.30	2 head firemen at 45 cents .	\$7.20
	6 firemen at 40 cents.....	19.20
	2 watertenders at 35 cents.....	5.60
Afternoon shift 2.30-10.30	2 head firemen.....	7.20
	6 firemen.....	19.20
	2 watertenders.....	5.60
Night shift 10.30- 6.30	6 firemen.	19.20
	1 watertender.....	2.80
Boiler room foremen.....		
Total cost per day.....		
Cost of firing boilers—cents per kw.-hr.....		
Actual cost in a neighboring manufacturing room to generate an equal amount of energy at 46 per cent load factor.....		
Estimated cost in neighboring manufacturing room if load factor is 46 per cent (allowing for maximum boiler rating).....		
Scale of pay—watch foreman..... 51½ cents per hour		
firemen..... 25 cents per hour		

Operators employed—		
Morning shift 6.30- 2.30	2 head firemen at 45 cents .	\$7.20
	6 firemen at 40 cents.....	19.20
	2 watertenders at 35 cents...	5.60
Afternoon shift 2.30-10.30	2 head firemen.....	7.20
	6 firemen.....	19.20
	2 watertenders.....	5.60
Night shift 10.30- 6.30	6 firemen.	19.20
	1 watertender.....	2.80
		\$86.00
Boiler room foremen.....		15.00
Total cost per day.....		\$101.00

About
\$100 a Day



Advertising in the 1914 Transactions of ASME

FULTON

Oil and Steam Engines

Are Backed by Our Reputation for Reliability
"Sixty Years of Successful Manufacturing"

We build our machinery complete in our own plant. Long experience has demonstrated the proper materials to be used in our castings and our workmanship is of the highest class.

Fulton-Tosi Oil Engines, Diesel Type
Fulton-Corliss, Medium and High Speed Engines

Write for Oil Engine Bulletin "A."

FULTON IRON WORKS

1289 Delaware ST. LOUIS, MO.

Our Standard Specifications Guarantee
28" Vacuum and higher with 70° F. Water Referred to 30 Inch Barometer



The only moving part required for the operation of this condenser is a centrifugal pump, which supplies the water to the condenser at a pressure of 9 lbs. This is the simplest condenser on the market.

Koerting Multi-Jet Condensers

do not require an air pump, as the jets of water discharging from a number of nozzles through throat and tail pipe act at the same time as a condenser and air pump.

Compared with barometric condenser—our Multi-Jet Condenser has the most desirable advantage that it can be connected direct to the exhaust of the turbine, thus saving you considerable money for long exhaust and water pipes, the continuous expense of keeping the many joints tight to prevent air leaks, and the costly erection.

SCHUTTE & KOERTING CO.

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Foster Superheaters

Will give increased efficiency and economical results in the operation of any plant using steam. Can be applied to boilers of any type, old or new.



FOSTER SUPERHEATER IN BABCOCK & WILCOX BOILER

Foster Superheaters are made for every class of service, either combined with boilers or separately fired. The exterior surface is protected from the destructive action of hot gases—a feature which distinguishes the Foster from all other types.

<p>Perfect Steam Circulation Uniform Superheat</p>	<p>Any Temperature Desired Freedom from Repairs Over a Million Horse Power in Use</p>
--	---

Gaskets for high temperature steam pipes; Piston-rod packing for superheated steam; Ram and Plunger Packing for high-water pressures.

We will be glad to send you some interesting and useful publications dealing with the subject of "Superheated Steam."

POWER SPECIALTY COMPANY

111 Broadway, New York

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PRESSURE AND VACUUM GAGES
OF BOTH REGISTERING AND RECORDING STYLES

All of a superior quality and guaranteed to give greatest efficiency, durability and perfect satisfaction. Backed by a reputation secured in 42 years of successful business.

Complete Catalogue mailed upon request.

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271 Franklin St., BOSTON, MASS.
128 Liberty St., NEW YORK 174 N. Market St., CHICAGO



Green Chain Grate Stokers

For Water Tube and Tubular Boilers

GREEN ENGINEERING CO.

Chicago, Ill.

Catalogue "D"—Green Chain Grate Stokers for free burning bituminous coals.
Catalogue "J"—Green Chain Grate Stokers for coking coals.
Catalogue No. 8—GECO Pneumatic Ash Handling Systems.
Start on application.

THE BABCOCK & WILCOX COMPANY

88 LIBERTY STREET, NEW YORK

WATER TUBE STEAM BOILERS

STEAM SUPERHEATERS MECHANICAL STOKERS

Works: BARBERTON, OHIO BAYONNE, N. J.

