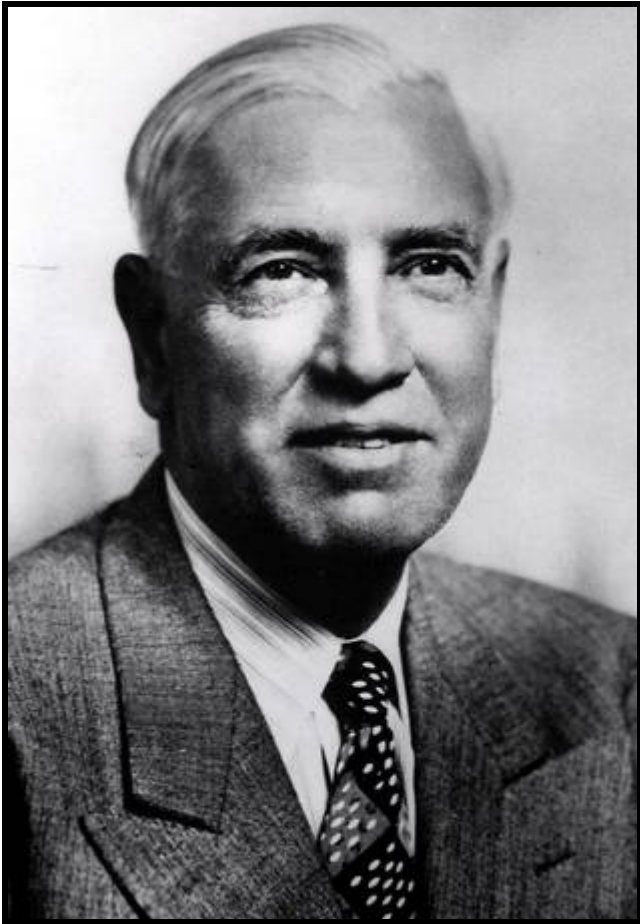


# REUBEN TRANE HEATING & AIR CONDITIONING

by Brian Roberts, CIBSE Heritage Group

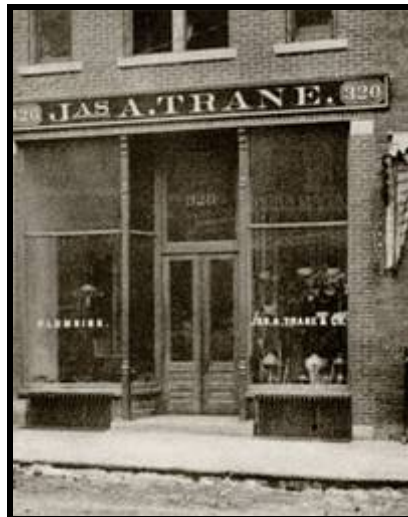


*Reuben Nicholas Trane, 1886-1954*

## A BUSINESS IS STARTED



*James A Trane*



*1906 Jas A Trane Plumbing*

James A Trane left his native country of Norway and set up in the plumbing and heating business in La Crosse, Wisconsin in 1886, the same year as his son Reuben was born. His store was described as “the largest plumbing building in the State.”



*The Trane Plumbing & Heating Store*



*Trane Storefront  
La Crosse, Wisconsin 1902*

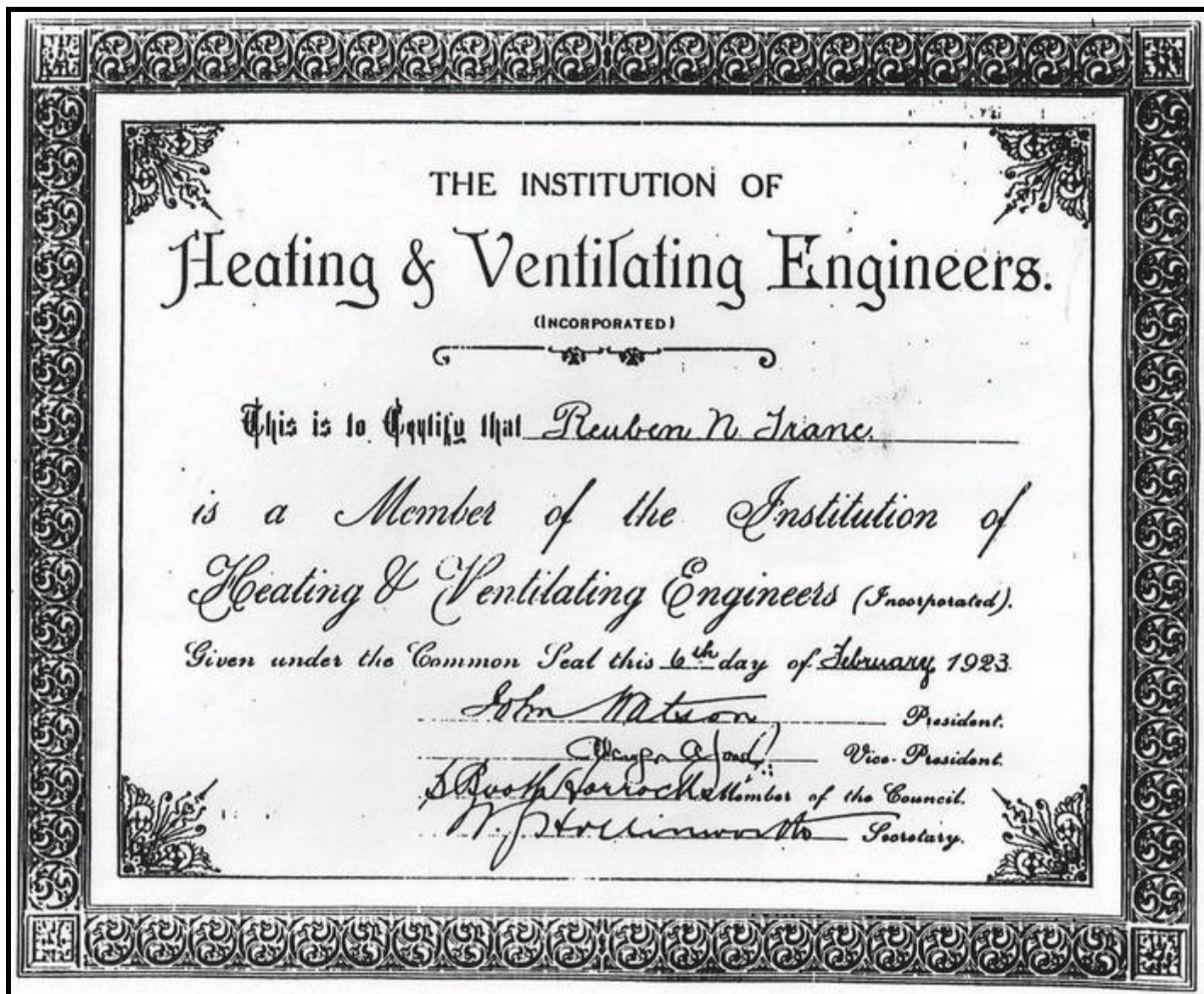


*The James A Trane Business*

## **REUBEN TRANE AT THE HELM IN THE HEATING YEARS**

Reuben Trane was born in La Crosse, Wisconsin on 13 September, 1886, the only son of James Trane and Mary Miller Trane. In 1910 Reuben graduated with a Bachelor of Science in Mechanical Engineering and then worked as a sales engineer for a Milwaukee machine tools firm. In 1912 he married Helen Hood of Madison. In 1913 Reuben returned to La Crosse and with his father incorporated The Trane Company to manufacture steam valves and traps that James had invented for use in vapour heating systems. Three years later, Reuben Trane assumed the Company's presidency.

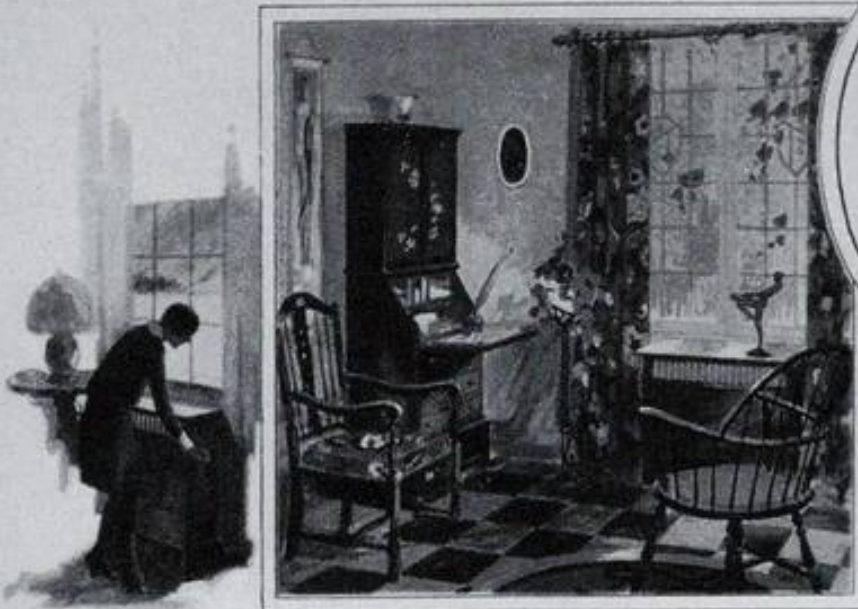
During the First World War, Reuben Trane devoted much of his time to war projects but in the years that followed he expanded the business, adding to the premises and the number of staff. He was joined by his brother-in-law, Frank Hood, who became a Director, Assistant General Manager and Treasurer. Reuben and Frank made a good team. Reuben headed the drive for the development of new products, while Frank handled all financial matters.



Reuben Trane's IHVE Membership Certificate, 1923

Around 1925 Reuben Trane conceived the idea of a lightweight convector heater as a successor to the heavy cast iron radiator. This heater consisted of a "heat cabinet" housing a fin-and-tube coil having thin copper or aluminium fins attached to copper tubing through which steam or hot water was circulated. Attempts to sell the idea to the large established radiator companies were unsuccessful so in 1926 he began manufacturing it himself. He went on to add a fan, creating the fan convector. The Company went from strength to strength even surviving the 1930's depression when Reuben Trane and his Company entered the air conditioning market.

# Reuben N. Trane's Achievement Made Heating History!



REUBEN N. TRANE,  
President, The Trane Company

## Replaces the Unsightly Radiator with Efficient Heating Furniture

"A radical improvement, yet based on sound, accepted heating principles"—that was the news quickly circulated throughout the heating world, following the announcement of Trane Heat Cabinets.

