Greater Los Angeles Regional Exhibit

Jan. 29-31, 2015 Pasadena, CA

2015 GLAR EXHIBIT

RAILROAD TIME

FREE - INSIDE THE MART ROOM

Presented by Chapters 190 & 133 NAWCC

Committee

J. A. Bloore
E. Jenson
R. Brown

RAILROAD TIME

Made possible by the invention of theTelegraph

Made necessary by the expansion of the Railroads

Made a business by the Observatories & Clock & Watch Manufacturers

RAILROAD TIME

The story of railroad time can be divided into three distinct sections:

1. **The evolution from Local Time to Railroad Standard Time**

2. **Railroad Clocks and Synchronization**

3. **Railroad Watches and Certification**

RAILROAD TIME

Became essential as a result of the exponential growth of the RAILROADS

GOAL: all railroad time pieces display precisely the same time

Why EXACT TIME scheduling was so critical:

So Trains did not CRASH into each other

So passengers and goods arrived & departed ON TIME

Was this related to TIME?

Was someone's watch wrong?

EXACT RAILROAD TIME

Challenges

1. Figuring out what time it is

Originally – using the noon Sun and eventually Observatories by 1850s

2. Railroads agreeing what time it is

1883 - Railroads changed from their own time to Railroad Standard Time

Local Time

or Mean Solar Time

Noon in any location is when the sun is at it's highest position

Noon is one minute later for every 1/4 of a degree of Longitude moving West

That equals one minute every 12. 5 miles West at the Equator

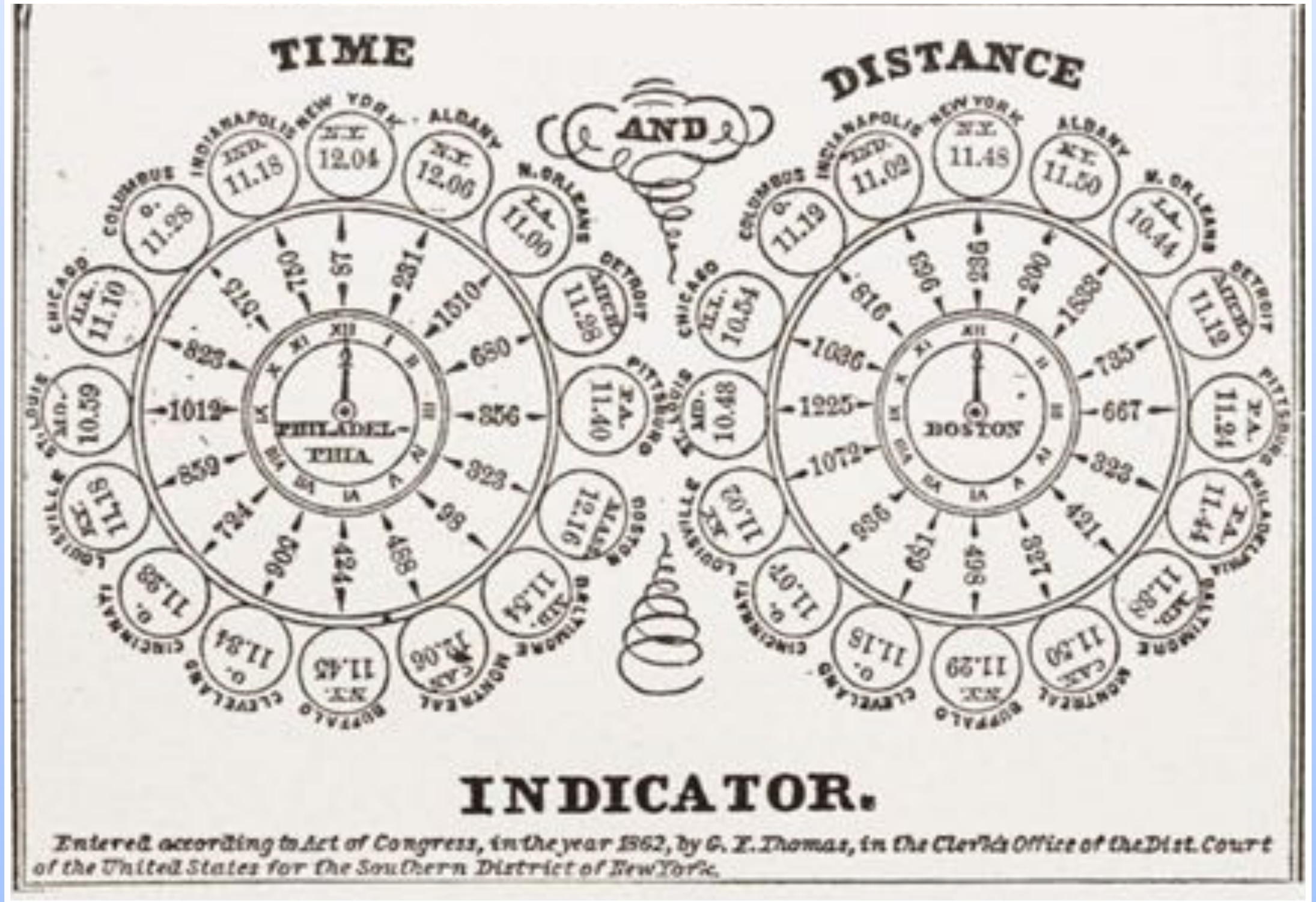
Sundials display Local Time

Time Balls display Local Time

US Naval Observatory 1845 First Time Ball in US

Local Time Differences

1862



When it is Noon in Washington D C