BRANCH OFFICES

BOSTON, 25 Federal St.	Portland, Wash. D.C. Bldg.	PHILADELPHIA, North American Bldg.	SAN FRANCISCO, 60 First Street
BUFFALO, 220 Exchange Bldg.	St. Louis, 1000 Market St.	CHICAGO, Algonquin Bldg.	SEATTLE, 1000 First St.
CLEVELAND, 100 Exchange Bldg.	Wash. D.C. Bldg.	PORTLAND, Ore., Wash. Bldg.	ATLANTA, 1000 Peach St.
LOS ANGELES, American Dues Bldg.		SEATTLE, Marine Life Bldg.	CINCINNATI, 1000 Main St.



Keeler Water Tube Boilers

No feature of its design is excluded. All Wrought-Iron Construction, Straight Tubes, Horizontal Drum, Vertical Bundle Walls, Rear Casing, perfect equipment, accessible and compact. This boiler is the result of fifty years of boiler shop practice. Built in units 75 to 1500 Horse Power.

Ask for new illustrated catalog.

ESTABLISHED 1864

New York	Barberton
Philadelphia	Pittsburgh
Cleveland	Chicago
Indian	San Francisco



From Testing... to Experience... to Application Sharing Knowledge & Implementing Rules

the United States in the past 60 years. We supplied over 90 per cent of the boilers for all combat ships in World War II. In addition, B&W destroyer boiler designs were given to two other companies so that the units they produced would be identical with ours and repair and spare parts could be used interchangeably.

Seventy-five per cent of all merchant ships built in that war were equipped with boilers designed by B&W. The Company

The Babcock & Wilcox Company

1867-1967

A Century of Progress

M. Nielsen

built the majority of these boilers. It also gave its detail drawings to eleven competitors, most of whom had never built a marine boiler before. This greatly speeded construction of the wartime emergency fleet and also insured that repair and spare parts would be identical for all such vessels.



Bailey Meter Company...

Bailey Meter Company is in the business of conceiving, developing, and manufacturing instrumentation, controls, and automation systems for public utilities, industrial plants, and the process industries. It was incorporated in 1916 and became a B&W subsidiary in 1925.

Bailey Meter grew out of the need early in this century for more efficient and economical combustion of fuels in boiler furnaces. This required an accurate means of measuring the many factors entering the furnace. Bailey invented the first effective tools in the

Automatic control was the logical step after metering, and in 1923 the first Bailey Meter combustion control was installed. This was the first automatic method of adjusting and maintaining optimum air and fuel supply to the furnace as the demand for steam increased or decreased. It was the forerunner of today's highly



Bailey Meter Company, founded in 1916, is a world-recognized leader in the field of instruments and computerized control and monitoring systems for the power and process industries. Shown above is the control console for a modern central station.

The Babcock & Wilcox Company

1867-1967

A Century of Progress

M. Nielsen

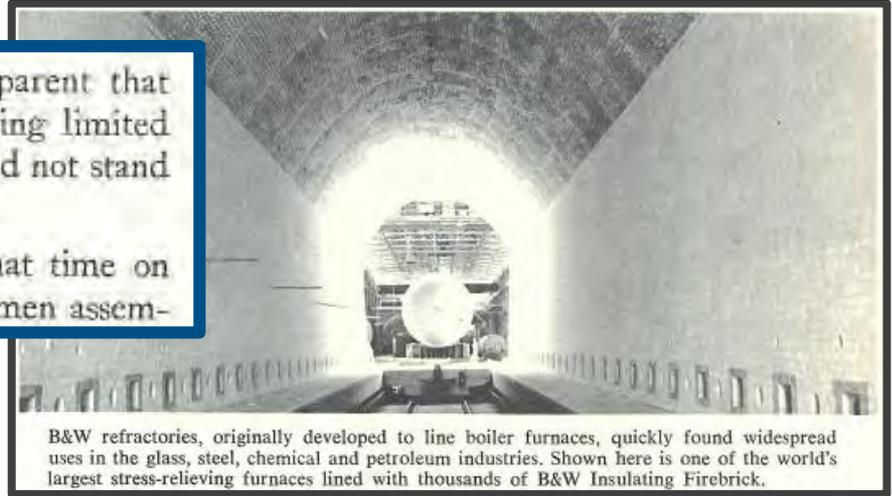


Firebrick and Insulation development...

lining boiler furnaces. By World War I, it was apparent that further development of boiler size and rating was being limited by the quality of firebrick available. They simply would not stand up in large furnace walls at high temperatures.

Very little scientific work had been done up to that time on firebrick. Therefore, the group of outstanding young men assem-

B&W's Refractories Division



B&W refractories, originally developed to line boiler furnaces, quickly found widespread uses in the glass, steel, chemical and petroleum industries. Shown here is one of the world's largest stress-relieving furnaces lined with thousands of B&W Insulating Firebrick.

and by 1930 they invented the first practical insulating firebrick—a development which revolutionized industrial furnace design.