The long-awaited "Successor to the Radiator" had arrived. Architects, engineers and the public quickly responded to this new achievement of Reuben N. Trane. They recognized that here, at last, was an opportunity to escape the limitations of existing methods—to attain new standards of heating efficiency—to make heating a constructive factor in the planning of beautiful interiors.

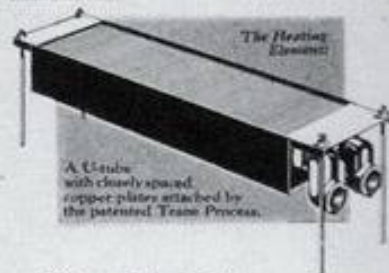
Trane Heat Cabinets of the visible type have all the decorative possibilities of the finest furniture. Not a modified radiator, but a new type of equipment, heating by convection. *Write today for complete information.*

THE TRANE COMPANY  
Established 1885. LA CROSSE, WIS.



A—End view of Trane Heat Cabinet (inside view), showing position of the damper.

B—Front view—Cross-section, indicating position of heating element and damper in the cabinet.

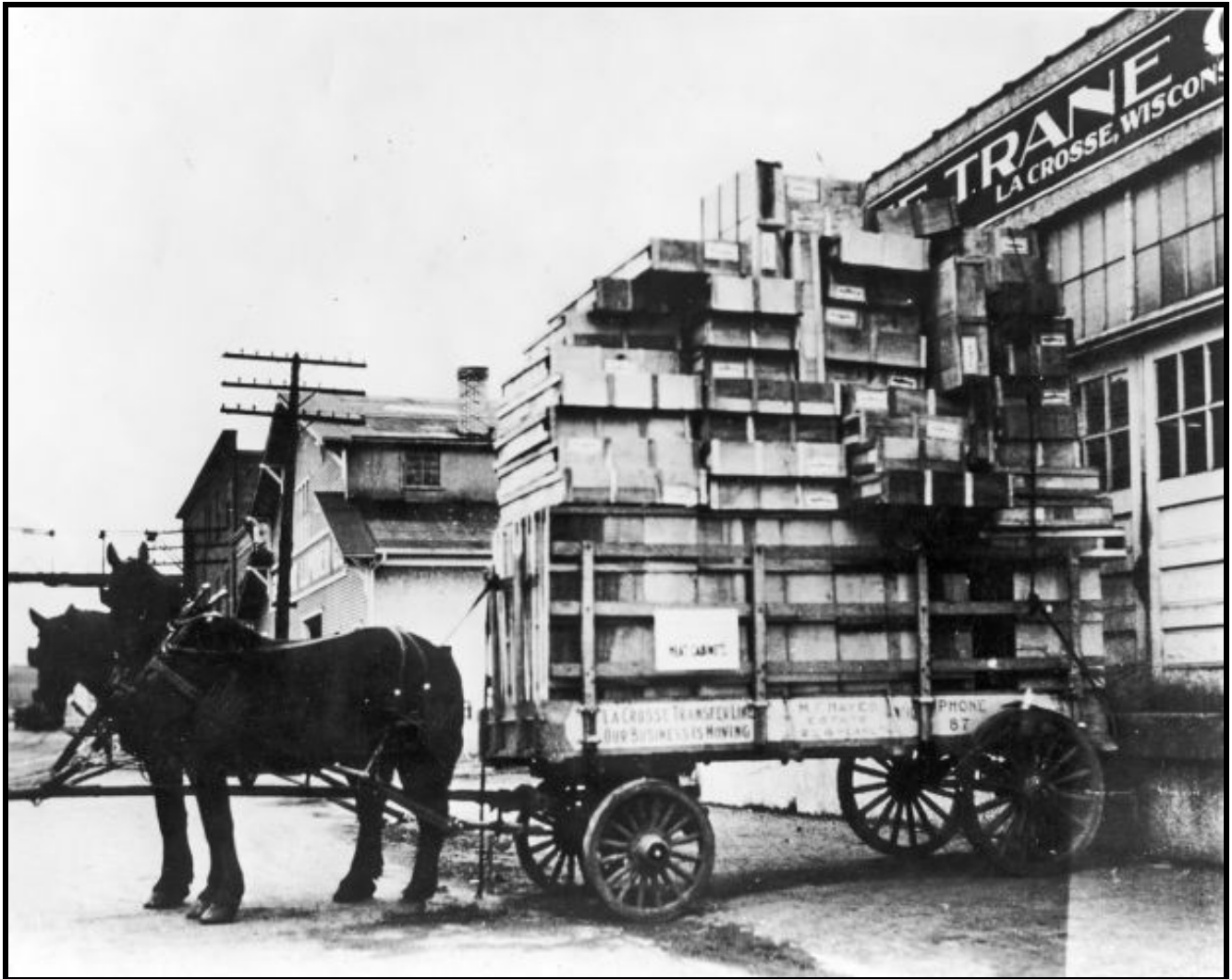


A U-tube with closely spaced copper plates attached by the patented Trane Process.

# TRANE

## HEAT CABINETS

*Successors to the Radiator*



*Trane Company, La Crosse, Wisconsin, 1925*

## **THE AIR CONDITIONING YEARS**

The Trane Company was to become a pioneer in the relatively new field of air conditioning and in 1931 developed the Trane Unit Cooler. This blew air across finned coils through which cool well water was circulated and its first commercial applications were in cinemas. The company went on to introduce a range of “air conditioners” in 1932 and 1933.

With the depression the industry fell upon hard times but Trane managed to remain solvent. As the United States came out of the depression, the company introduced a major innovation. This was the industry’s first *hermetic* centrifugal refrigeration machine for producing chilled water (Trane had to compete against the Carrier centrifugal chiller first introduced in 1922). Reuben Trane christened the new machine the “Turbovac.” The year was 1938. Also in the late 1930s, Trane began manufacturing fans, mainly for use in its air handling units.

Then during World War II, Trane manufactured a variety of products for the armed forces and, perhaps most important, an aircraft intercooler which enhanced performance.