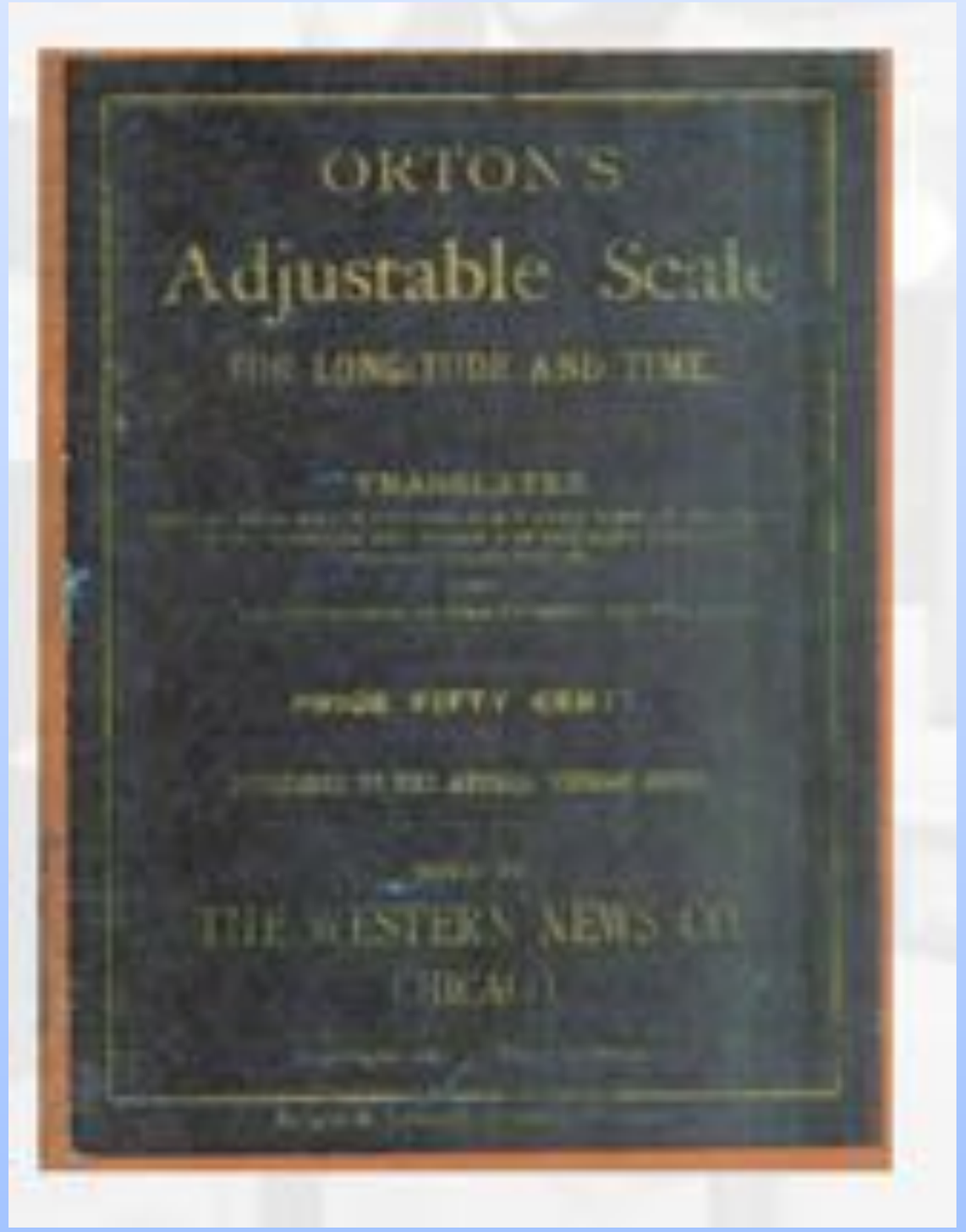
It is:

12:22 in Boston

12:12 in New York

12:08 in Philadelphia

Differences in local times for various cities posed a problem- The solution - Orton's Adjustable Scale - 1880 - for calculating differences in local times between cities



AS THE RAILROADS EXPANDED precise timing BECAME MORE IMPORTANT

- 1829 - first locomotive
- 1840 - 2800 miles of railroad track
- 1850 - 9000 miles of railroad track
- 1880 - 93,000 miles of railroad track

All running on their own LOCAL TIME

Transcontinental railroad completed in 1869

All cities used local time

Each railroad used their own railroad time

1880
at least 90 railroads

Railroads originally ran on Local Time

Different local times were not a problem until
it was possible to travel
relatively quickly between cities

As railroads moved farther and faster
Local Time created conflicts

Appears to be some sort of a Timing problem!

As the Railroads grew the

Communication and Timing

Problems mounted:

The solution

The TELEGRAPH

Telegraph made communication possible over great distances

The first experimental telegraph went from Washington to Baltimore in 1843

1850s Observatories transmit time signals via telegraph to provide precise local time:
for a fee $$$

The Ideal Railroad Clock

1. receives time from precisely accurate source

2. can be connected & synchronized with all company clocks at one time

3. requires no manual winding i.e. is self-winding

Until 1883 the individual railroads had their own time standards

1869 Pennsylvania RR subscribed to the Allegheny Time System.
A system of time distribution provided by the Allegheny Observatory.