These brick weigh one-eighth to one-fourth as much as ordinary firebrick, and combine high heat resistance, excellent insulating properties, and low heat storage. They can be used directly exposed to furnace gases, and because of their high resistance to the flow of heat require no back-up insulation. Their use makes it possible to design furnaces with light, thin walls, less supporting

The Babcock & Wilcox Company
1867-1967
A Century of Progress
M. Nielsen



Tube and Pipe Process development...

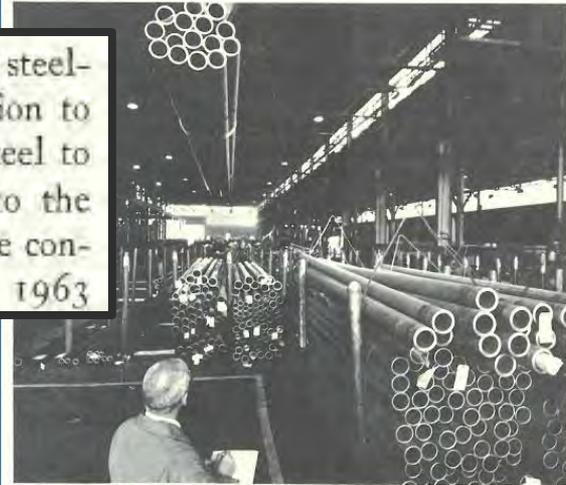
In typical B&W fashion, once we were in the business of steel-making, it was only natural for someone in the organization to insist that there was a better way to go from the molten steel to semi-finished forms such as billets and slabs. This led to the establishment of a research and development project for the continuous casting of steel. As a result of this effort, B&W in 1963

The Babcock & Wilcox Company

1867-1967

A Century of Progress

M. Nielsen



In the search for better boiler components, B&W acquired a tube-making facility in 1904. This has grown to be one of the world's largest suppliers of specialty alloy and steel tubing for the chemical, petroleum, automotive and many other industries.

The Tubular Products Division took another pioneering step in 1952 when it introduced in the United States the extrusion method of fabricating alloy and stainless steel tubes and shapes.

Boiler Shops & Contd. Product Development



**Package
Boiler**

Bayonne Works, NJ



Foundry



Barberton
Works, OH

Train



▶ Hoover Dam Pipe Segment

B&W Barberton Machine Shop – 1930s



Manufacturing &
Early X-ray Equip.

Barberton Works
Machine Shop
Barberton, OH
1930s...



Developing a Standard... ASME to NBIC

"In 1911 The American Society of Mechanical Engineers appointed a committee to formulate standard specifications for the construction of steam boilers and other pressure vessels and for their care in service which committee has since come to be known as the Boiler Code Committee."

MEMBERS OF THE NATIONAL BOARD OF BOILER AND PRESSURE VESSEL INSPECTORS

MEMBERS OF THE NATIONAL BOARD OF BOILER AND PRESSURE VESSEL INSPECTORS

Joseph F. Scott, Chairman	State of New Jersey
R. L. Hemingway, Vice Chairman.....	State of California
C. O. Myers, Secretary-Treasurer.....	State of Ohio
Wm. E. Murray, Statistician.....	City of Seattle, Wash.
J. D. Newcomb.....	State of Arkansas
J. F. Geiger.....	State of Indiana
J. C. McCabe.....	State of Michigan
J. H. Bishop.....	State of Minnesota
Eugene Webb.....	State of Missouri
George A. O'Rourke.....	State of New York
L. R. Land.....	State of Oklahoma
C. D. Thomas.....	State of Oregon
E. W. Farmer.....	State of Rhode Island
M. A. Edgar.....	State of Wisconsin
Gerald Gearson.....	City of Chicago, Ill.
James E. Speed.....	City of Erie, Pa.
W. H. Brooks.....	City of Kansas City, Mo.
E. S. Conser.....	City of Memphis, Tenn.
W. D. Johnston.....	City of Nashville, Tenn.
John M. Lukens.....	City of Philadelphia, Pa.
N. H. Murree.....	City of St. Joseph, Mo.
Robert D. Ridley.....	City of St. Louis, Mo.
Gomer Richards.....	City of Scranton, Pa.
A. J. Bell.....	Allegheny County, Pa.

COMMITTEES.

Executive Committee

Joseph F. Scott, Chairman.....	State of New Jersey
R. L. Hemingway.....	State of California
C. O. Myers.....	State of Ohio
Wm. E. Murray.....	City of Seattle, Wash.

Constitution and By-Laws.

R. L. Hemingway, Chairman.....	State of California
George A. O'Rourke.....	State of New York
C. O. Myers.....	State of Ohio

Specific Designs of Boilers and Other Pressure Vessels.

J. C. McCabe, Chairman.....	State of Michigan
C. O. Myers.....	State of Ohio
Joseph F. Scott.....	State of New Jersey
Claude E. Connelly.....	State of Pennsylvania
D. M. Medcalf.....	Province of Ontario, Canada

The Commonwealth of Massachusetts

DEPARTMENT OF PUBLIC SAFETY, BOARD OF BOILER RULES, STATE HOUSE,
BOSTON.