# How Reuben N. Trane's Vision Revolutionized Heating

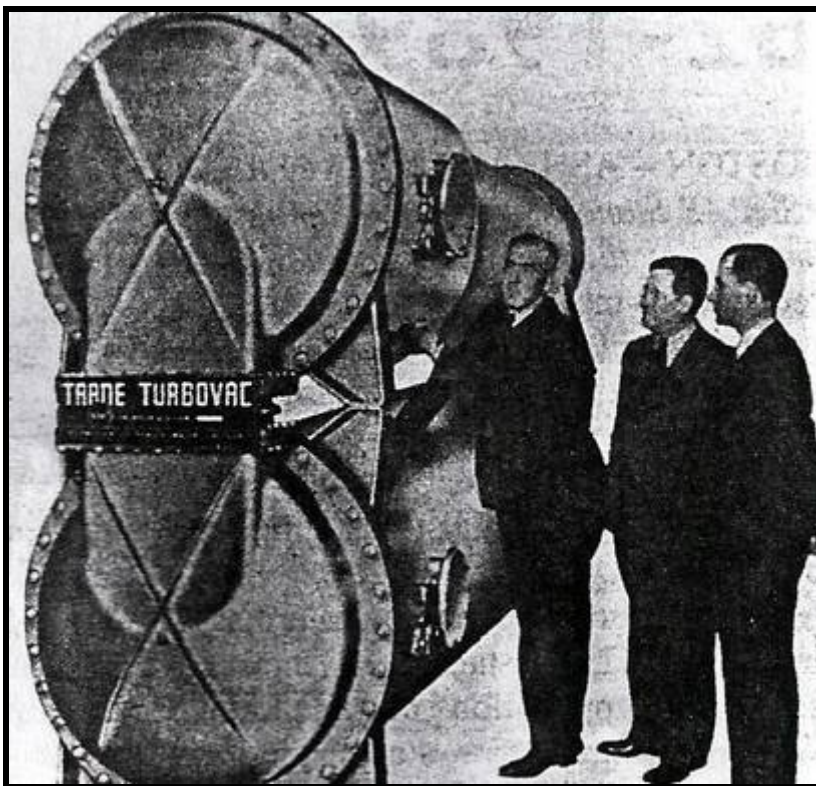


*In 1931, Trane provided a "Cooling Coil System" for the Indianapolis Theatre*





*The Trane DC3 Sky Sleeper with Reuben Trane (left), c.1939*



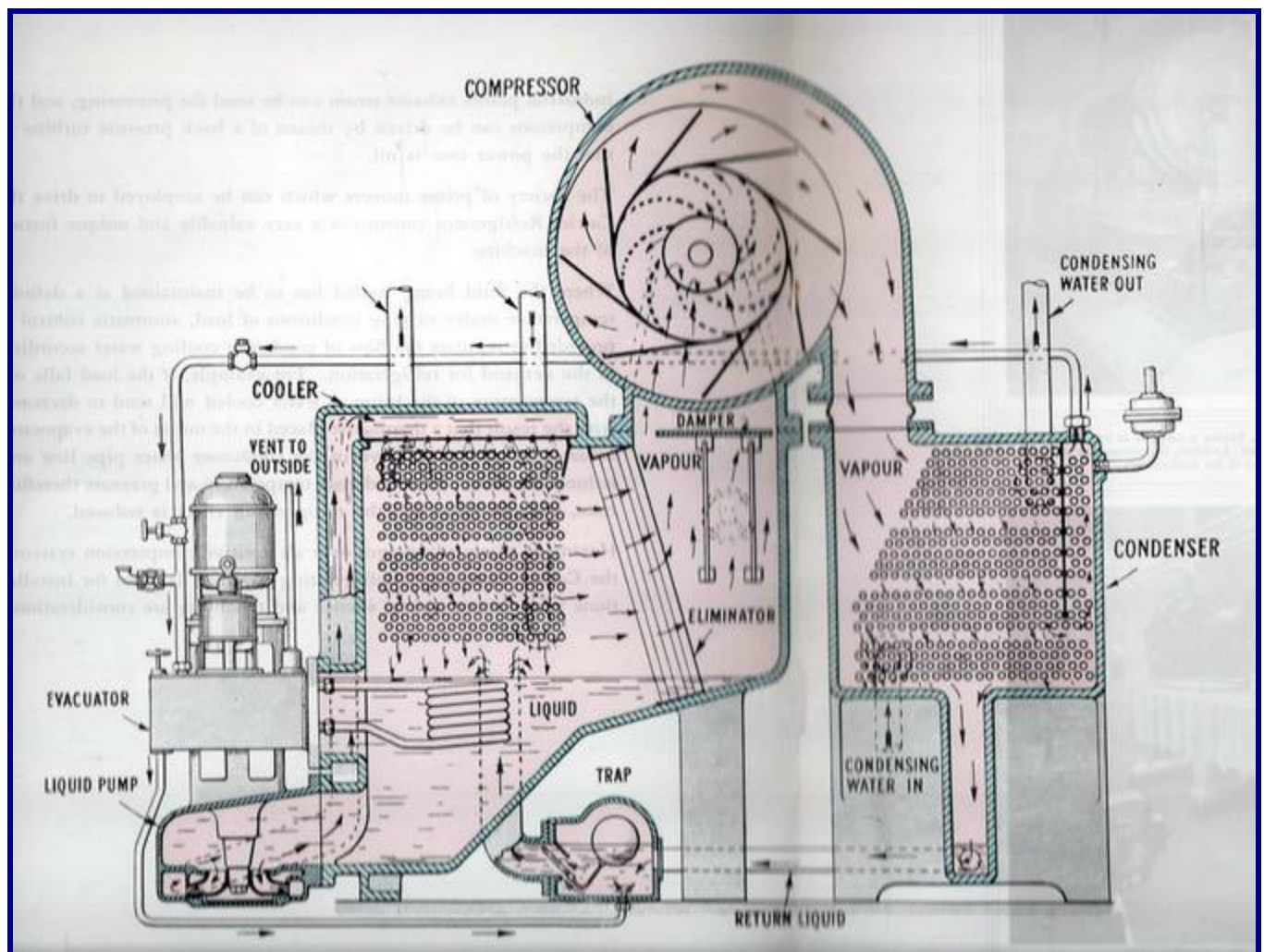
*Introduction of the Turbovac, 1938*

By 1951, the Company had developed the still more efficient centrifugal –the “Centravac.” In 1950, Trane began to manufacture its own reciprocating refrigeration compressors and a few years later the production of self-contained air conditioning units.

## OUTLINE OF CENTRIFUGAL REFRIGERATION DEVELOPMENT

Centrifugal compressors, once also termed turbo-compressors, were initially used for air, but the first attempt to use them for refrigerating machinery was made by Lorenz and Elgenfeld in 1910-11. About the same time, in France, Leblanc obtained a broad patent for his centrifugal compressor and built a workable experimental machine, using water vapour as the refrigerant. (He also invented a steam jet machine in 1905 and with the help of Westinghouse demonstrated a successful apparatus in Paris in 1910). Leblanc was unable to make progress with his centrifugal compressor due to the lack of a suitable refrigerant.

Willis Carrier became interested in the centrifugal in about 1911, but it was not until 1922 that he was able to demonstrate the first practical machine. Over the years, a number of other companies manufactured and sold centrifugal water chillers: Brown Boveri, Ingersoll-Rand, Trane (1938), Worthington, York, Ideal Standard and Sulzer.



*Diagram of a Carrier centrifugal refrigeration machine*

March 9, 1926.

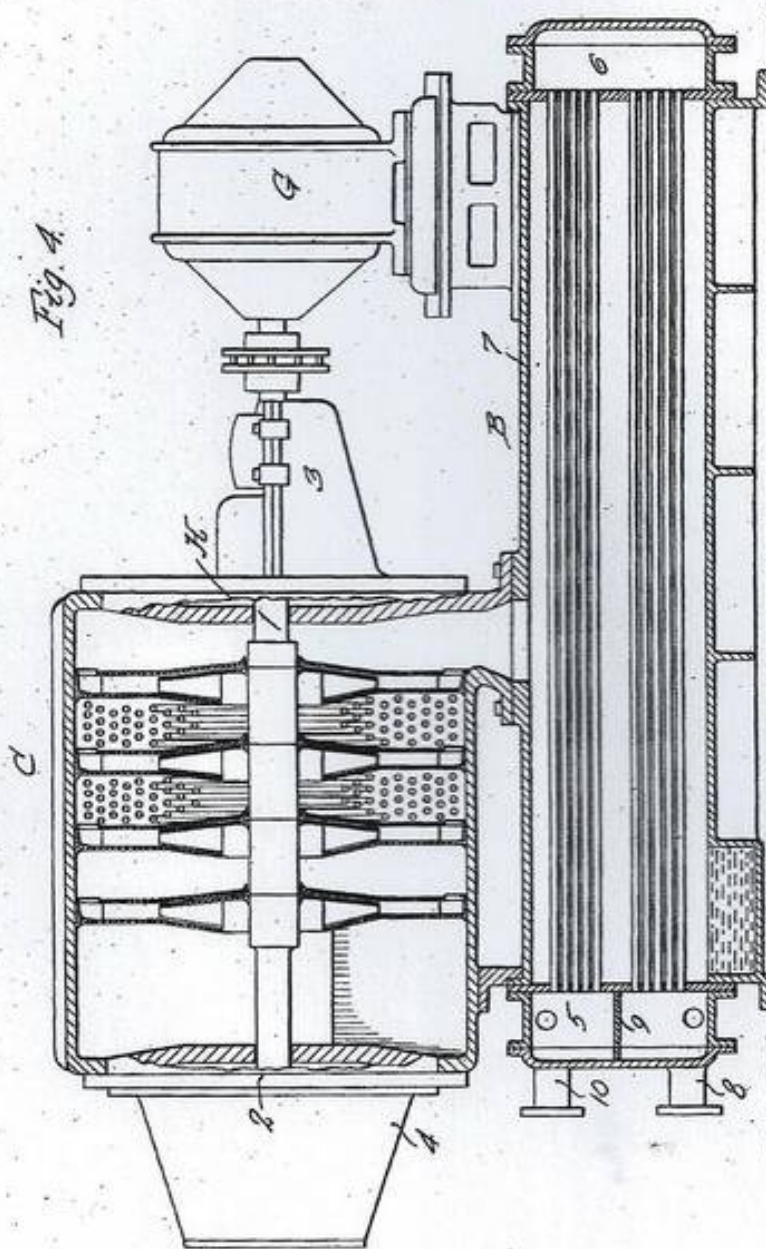
1,575,819

W. H. CARRIER

REFRIGERATING SYSTEM

Filed April 5, 1921

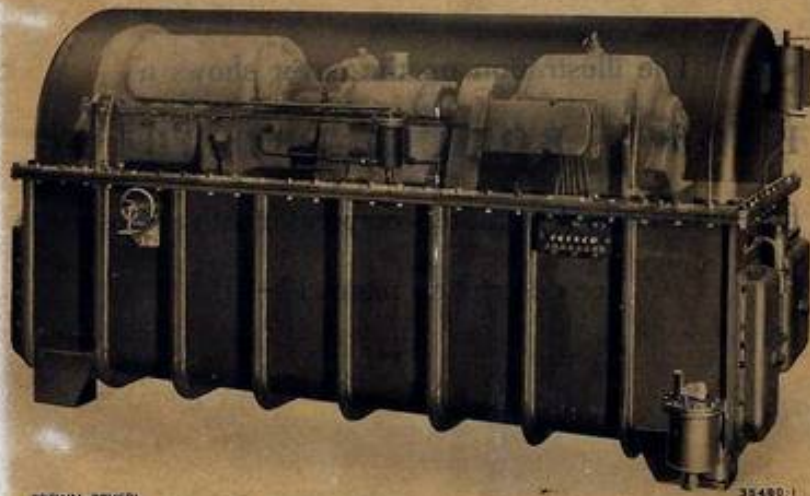
3 Sheets—Sheet 2



INVENTOR  
*Willis H. Carrier*  
By *Parker & Prochman*  
ATTORNEYS.