This is thought to be the first railroad use of transmitted time signals.

By 1870, the Allegheny Time service extended over 2500 miles with 300 telegraph offices receiving time signals.

Standard Railway Time = Standard Time Zones based on Greenwich Time

November 18, 1883
The day of "Two Noons"
All trains were stopped, clocks and watches were adjusted and trains then restarted on Standard Railway Time

- Becomes law in 1918

The Ideal Railroad Clock

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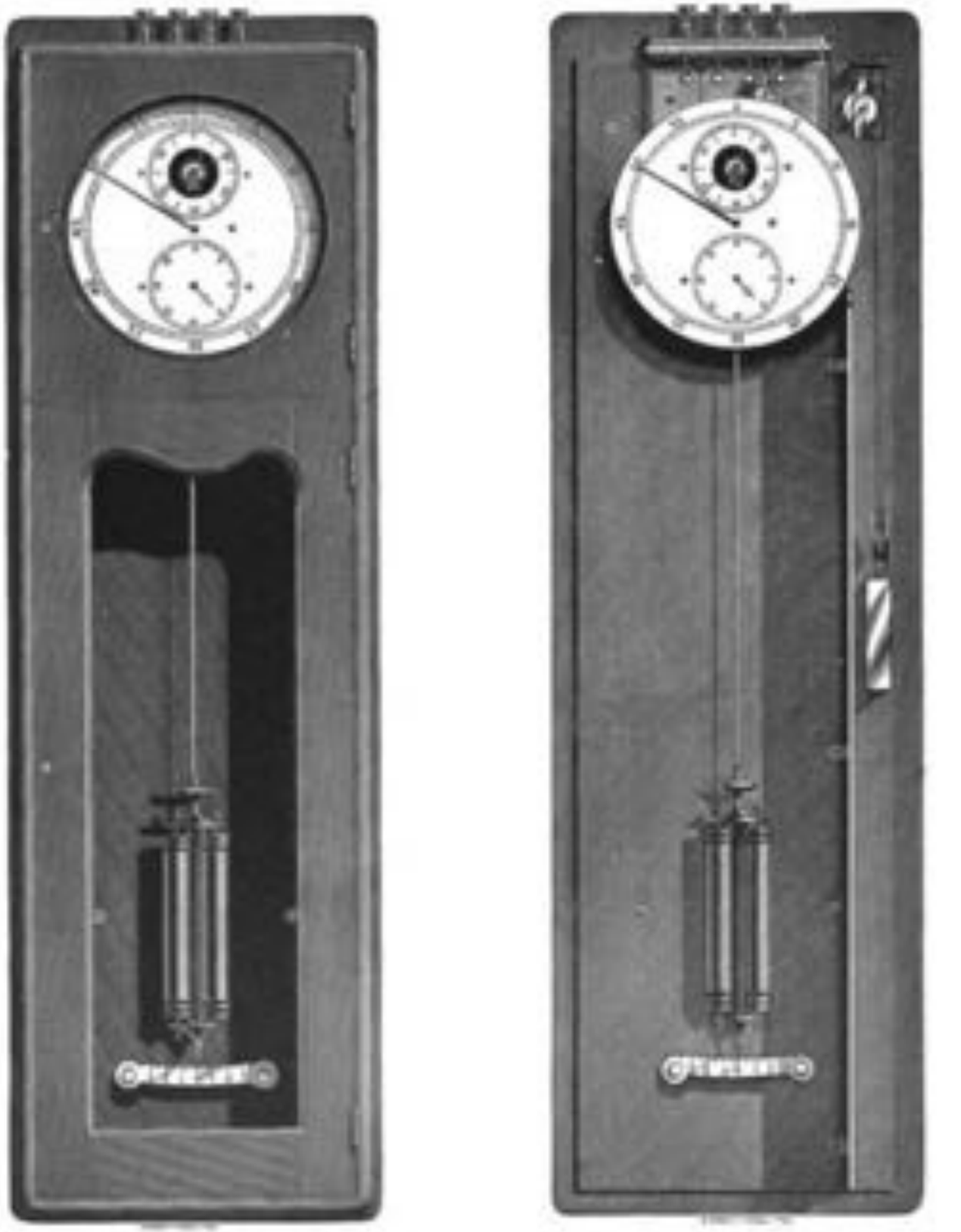

The Howard Mean-Time Clock.

Observatories used Astronomical Regulators to transmit time signals

E. Howard astronomical regulator in the Lick Observatory San Jose, CA 1887

Transmitted “Pacific Time”

Meridian 120 degrees west from Greenwich

To railroads in California

Time Signals from US Naval Observatory

Standard Time

Furnished by signals over the lines of the Western Union Telegraph Company

1870's began transmitting noon time signals via Western Union

Charged RR for service

1921 time signals transmitted free

TIME ZONES

Started with the railroads in 1883

Synchronization

- **adjusting (a clock or watch) to show the same time as another:**

synchronize timepiece manually

synchronize timepiece automatically via an electrical impulse

The Ideal Railroad Clock

1. receives time from precisely accurate source

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Electricity and RR Clocks

Late 1870s- synchronization via wires
between connected clocks
Assured each clock displayed exactly the same time:
Only two systems existed

P.H. Dudley Synchronized Clock System

Lund Synchronizer - added to E. Howard clocks

PH Dudley - Reliable Railroad Time

All future clocks will be furnished with the improved dials, similar in principle to one shown in the cut of No. 10 clock.