At a legislative hearing on the 1909 edition of the Massachusetts boiler rules, B&W sent a representative to express his views. Several people at the hearing questioned why a New York company would send a representative to Massachusetts to upset their plans to further their regulations. Surprising everyone, the representative stated that B&W would be willing to cooperate with the legislation, considering it a “movement for the protection of human life and property”.

Internal B&W Memo...

NEW YORK CONTRACT DEPARTMENT - H.B.JONES, MANAGER

BARBERTON CONTRACT DEPARTMENT - J. C. RICHEY

In line with your recent suggestion regarding the history of the State, A.S.M.E. and National Board serial numbers for stationary steam boilers, I am writing this letter to make a record of some principal dates and facts relating to this subject.

The State of Massachusetts authorities originated their steam boiler rules during the year 1907 and the first boiler built by Babcock & Wilcox Company in accordance with their rules was contract number B&W-6391 and which was stamped, as required, with Massachusetts serial number 1. This job was sold July 10, 1908 to the New York, New Haven & Hartford Railroad and was installed at Readville, Massachusetts.

The State of Ohio followed the example set by Massachusetts and the special requirements of this state went into effect in January, 1912. The first boiler built by our company in accordance with Ohio rules was contract B&W-7491, City of Urbana, Ohio and which was stamped with Ohio serial #1. This job was sold December 28, 1911, and shipped in January, 1912. The first Stirling job built in accord with Ohio rules was 8-4758 for Goodyear Tire & Rubber Company, Akron, Ohio, which was stamped with Ohio serial #2. This order was entered January 9, 1912.



B&W

Working Together

The entire first day was devoted to the hearing of addresses. Dr. D. S. Jacobus, acting chairman of the A. S. M. E. Boiler Code Committee, told of the genesis and development of the Code, emphasizing the fact that no *(decision was reached that was not unanimous and mutually agreed upon. This was...)* appreciated from the following list of the inspectors present:

Joseph F. Scott, New Jersey; James Neil,¹ Pennsylvania; C. O. Meyers, Ohio; R. L. Hemingway, California; J. C. McCabe, Michigan; Eugene Webb, Missouri; Geo. A. O'Rourke, New York; L. R. Land, Oklahoma; C. D. Thomas,⁷ Oregon; E. W. Farmer, Rhode Island; Gerald Gearon, Chicago; James Speed, Erie; W. H. Brooks, Kansas City, Mo.; W. D. Johnston, Nashville; Robt. D. Ridley, St. Louis; Wm. E. Murray, Seattle; A. J. Bell, Allegheny Co., Pa.; D. M. Medcalf,³ Ontario, Canada; W. G. Matthewson,³ New Glasgow, N. S.

Report on the Inauguration (1st Meeting) of the National Board of Boiler & Pressure Vessel Inspectors