One of many Willis Carrier patents for his centrifugal refrigerating machine

# Brown Boveri Refrigerating Turbo-Compressors



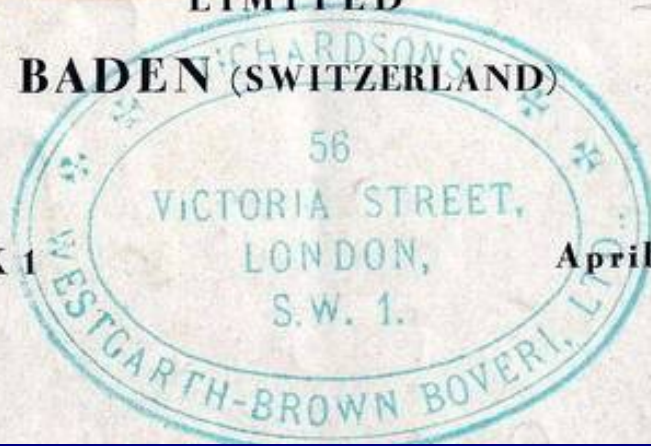
BROWN BOVERI

35480-1

**BROWN, BOVERI & COMPANY  
LIMITED**

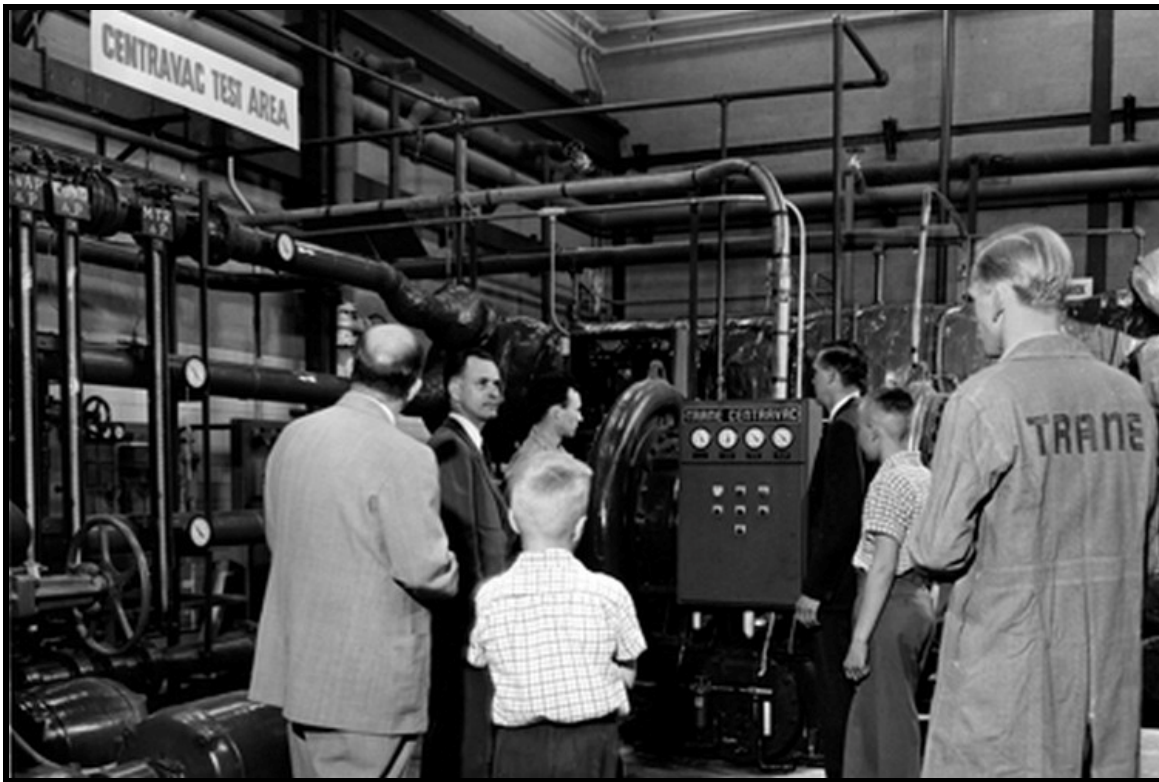
**BADEN (SWITZERLAND)**

1327E-IX 1

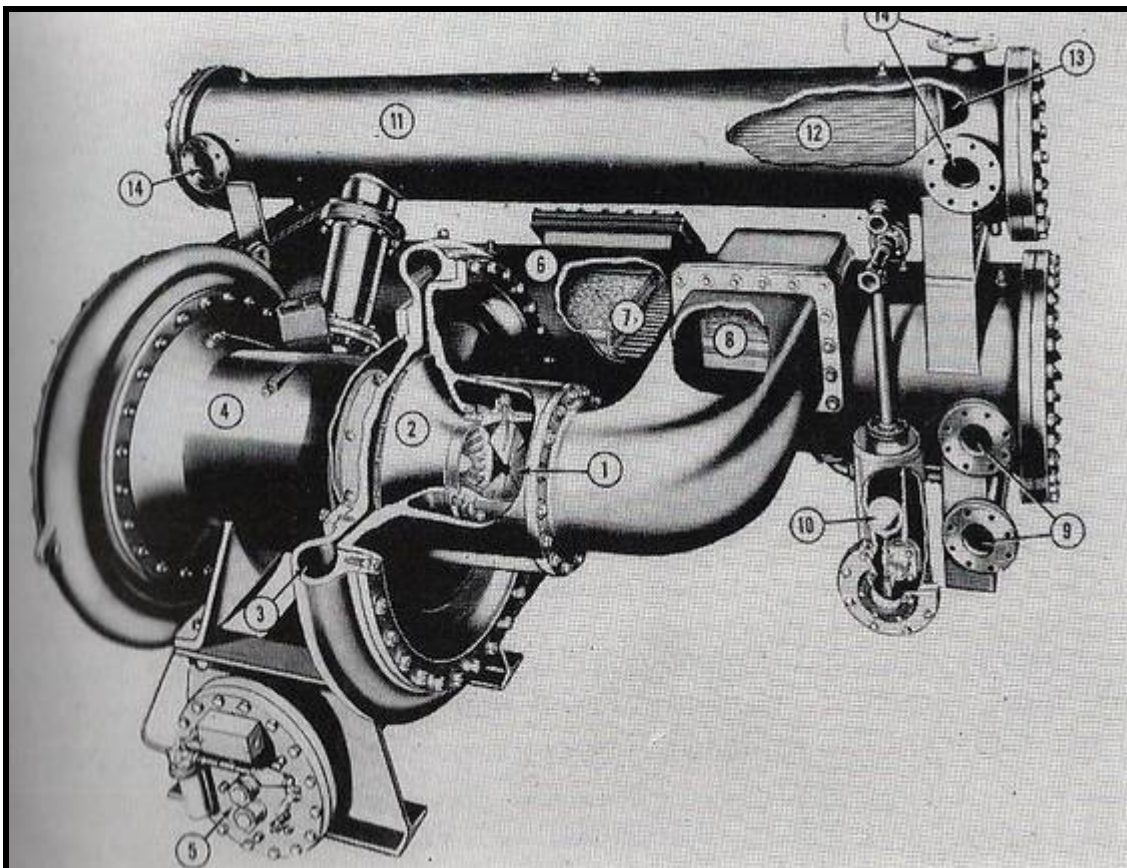


April, 1932

1932 Brown Boveri catalogue for a centrifugal refrigerating machine (or turbo-compressor)



*A 300 hp Centravac compressor at the Trane Research & Testing Laboratory*



*Trane Centravac centrifugal water chiller, 1956*

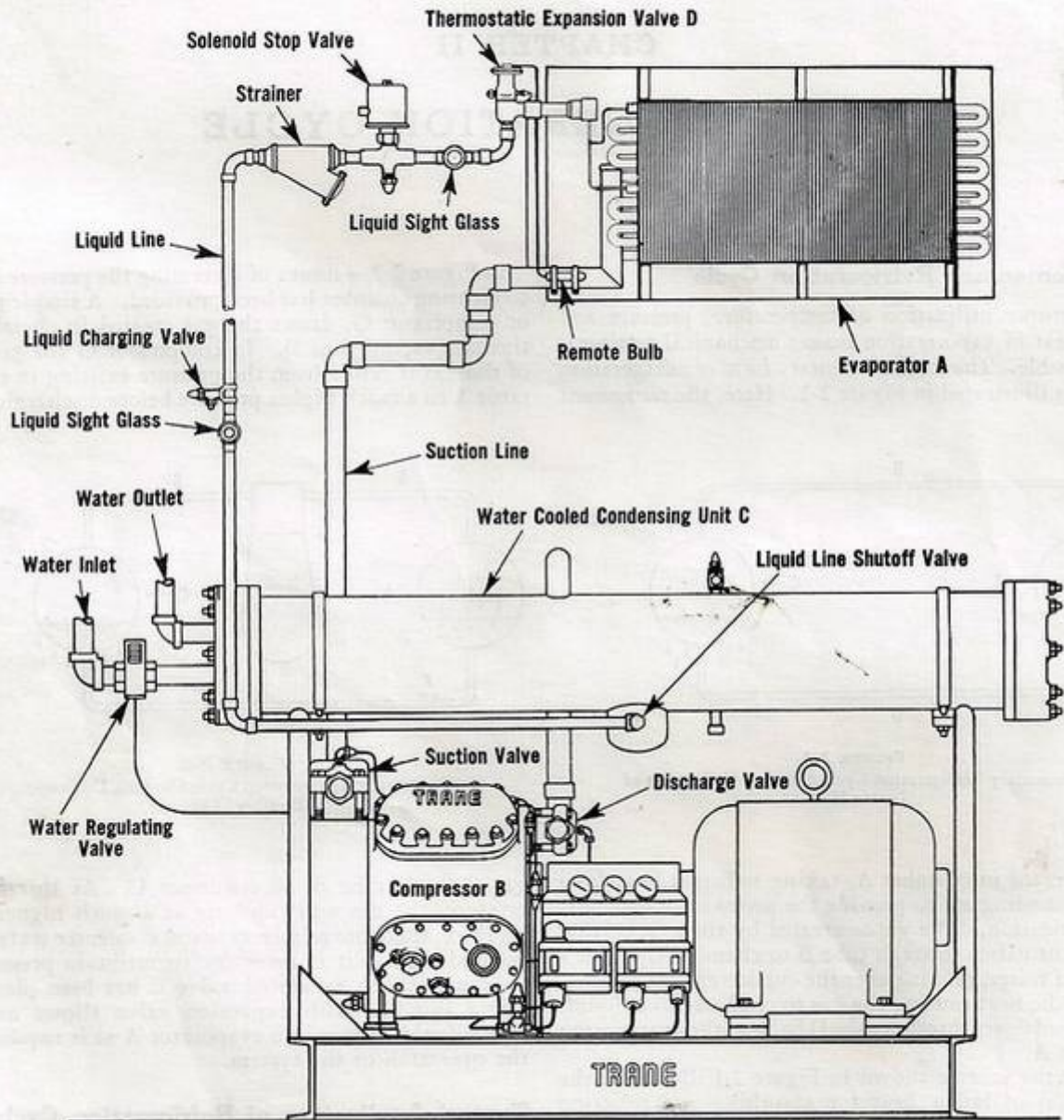


FIGURE 2-3  
Typical Small Refrigeration System.

Typical Trane reciprocating compressor system with direct-expansion cooling coil (evaporator) and water-cooled shell & tube condenser

ARCHITECTURAL DETAILS

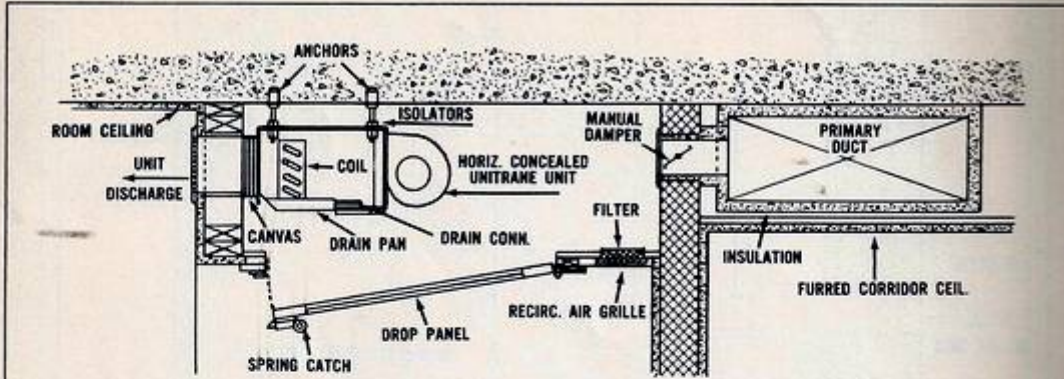


Figure 23 — Primary Air to Concealed Interior Unit.