This system has been in use on P., W. and B. R. R., over three years; on the N. Y. C. and H. R. R. R., over two years; in the Grand Central Depot and Yard, N. Y.; on the N. Y. and H. R. R.; Boston and Albany R. R.; Conn. River R. R.; and in a large number of Public Buildings. Having been thoroughly tested, it is now known that it meets the wants of the most exacting service. Experienced men are sent to put up the clocks, and show the workings of the system.

For further information, address

WASHBURN OBSERVATORY,
University of Wisconsin
MADISON.

Or,

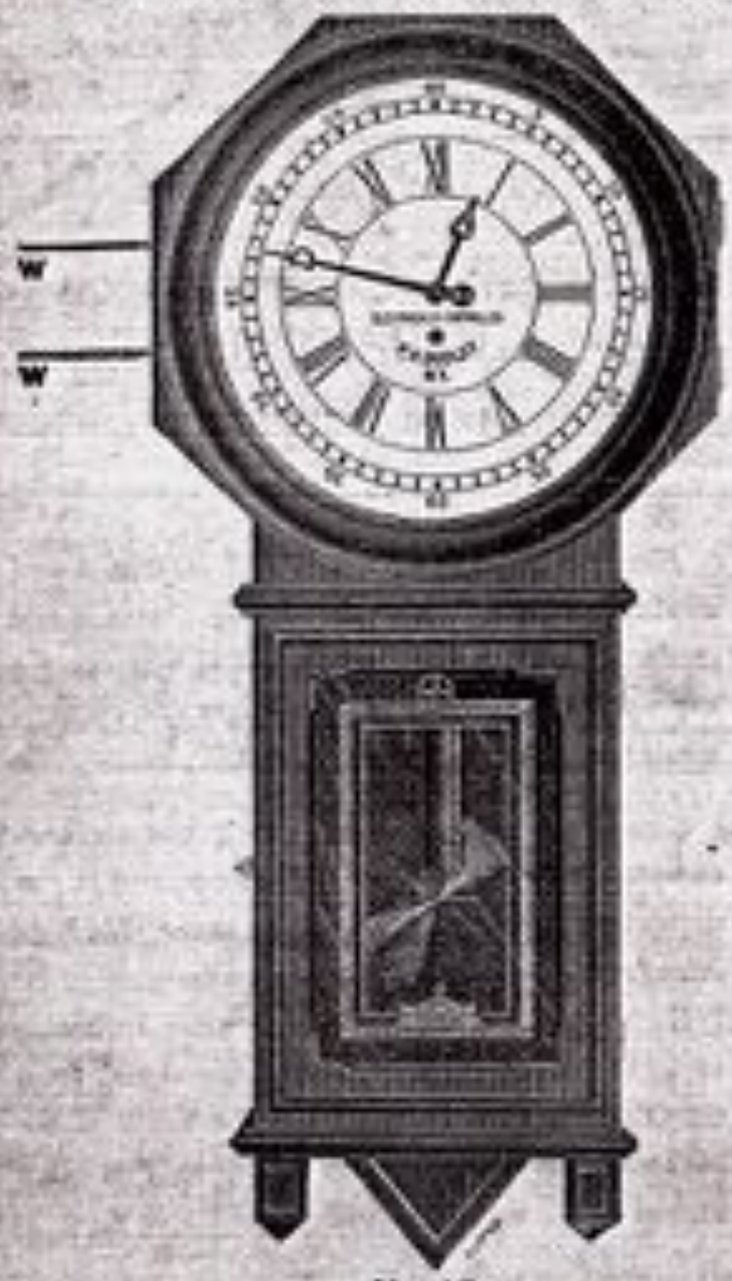
P. H. DUDLEY,
Care Western Electric Manufacturing Co.,
New York.

NEW YORK, JANUARY 1, 1880.

"….an Astronomical Observatory sends out the standard of time….