Transactions of the ASME
1914



C. O. MEYERS
Secretary-Treasurer





JOSEPH F. SCOTT

National Board of Boiler and Pressure Vessel In- spectors Organizes

**Detroit Meeting Fills Long-Felt Need
for Permanent National Body of
Boiler Inspectors**

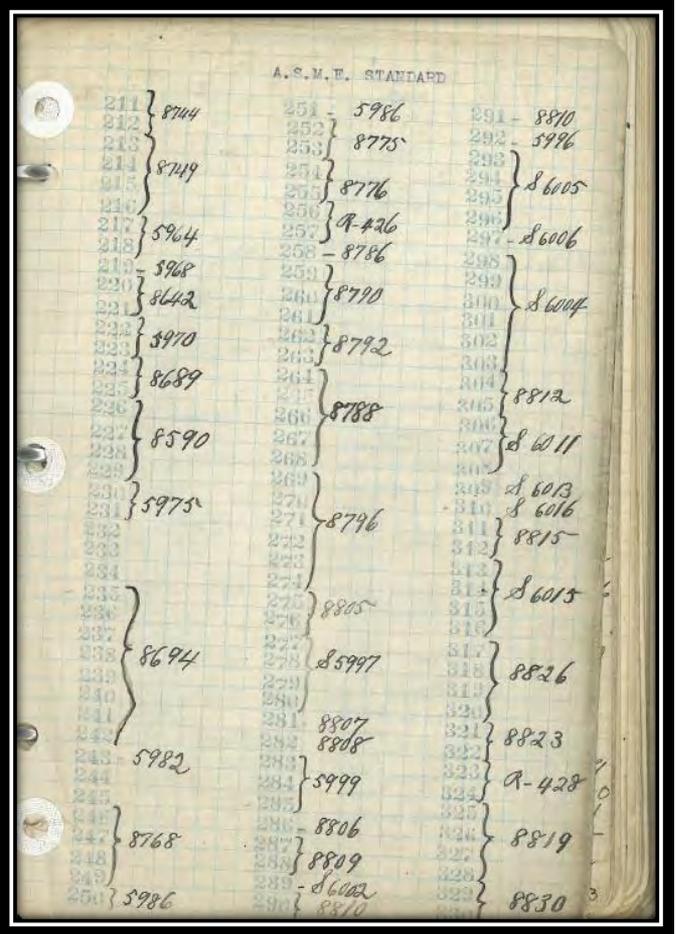
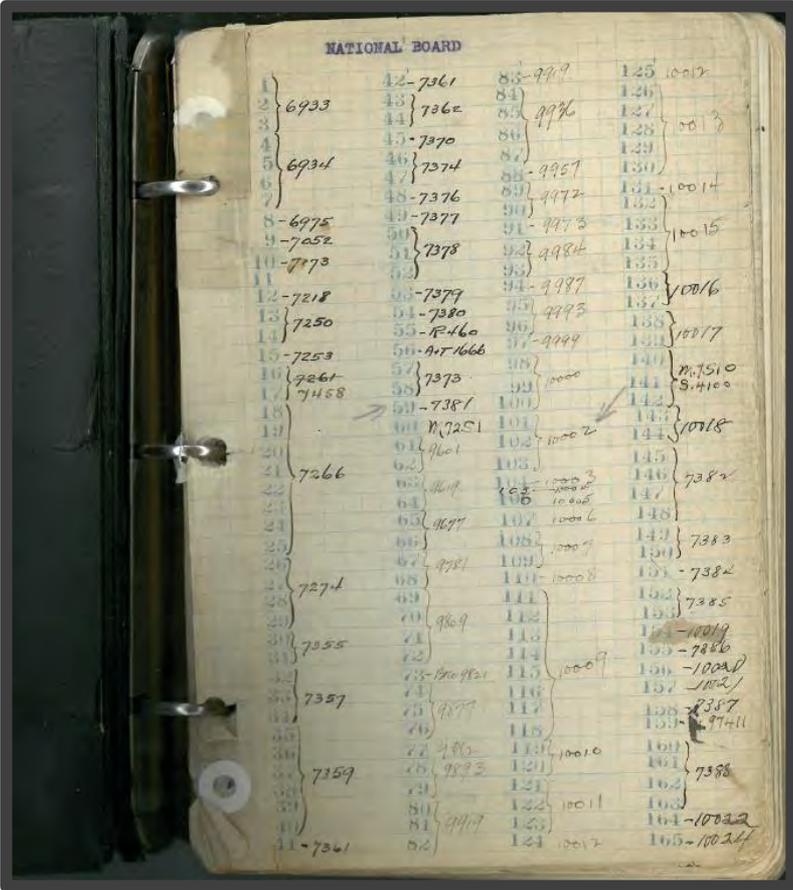
C. O. MEYERS
Secretary-Treasurer

THE first annual meeting of the National Board of Boiler and Pressure Vessel Inspectors brought together at the Hotel Statler in Detroit on Feb. 2, 3 and 4 about sixty people, including members of the Board itself, of the Boiler Code Committee of the A. S. M. E. and others interested.

February 15, 1921

B&W

B&W Log Books for NBIC...



...and ASME 

1909 Data Report & Steam Drum Drawing

THE BABCOCK & WILCOX CO.
NEW YORK.

A.&T. BOILER DATA.

B. & W. CO'S CONTRACT N° 147-1516 NUMBER OF BOILERS 2
 SIZE 2-32-12-18
 NAME OF BOILER OWNER Safton Mfg. Co. OWNER'S SERIAL N° _____ YEAR INSTALLED 1909

- LOCATION Anderson, Ind.
- WORKING PRESSURE CONSTRUCTED FOR, LBS. PER SQ. IN. 160
- FACTOR OF SAFETY 7.03
- NUMBER OF WATER TUBES 144 DIA. 4" LENGTH 18'-0" B.W.G. N° 10 dia.
- HEATING SURFACE, SQUARE FEET 2977
- GRATE AREA AS SHOWN ON DRAWINGS, SQUARE FEET _____
- NUMBER OF POP VALVES 2 SIZE 4" MAKE Ashton
- NUMBER OF STEAM DRUMS 2
- TYPE OF HEADERS, A-T Vertical MATERIAL Cast Iron
- MINIMUM TENSILE STRENGTH OF PLATES AND HEADS, LBS. PER SQ. IN. 54,000
- SINGLE SHEAR OF RIVETS, LBS. PER SQ. IN. 42,000
- DOUBLE SHEAR OF RIVETS, LBS. PER SQ. IN. 78,000