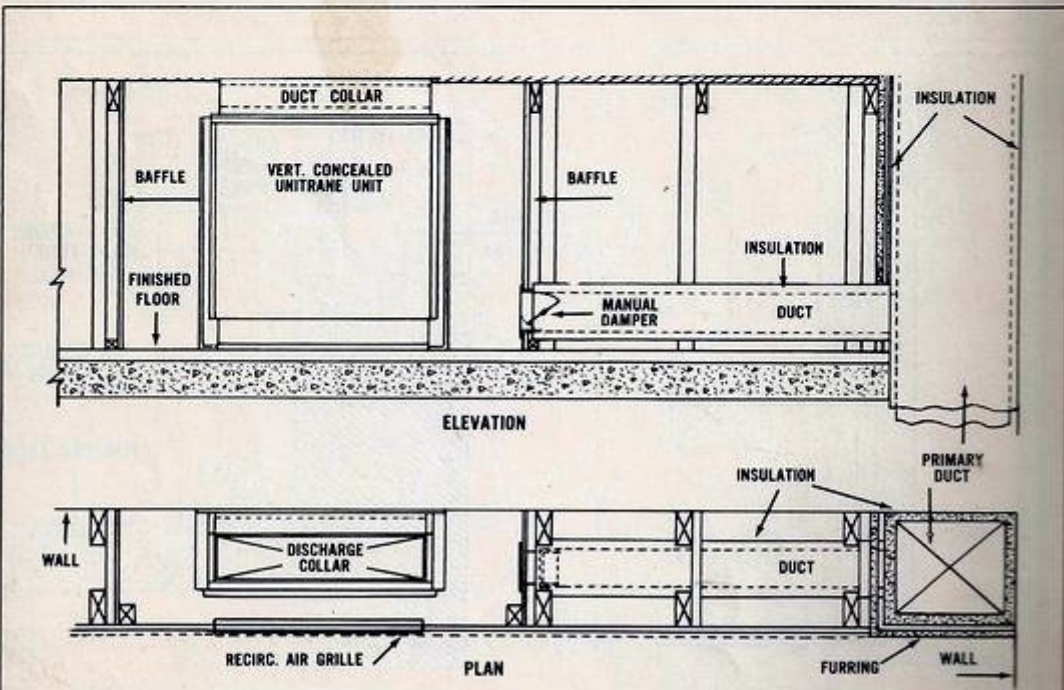
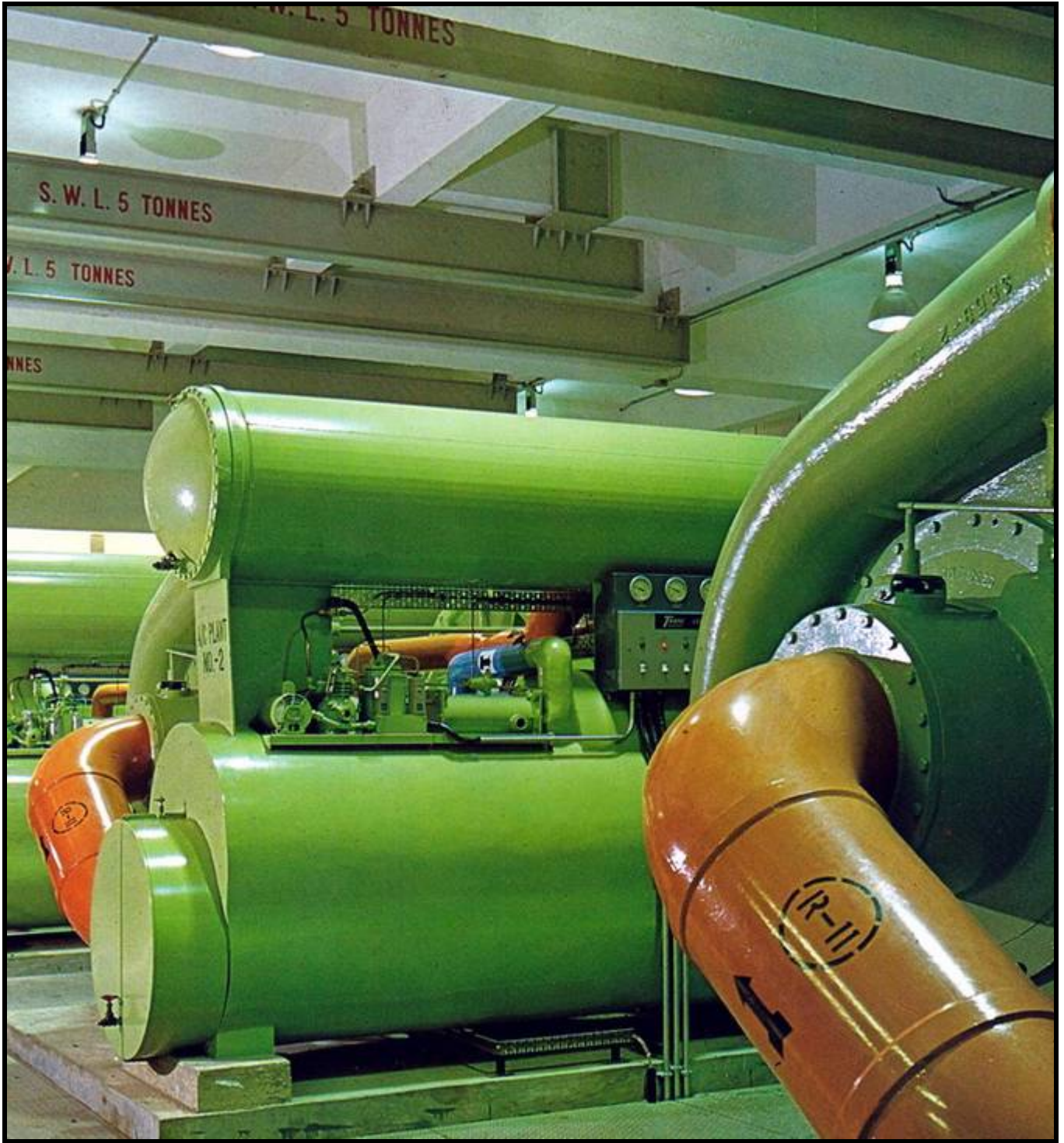


Figure 24 — Primary Air to Perimeter Unit.

Examples of Trane room fan-coil unit arrangements



*Trane centrifugal water chillers at Kai Tak Airport, Hong Kong, 1975 (Drake & Scull)*



APPENDIX I: SOME OF THE PATENTS OF REUBEN TRANE

R. N. TRANE.  
PRESSURE GAGE.  
APPLICATION FILED JAN. 25, 1916.

1,195,750.

Patented Aug. 22, 1916.

Fig. 1,

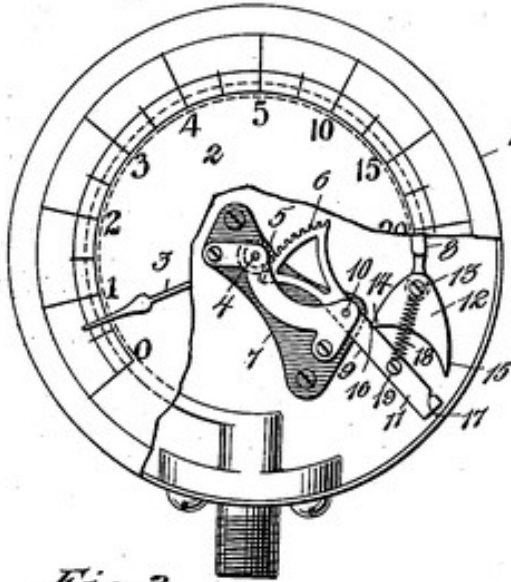


Fig. 2,



Fig. 3,

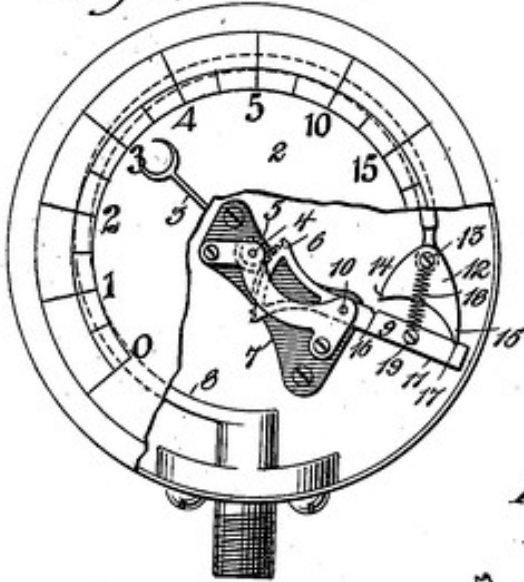


Fig. 4,



Fig. 5,



Fig. 6,



Fig. 7,



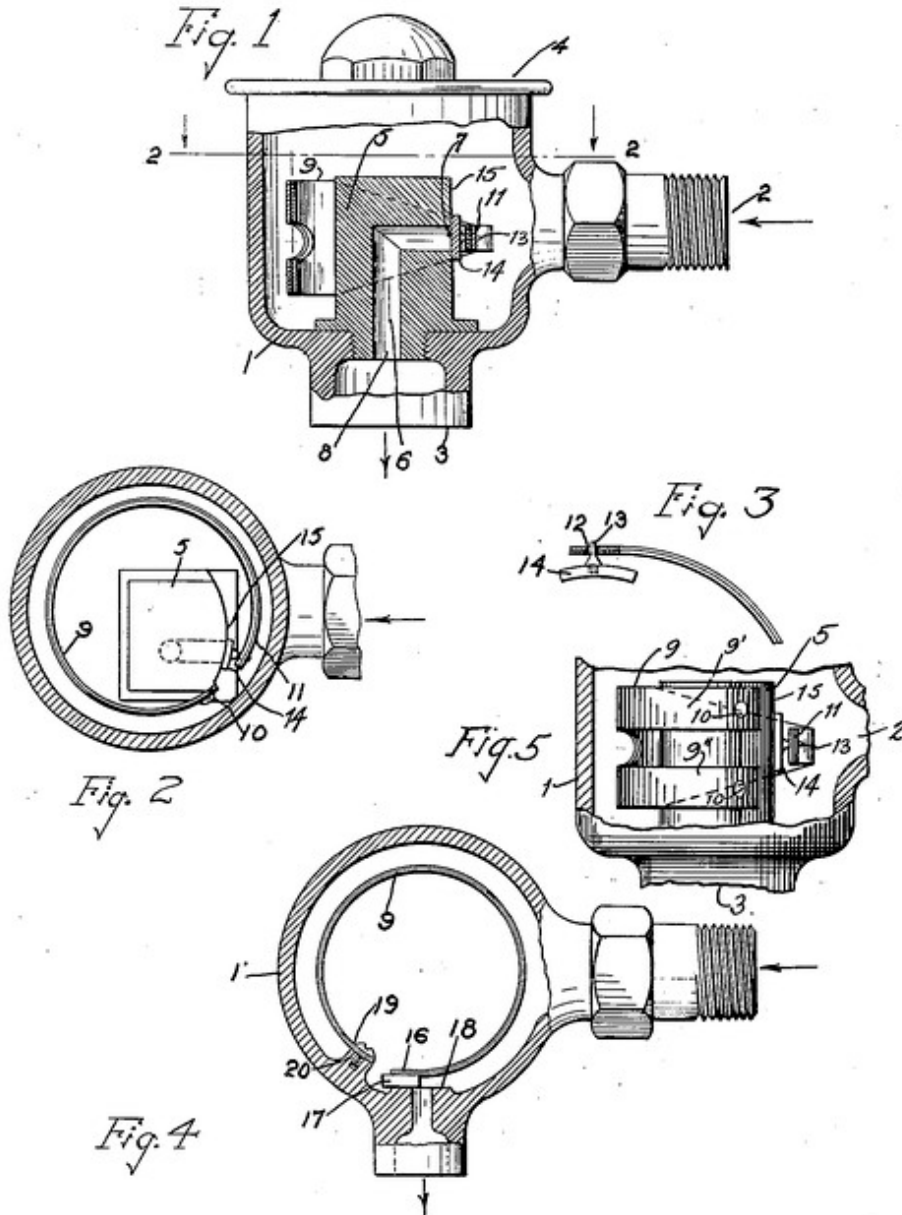
WITNESSES  
Edw. Thorpe  
Bradway

INVENTOR  
R. N. TRANE  
BY  
Mum Co  
ATTORNEYS

R. N. TRANE.  
 THERMOSTATIC VALVE.  
 APPLICATION FILED MAR. 21, 1919.

1,371,060.