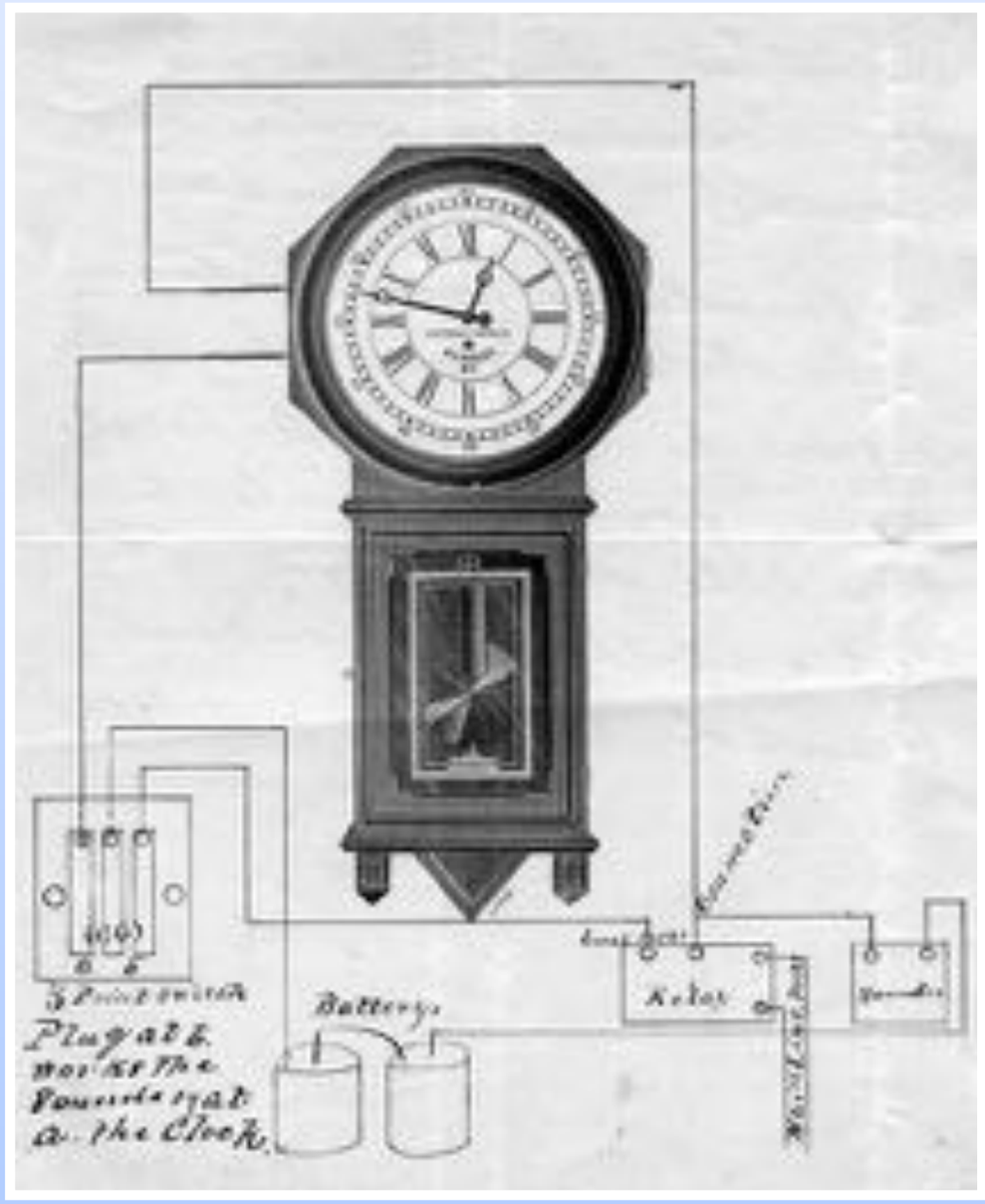
….upon the clock receiving the signal it sets the hands either backward or forward, if in error, to the exact second of the signal."

Reliable Railroad Time.



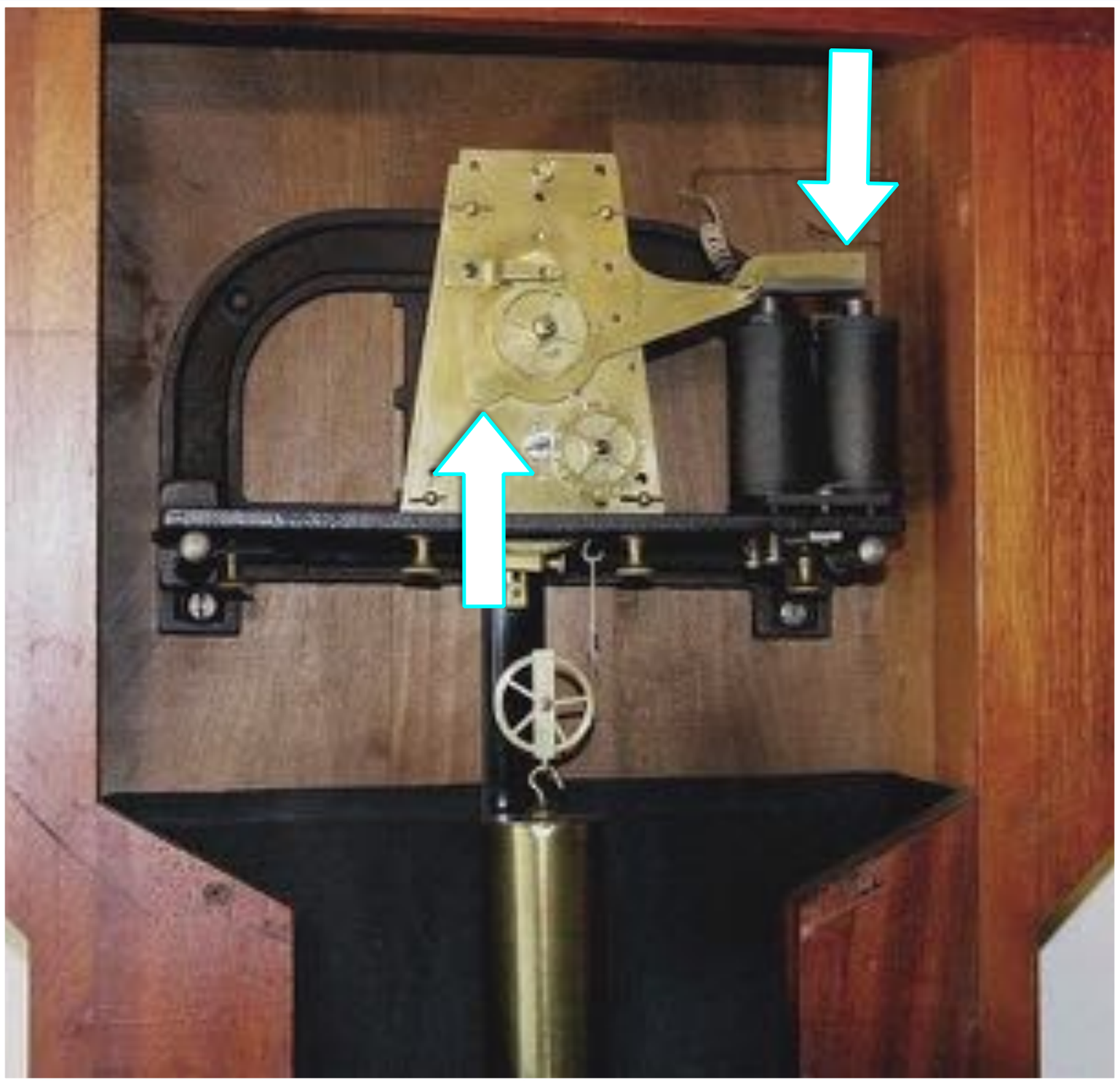
No. 10.