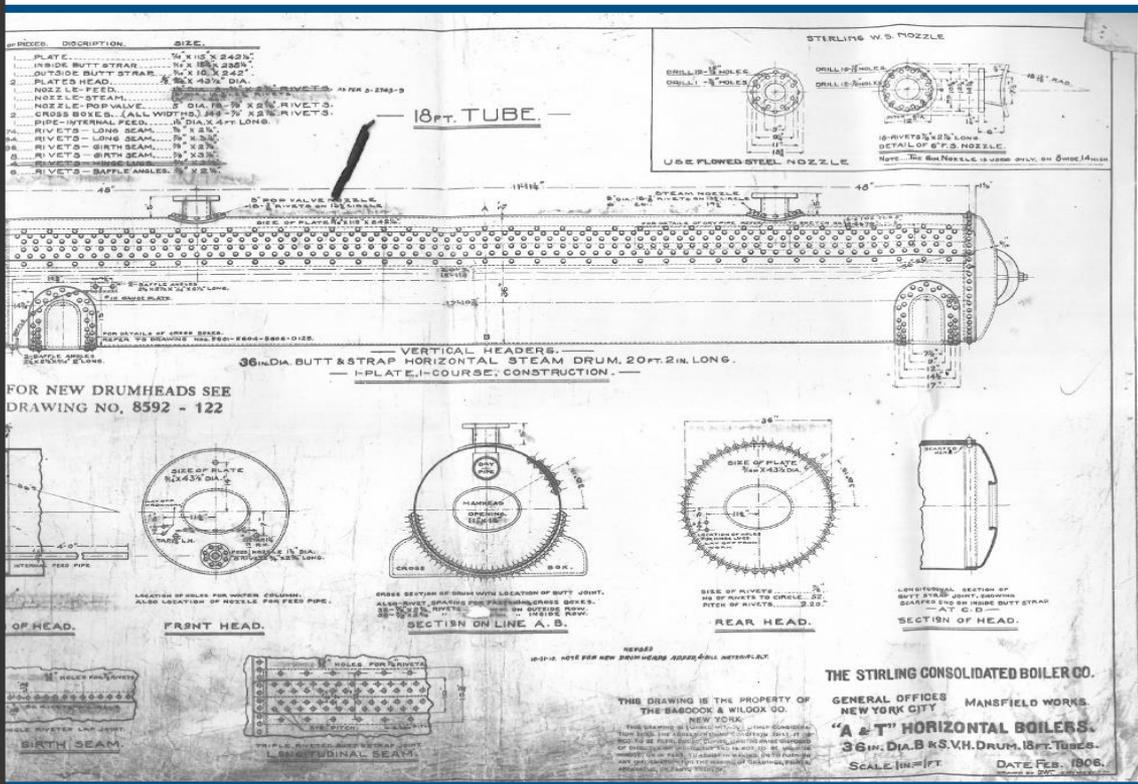
13. INSIDE DIAMETER OF OUTSIDE COURSE	36"
14. LENGTH OVER ALL	21'-2"
15. NUMBER OF COURSES	1"
16. THICKNESS OF SHELL PLATES	7/16"
17. BUTT STRAPS	7/16"
18. LONGITUDINAL JOINT, <u>Double</u> RIVETED, DIA. RIVET HOLE	29/32"
19. PITCH OF RIVETS, OUTER ROW	6.38"
20. " " INNER " "	3.19"
21. EFFICIENCY OF LONGITUDINAL JOINT	85.7 %
22. GIRTH JOINT, LAP, <u>Single</u> RIVETED, DIA. RIVET HOLE	29/32"
23. PITCH OF RIVETS, GIRTH JOINT	2.20"
24. EFFICIENCY OF GIRTH JOINT	98.8 %
25. THICKNESS OF MANHEAD (MANHEAD BOTH ENDS)	5/8"
26. INSIDE RADIUS OF DISH IN HEADS	36"
27. WEAKEST PART	7/16" PL.

— FORMULA FOR FINDING FACTOR OF SAFETY —

$$F.S. = \frac{\text{TENSILE STRENGTH} \times \text{THICKNESS OF TUBE} \times \text{EFF. OF WEAKEST PART}}{\frac{1}{2} \text{ DIA. OF DRUM} \times \text{WORKING PRESSURE}}$$

SETTING DRAWINGS:
 FRONT _____
 SIDE _____
 PLAN _____
 FOUNDATION _____

FIGURED BY _____
 CHECKED BY _____
 PASSED BY _____
 DATE _____



ASME, NBIC.....The State Codes.