Patented Mar. 8, 1921.



WITNESSES

Robert Burns  
 A. L. Kitchin.

INVENTOR

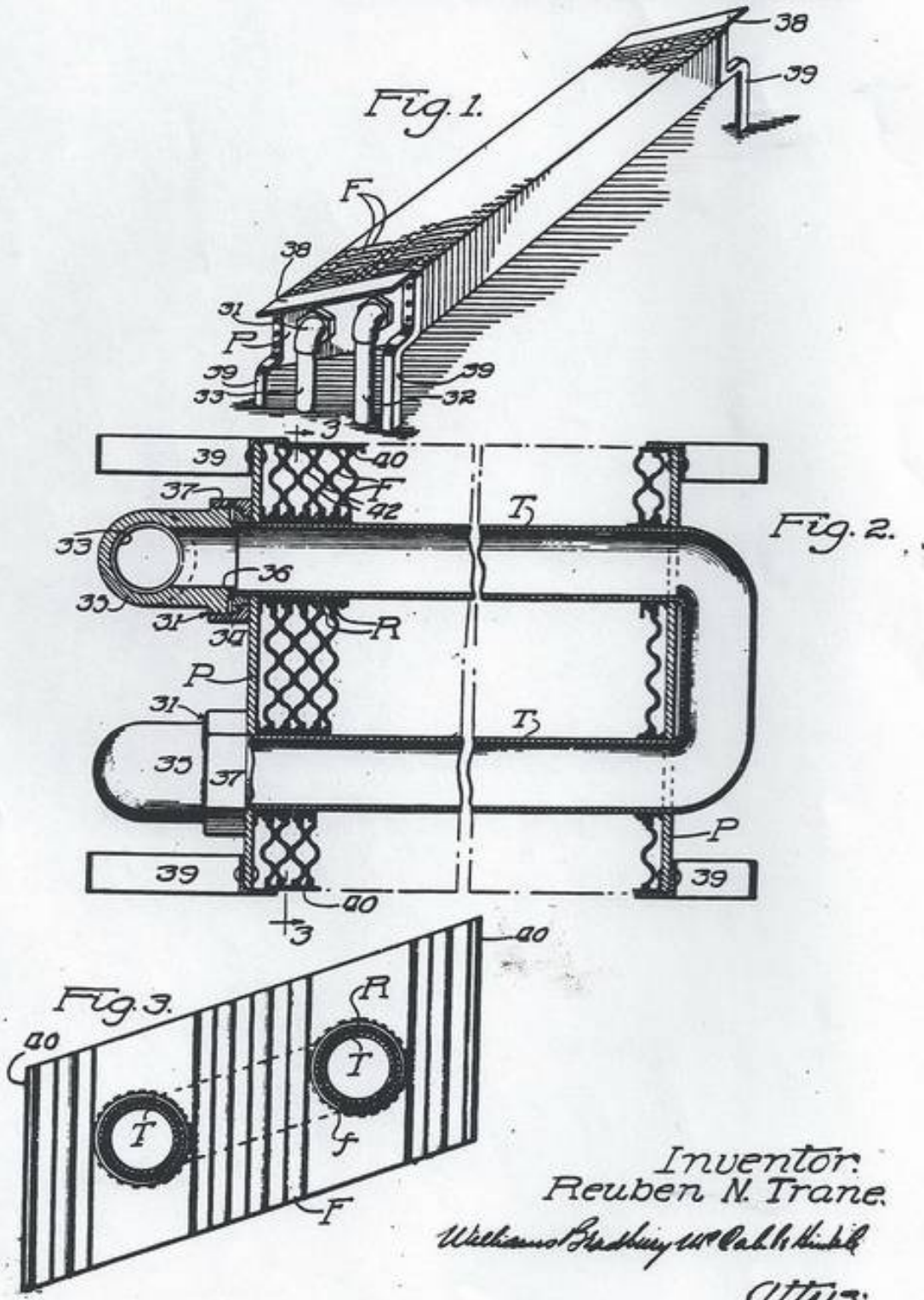
REUBEN N. TRANE  
 BY *Munn Co.*  
 ATTORNEYS

May 12, 1931.

R. N. TRANE  
RADIATOR

1,805,116

Original Filed April 23, 1926 3 Sheets-Sheet 1



Inventor:  
Reuben N. Trane.  
William B. Stubbins, Chas. H. Kiehl  
Attys.

Feb. 5, 1935.