The First Synchronized Clock system - 1879



Wiring Diagram for P.H. Dudley synchronizer

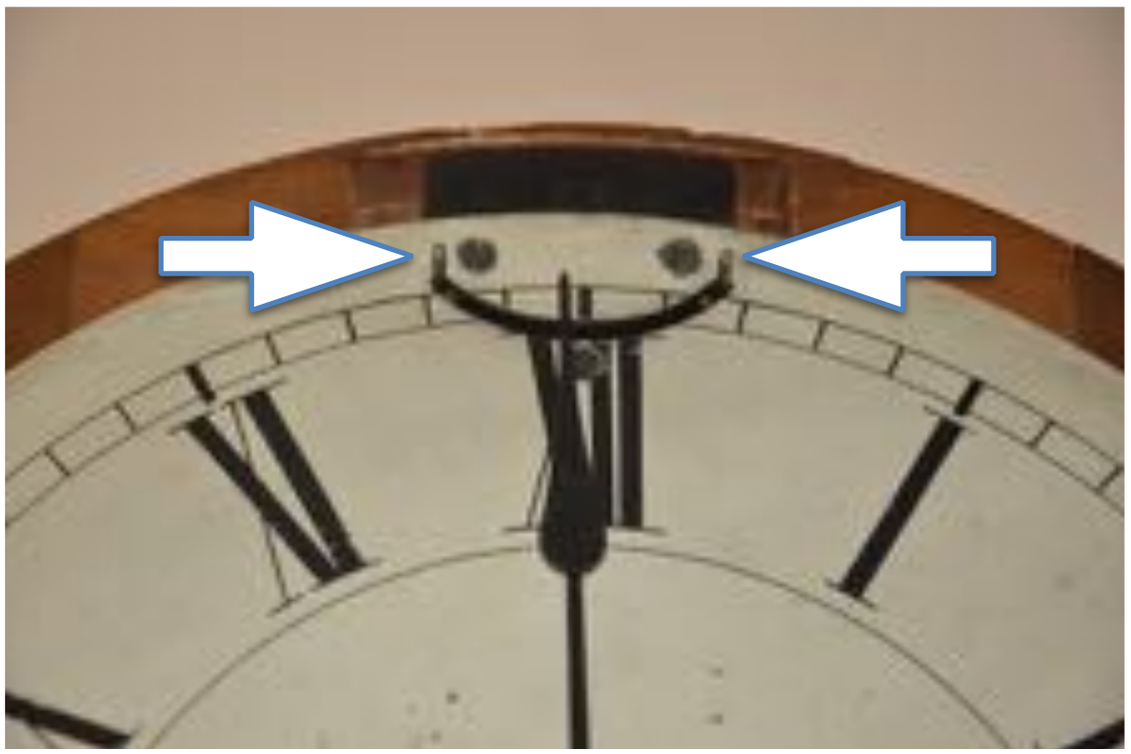
PH Dudley movement with synchronizer