California, Maine, Massachusetts, Michigan, New York

N. Y. STANDARD			
1	9106	41	81
2	9128	42	82
3		43	83
4	R. 443	44	84
5		45	85
6	6398	46	86
7		47	87
8	6413	48	88
9		49	89
10	6431	50	90
11		51	91
12	6467	52	92
13		53	93
14	6477	54	94
15		55	95
16	6485	56	96
17		57	97
18	9221	58	98
19		59	99
20	9222	60	100
21		61	101
22	9230	62	102
23		63	103
24	9231	64	104
25		65	105
26	9333	66	106
27		67	107
28	6504	68	108
29		69	109
30	6672	70	110
31		71	111
32	6693	72	112
33		73	113
34	6916	74	114
35		75	115
36	6928	76	116
37		77	117
38	6934	78	118
39		79	119
40	80	120	

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CALIFORNIA STANDARD			
1	41	81	121
2	42	82	122
3	43	83	123
4	44	84	124
5	45	85	125
6	46	86	126
7	47	87	127
8	48	88	128
9	49	89	129
10	50	90	130
11	51	91	131
12	52	92	132
13	53	93	133
14	54	94	134
15	55	95	135
16	56	96	136
17	57	97	137
18	58	98	138
19	59	99	139
20	60	100	140
21	61	101	141
22	62	102	142
23	63	103	143
24	64	104	144
25	65	105	145
26	66	106	146
27	67	107	147
28	68	108	148
29	69	109	149
30	70	110	150
31	71	111	151
32	72	112	152
33	73	113	153
34	74	114	154
35	75	115	155
36	76	116	156
37	77	117	157
38	78	118	158
39	79	119	159
40	80	120	160

The State of Ohio followed the example set by Massachusetts and the special requirements of this state went into effect in January, 1912. The first boiler built by our company in accordance with Ohio rules was contract B&W-7491, City of Urbana, Ohio and which was stamped with Ohio serial #1. This job was sold December 28, 1911, and shipped in January, 1912. The first Stirling job built in accord with Ohio rules was S-4758 for Goodyear Tire & Rubber Company, Akron, Ohio, which was stamped with Ohio serial #2. This order was entered January 9, 1912.



Standardizing Stamping Practices...

American Uniform Boiler Law Society. He told of seeing on his recent trip to the Coast a boiler with the stamps of 22 different states on it, which absurd practice, now not uncommon, would be avoided by the facilities and simple procedure offered by the organization of the National Board.



He told of seeing
boiler with the stamps of
22 different states on it

A Common Cause – One Code

- **Together...**

"In 1911 The American Society of Mechanical Engineers appointed a committee to formulate standard specifications for the construction of steam boilers and other pressure vessels and for their care in service which committee has since come to be known as the Boiler Code Committee."

- **The NBIC, ASME, Inspectors, Manufacturers and Users have worked hand in hand for more than 100 years to Standardize and keep the Boiler Industry safe.**
- **It is the key contributions of thousands of volunteers along the way that are responsible for the longevity of the Code.**

. Together...

This code specified that boilers which were built in accordance with the rules should be stamped with the Code symbol and bear the manufacturers serial number which became known as the A.S.M.E. number to distinguish it from the numbers required by the various states. These state numbers were also included in the stamping on the pressure parts.

FOR A HISTORIC BACKGROUND WE GIVE ON THE FOLLOWING PAGES THE ENTIRE CONSTITUTION AND BY-LAWS OF THE NATIONAL BOARD OF BOILER AND PRESSURE VESSEL INSPECTORS AS IT EXISTED AT THE TIME THIS ORGANIZATION WAS FOUNDED.

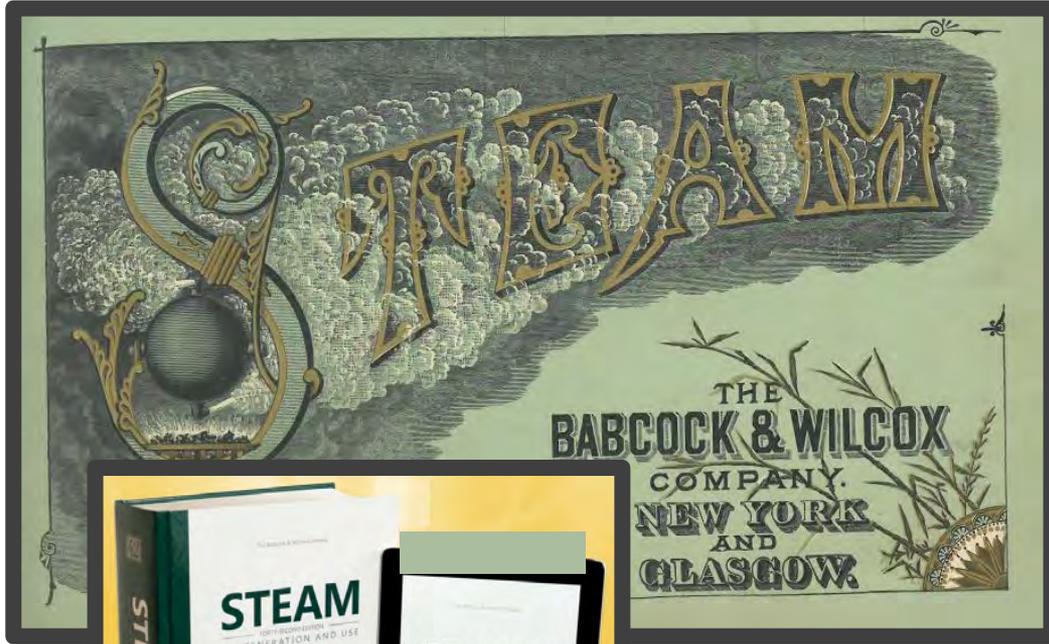
- . The fact that many of the rules are the same today as they were 50, or even 100, years ago is a testament to the forward thinking ingenuity of those involved in the writing of the Code.