R. N. TRANE

1,990,356

HEATER

Filed March 31, 1933

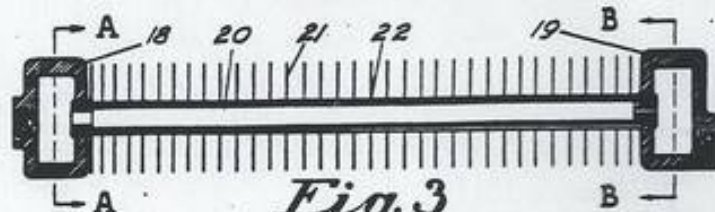


Fig. 3

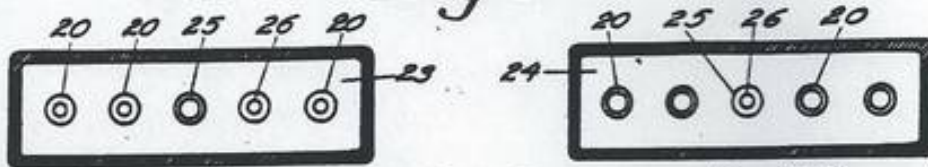


Fig. 4

Fig. 5

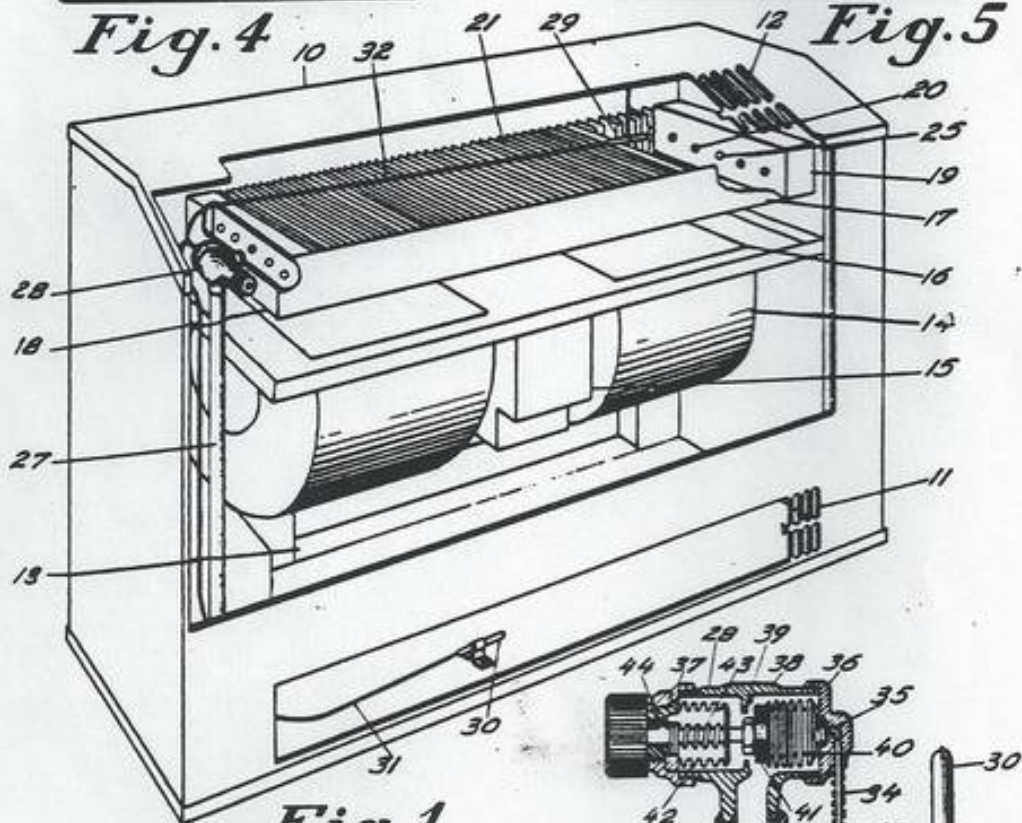


Fig. 1

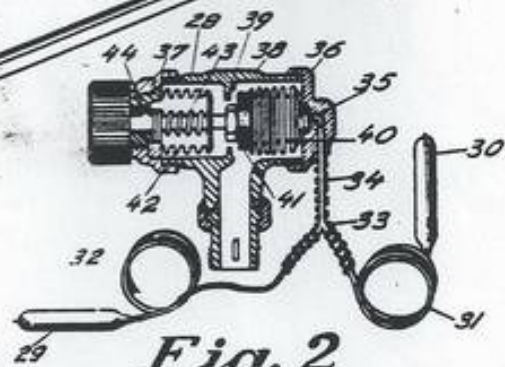


Fig. 2

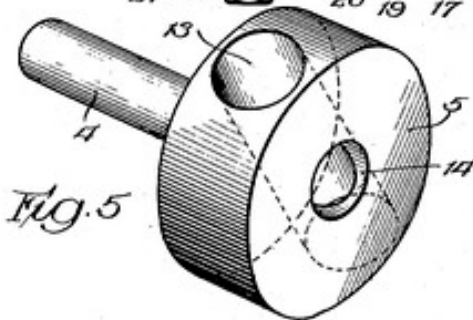
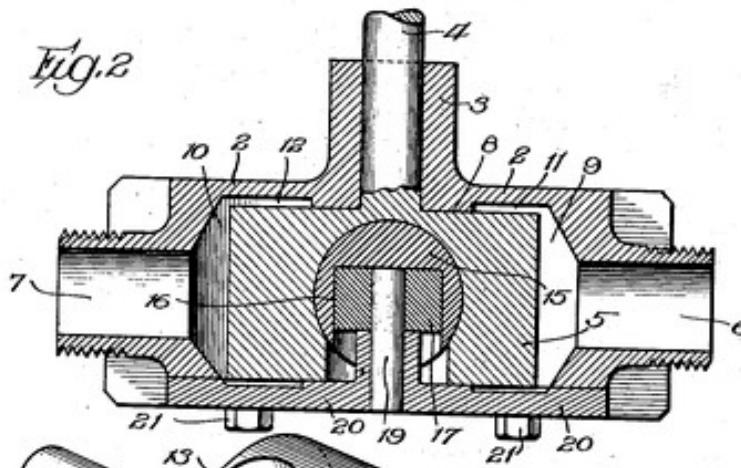
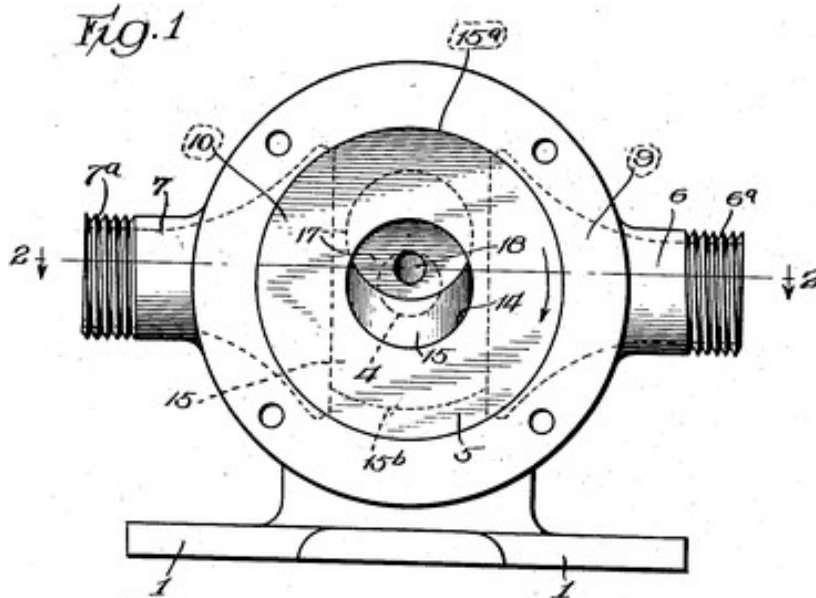
Inventor.  
R. N. Trane  
per Arthur I. Holmes  
Attorney.

Jan. 16, 1923.

1,442,195.

R. N. TRANE.  
ROTARY PUMP OR MOTOR.  
FILED FEB. 14, 1920.

2 SHEETS—SHEET 1.



INVENTOR  
R. N. Trane  
BY *Munn Co.*  
ATTORNEYS

Dec. 15, 1953

R. N. TRANE ET AL

2,662,747

BASEBOARD RADIATOR PROVIDED WITH DAMPER

Filed March 16, 1951

2 Sheets-Sheet 2

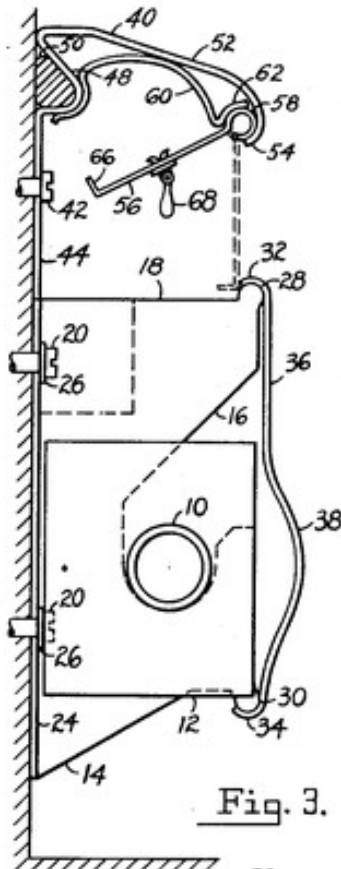


Fig. 3.

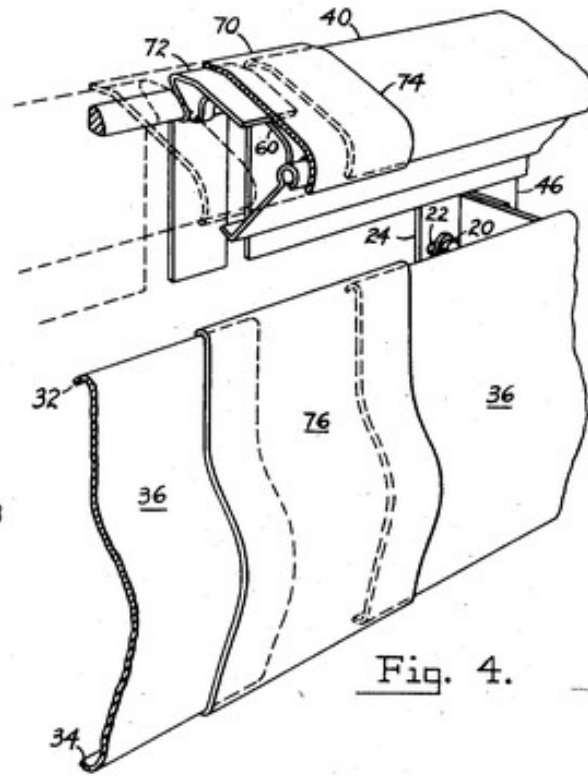


Fig. 4.

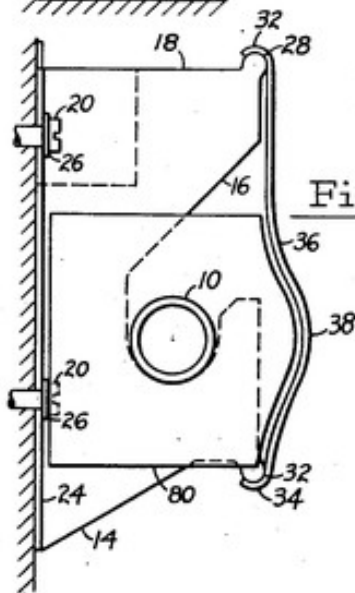


Fig. 5.

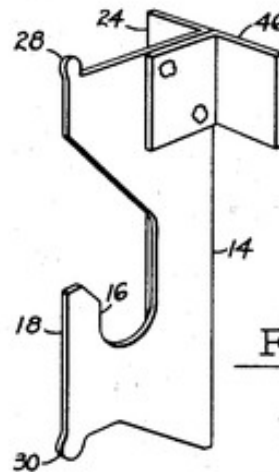


Fig. 6.

INVENTORS  
REUBEN N. TRANE  
& OTTO A. LABUS  
BY  
*Holmes + Anderson*  
ATTORNEYS

## APPENDIX II: FAMOUS TRANE BUILDINGS

The following information is taken from the Trane website but it does not provide dates or details of the equipment provided. However, it does feature a number of historic buildings and national monuments.

### Famous Trane Buildings

Trane serves building owners and their construction agents on all continents and in markets including education, healthcare, government, industrial and manufacturing, lodging, retail and commercial real estate.

Trane equipment and systems can be found in more than half of all commercial buildings in North America.

Below are a few of the well-known buildings worldwide that deliver indoor comfort through Trane systems:

- Australian Stock Exchange, Melbourne
- The Entertainment Centre in Sydney, Australia
- GE Technology Center, Bangalore, India
- International Airport in Bangkok, Thailand
- The Kremlin, Moscow, Russia
- La Scala Theatre, Milan, Italy
- McCormick Place Convention Center in Chicago, Ill.
- The Olympic Sports Complex in Athens, Greece
- Sea World, Orlando, Fla.
- The Skydome in Toronto, Canada
- Statue of Liberty, New York
- Washington Monument, Washington, D.C.
- World Trade Center, Beijing, China

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----- *R N Trane*, US Patent Office Records

----- *Trane Named to Receive Citation from University*, copy of newspaper cutting, source unknown

----- *The History of a Person: Reuben N Trane*, James M Ritter, La Crosse Area Chapter, ASHRAE

1938 *Trane Air Conditioning Manual: The Trane Company, La Crosse, Wisconsin*  
(Introduction by Reuben Trane)

1955 *Trane Air Conditioning Manual: The Trane Company, La Crosse, Wisconsin*

1955 *Unitrane Engineering Manual (Room Fan Coil Units)*, Bulletin D-420: The Trane Company,  
La Crosse, Wisconsin, May Revision

1956 *Refrigeration and Air Conditioning*, Richard C Jordan & Gayle B Priester, 2<sup>nd</sup> Edition,  
Constable, London

1959 *Trane Reciprocating Refrigeration Manual: The Trane Company, La Crosse, Wisconsin*  
(First published 1946)

1994 *Heat & Cold, Mastering the Great Indoors, (Refrigeration of the Nineteenth Century)*,  
Barry Donaldson & Bernard Nagengast, ASHRAE

1997 *HVAC&R Pioneer Reuben Trane Inducted into ASHRAE Hall of Fame*, Insights, ASHRAE,  
Vol. 12, No. 6, June