Installed in 1879

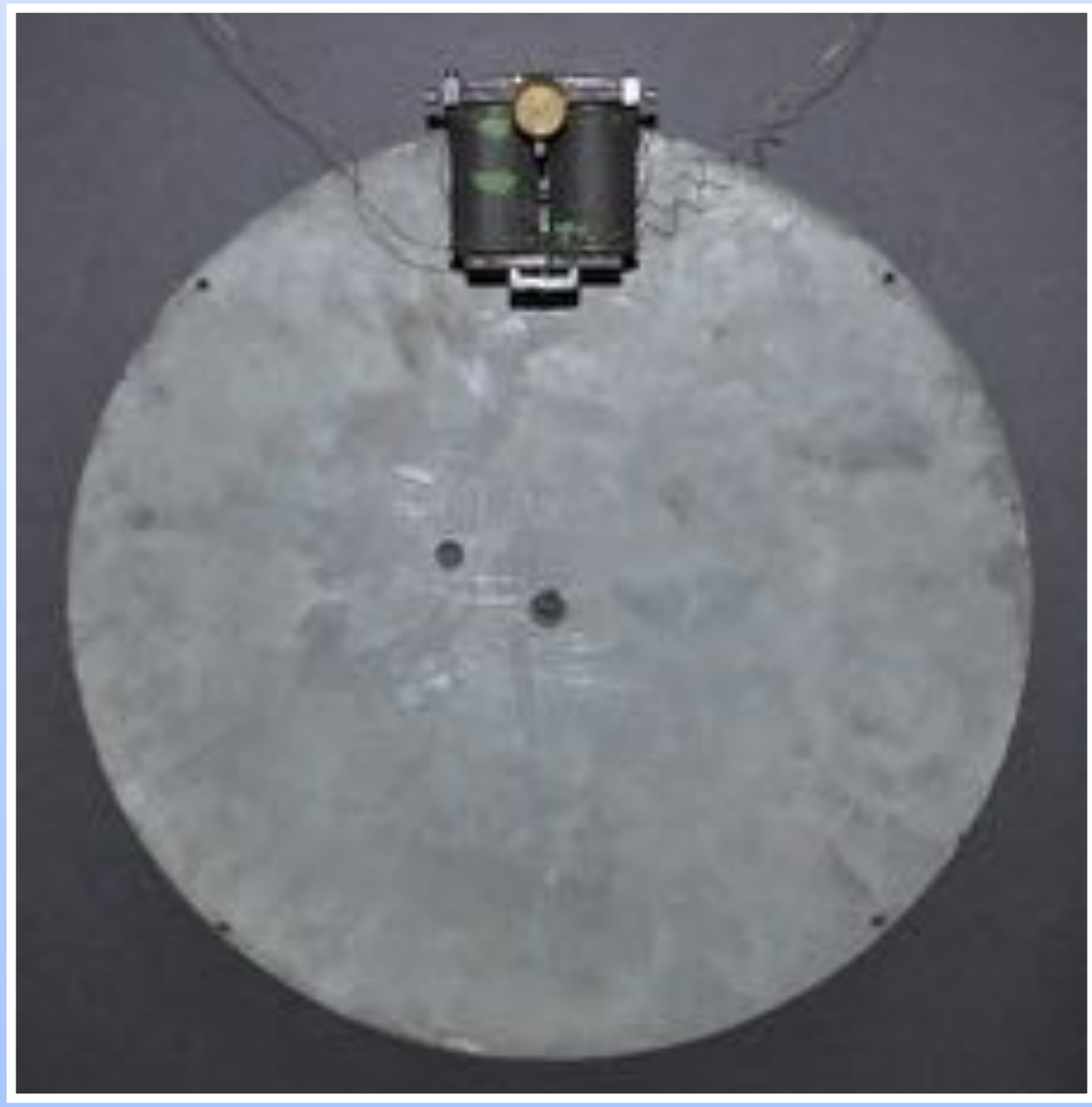
Dudley never applied for a patent

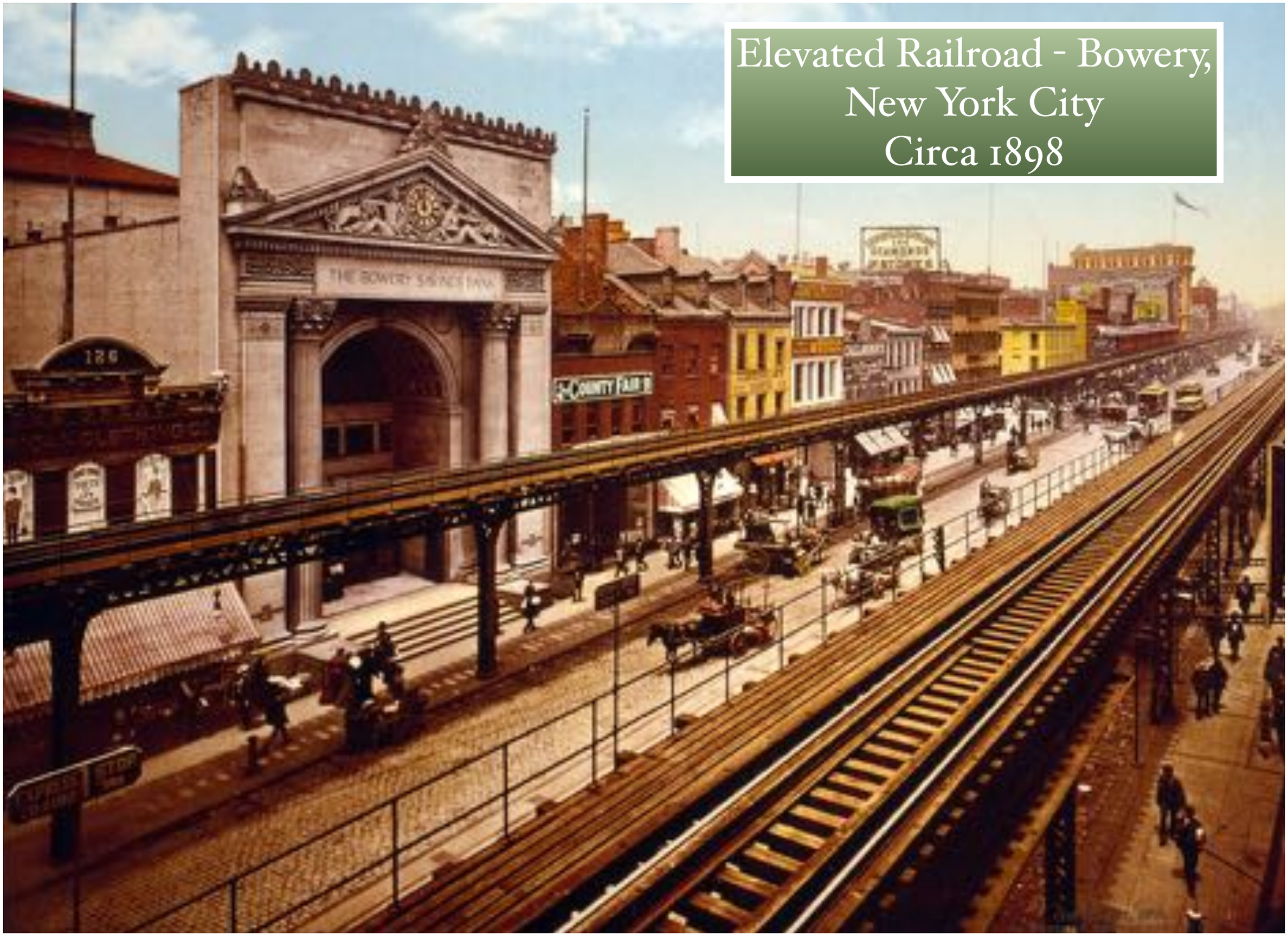
E. Howard #70 with Lund Synchronizer - Pat. 1884