Together...

I believe that it is generally conceded that John A. Stevens, the chairman and Dr. D. S. Jacobus were the outstanding personalities on the original committee.

As new technology developed and new manufacturing techniques were introduced, it was the consistent participation by 'Users' of the Code that kept the rules relevant, safe, and in all possible cases, practical.

STEAM - From the 1st Edition in 1875...



...to the 42nd
Edition in 2015

FROM THOSE WHO CAME BEFORE US...



National Board of Pressure Vessel Inspectors
(1930)



At Left: (ASME BPV I) 2014
Below:
(National Board Chiefs, Board of Trustees & Advisory Committee)
2018



TO THOSE WHO WORK TO MAINTAIN THE LEGACY...



To the Manufacturers, Users, Inspectors and
Visitors at ASME & NBIC who contribute their
experience to make
us all a little safer...

THANK YOU!!!

“ This year, the
National Board
celebrates its 100th
anniversary. These 100 years
of success began with C. O.
Myers’ perseverance and
dedication to making the
boiler and pressure vessel
industry safer and more
effective. ”

Thank you, Mr. Myers, for leading us by
example, for 100 years and counting. ♣

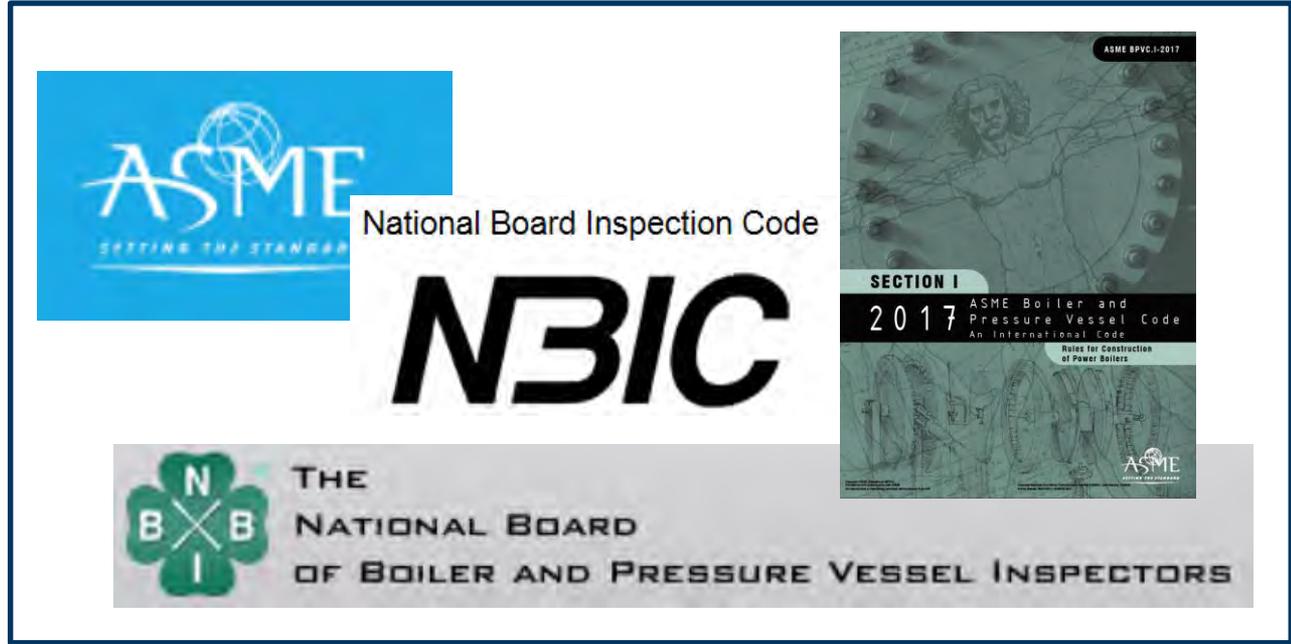


ASME, NBIC, & Volunteers...



One Code.
One Inspector.
One Stamp.

Keeping the Industry Safe.
For the next One Hundred Years...



THANK YOU!

(AND HAVE AN ENJOYABLE AND PRODUCTIVE WEEK 😊)
QUESTIONS?

Patricia A. Becker
The Babcock & Wilcox Company
Pressure Vessel Engineering & Design
(330) 860-2807
pabecker@babcock.com