1995 *The History of the Trane Company*, Company Brochure

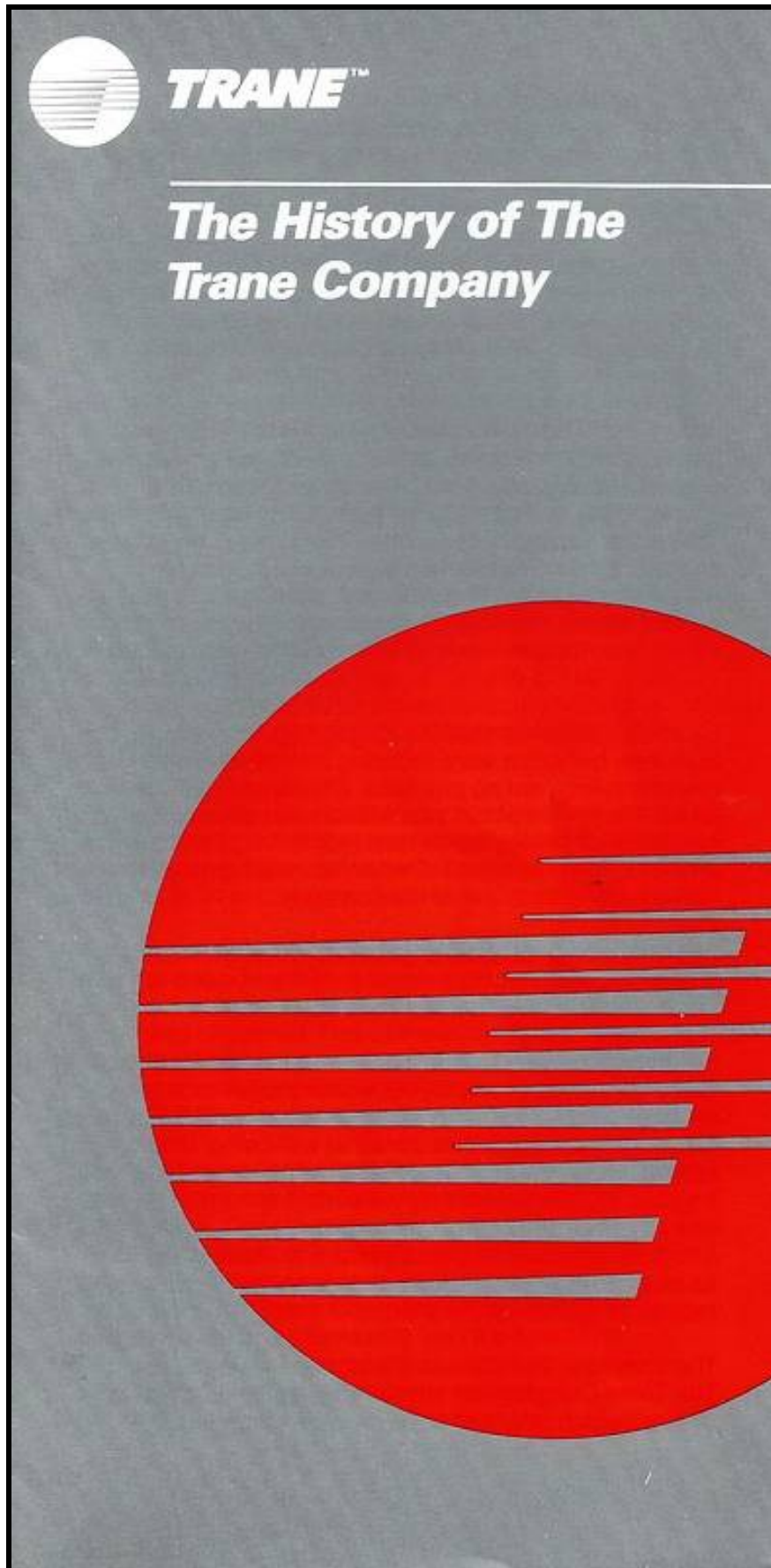
1997 *A Special Tribute to Reuben Trane*, ASHRAE Journal, August

2000 *The Comfort Makers*, Brian Roberts, ASHRAE

2013 *100 Years of Trane History*, Trane Engineering Newsletter, Volume 42-1, March



**POSTSCRIPT: FURTHER READING**



c.1995

TRANE  
AIR  
CONDITIONING  
MANUAL

TRANE  
AIR

AIR

1938

**TRANE**  
RECIPROCATING  
REFRIGERATION  
MANUAL

THE TRANE COMPANY - LA CROSSE, WISCONSIN

1956



providing insights for today's hvac system designer

# Engineers Newsletter

volume 42-1

## 100 Years of Trane History

An Applications Engineering Perspective

The Trane *Engineers Newsletter* has been providing insight into HVAC system design for more than 40 years. This issue is quite different from our typical technical focus. As Trane begins its second century of operation as a company, Applications Engineering wanted to look back at the first 100 years and share some technology highlights with you. The research helped us understand how Trane worked with our readers—consulting engineers, design-build contractors, and technical owners—to develop, refine and offer various systems throughout the years. We hope you find it interesting and invite you to join in the anniversary celebration.

In 1864, a young James A. Trane immigrated from Norway to La Crosse, Wis., with his parents. He married Mary Miller in 1880 and opened a plumbing and heating shop on Pearl Street in 1885. On Sept. 13, 1886, his son Reuben was born.

Figure 1. James A. and Reuben Trane



### The formative years

Reuben Trane worked for his father as a plumber's helper for a year after graduation from high school in 1905, earning enough money to fund his engineering education at the University of Wisconsin. Upon graduation with a Bachelor of Science degree in mechanical engineering in 1910, Reuben first worked for three years as a sales engineer with a Milwaukee machine tools firm before returning to La Crosse in 1913. That same year, Reuben, along with his sister Stella and his father, incorporated The Trane Co. to manufacture steam valve traps that James A. Trane had invented in connection with a vapor heating system.

Initially, the business included contracting, as well as manufacturing and sales of heating specialties, and the design and distribution of Trane heating systems. The primary products of the decade included vapor heating products, steam heating specialties, the direct return trap patented by Reuben in 1917, and a condensation pump line in 1918.

In 1917, Emil H. Erickson joined The Trane Co. from the Ford Motor Co. and persuaded Reuben Trane to focus on equipment manufacturing. The company discontinued its contracting business to concentrate on heating systems and specialties. In 1918 Erickson was asked to oversee the new 5,000-square-foot manufacturing operation. It was noted

that Erickson dug into his own pocket to help purchase the first machines for the new plant.

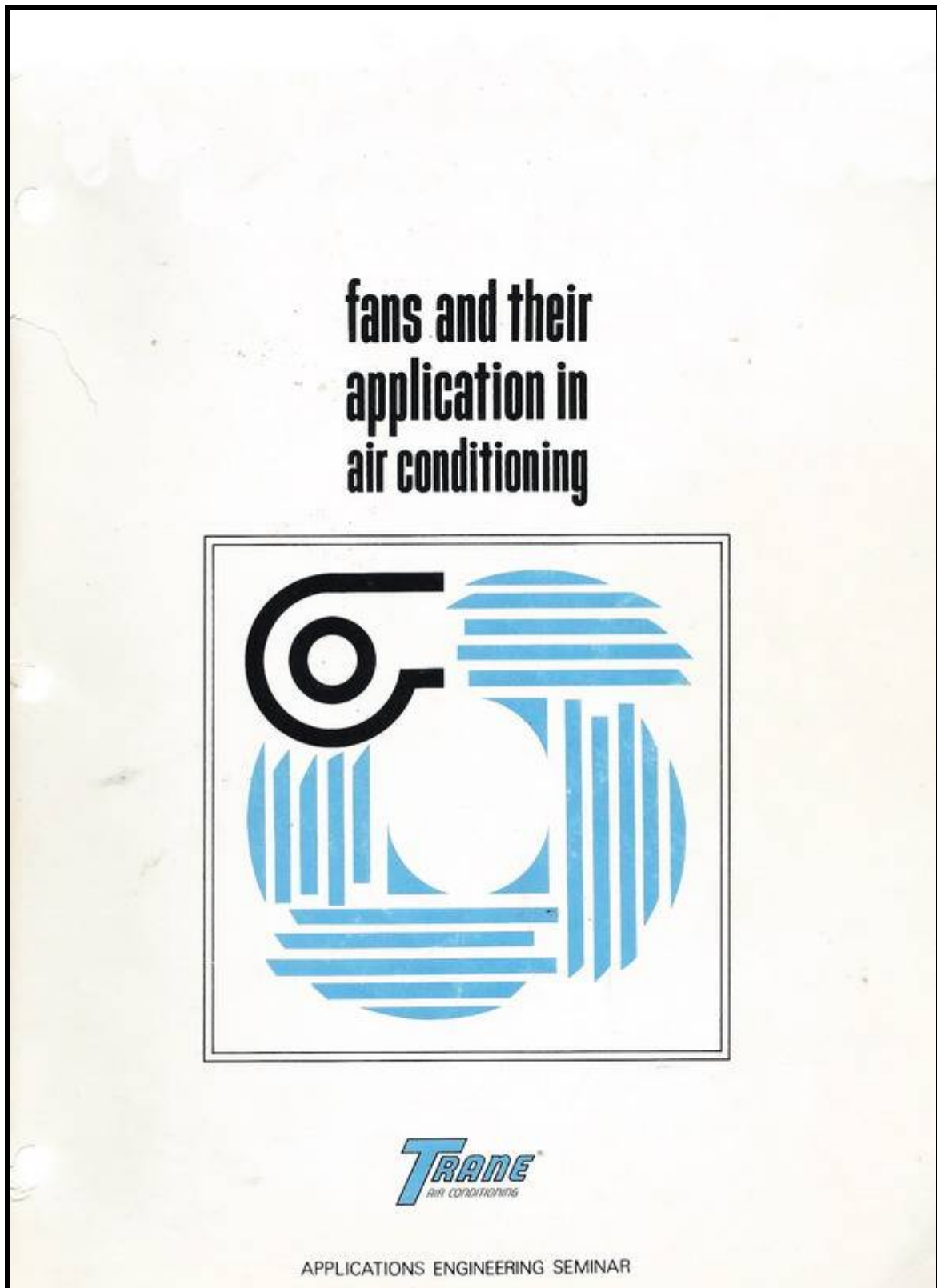
### 1920s: Growth, innovation and seminal tenets

Frank Hood, Reuben's brother-in-law, joined the company in 1920. During this decade, the direction of the company was shaped by ideas, inventions, and business strategy. The year 1925 exemplified this and was pivotal for two reasons—one product focused and the other business inspired.

Reuben wanted to design a heating unit that could replace and improve upon the cast iron radiator. Realizing the need for a lighter material and better heat conductivity, he turned to copper. Using this new material, he created a new finned-tube design that would become today's ubiquitous coil. Once the coil design was complete, he turned his attention to a new cabinet. The cabinet was specifically designed to circulate air without a fan using the properties of natural convection. This seemingly simple change transformed the industry, but not immediately.

Two daunting factors had to be overcome: manufacturing and distribution.

Reuben Trane's drive to educate engineers continued after his death with the publication of *Trane Applications Engineering Manuals*, as these examples:



1971



1973



conserve energy by design



APPLICATIONS ENGINEERING MANUAL

## EPILOGUE

Reuben Trane died on 5 September 1954 and is buried in the Oak Park Cemetery in La Crosse, Wisconsin. He had joined the Institution of Heating & Ventilating Engineers way back in 1923. He was voted a Life Member of ASHRAE in 1951 and inducted into the ASHRAE Hall of Fame in 1997. One of his most lasting contributions to the industry was the Trane Graduate Engineer Training Programme which he started back in 1925. He was also responsible, in 1938, for the introduction of the Trane Air Conditioning Manual which by 1977 had reached its 53<sup>rd</sup> edition.



When the 1<sup>st</sup> edition of the Trane Manual was published, Reuben Trane defined its purpose in these words: “To organise and to make comprehensible and available the store of knowledge on Air Conditioning- to envision the field in its entirety- is the function of this Manual.”