Installed on New York Elevated RR 1884

Lund Synchronizer mounts on the dial back




Elevated Railroad - Bowery,
New York City
Circa 1898
THE BOWERY SAVINGS BANK
126
COUNTY FAIR

The Ideal Railroad Clock

1. receives time from precisely accurate source

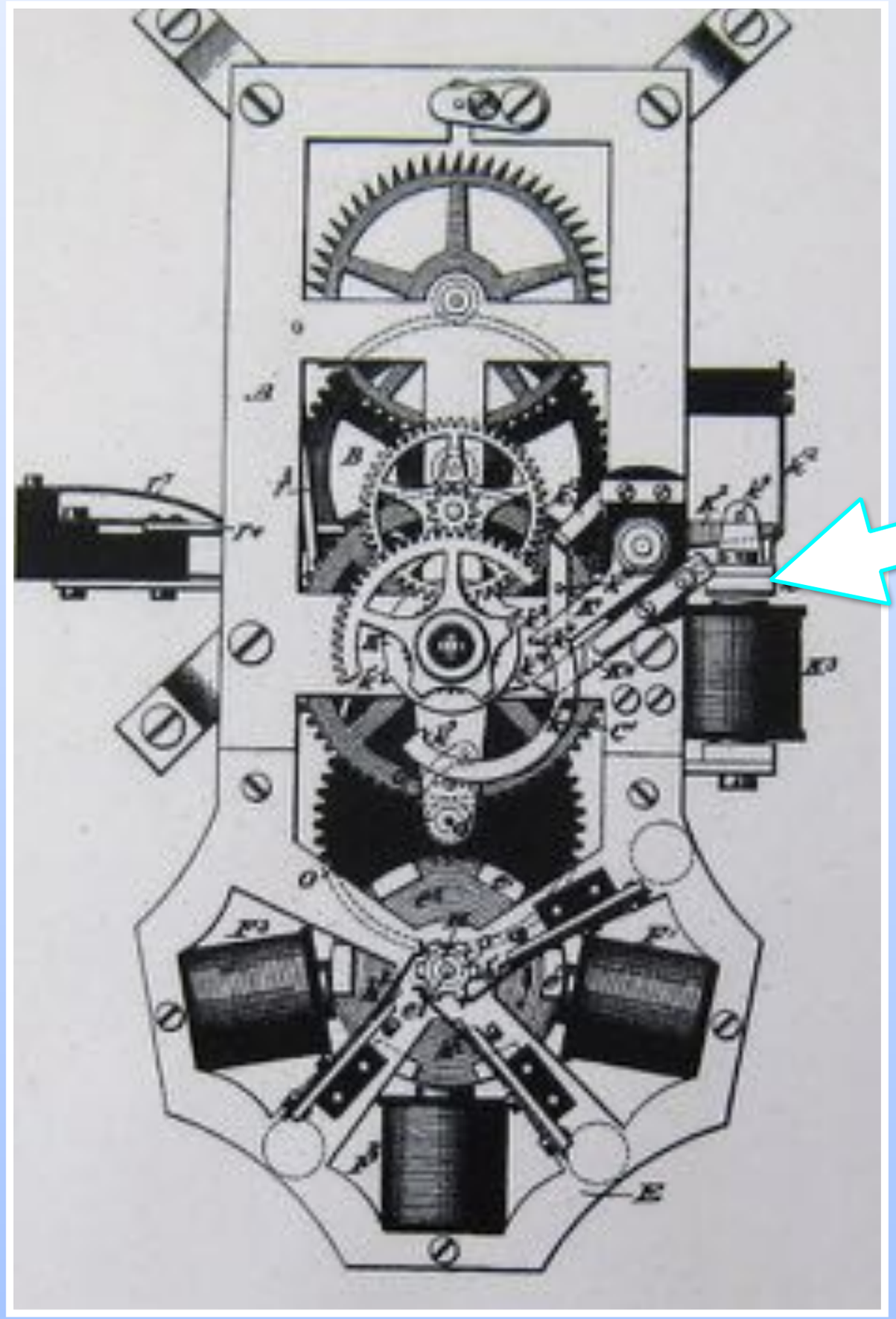
2. can be connected & synchronized with all company clocks at one time

3. requires no manual winding i.e. is self-winding

Electricity & Clocks

1884 - The Self Winding Clock Company patents an automatic winding electric clock movement

1886 - The Self Winding Clock Company patents a synchronizer for their self winding clocks



Synchronizer

1886

Self Winding Clock Company's patented synchronizer for their "rotary" self winding clock movement

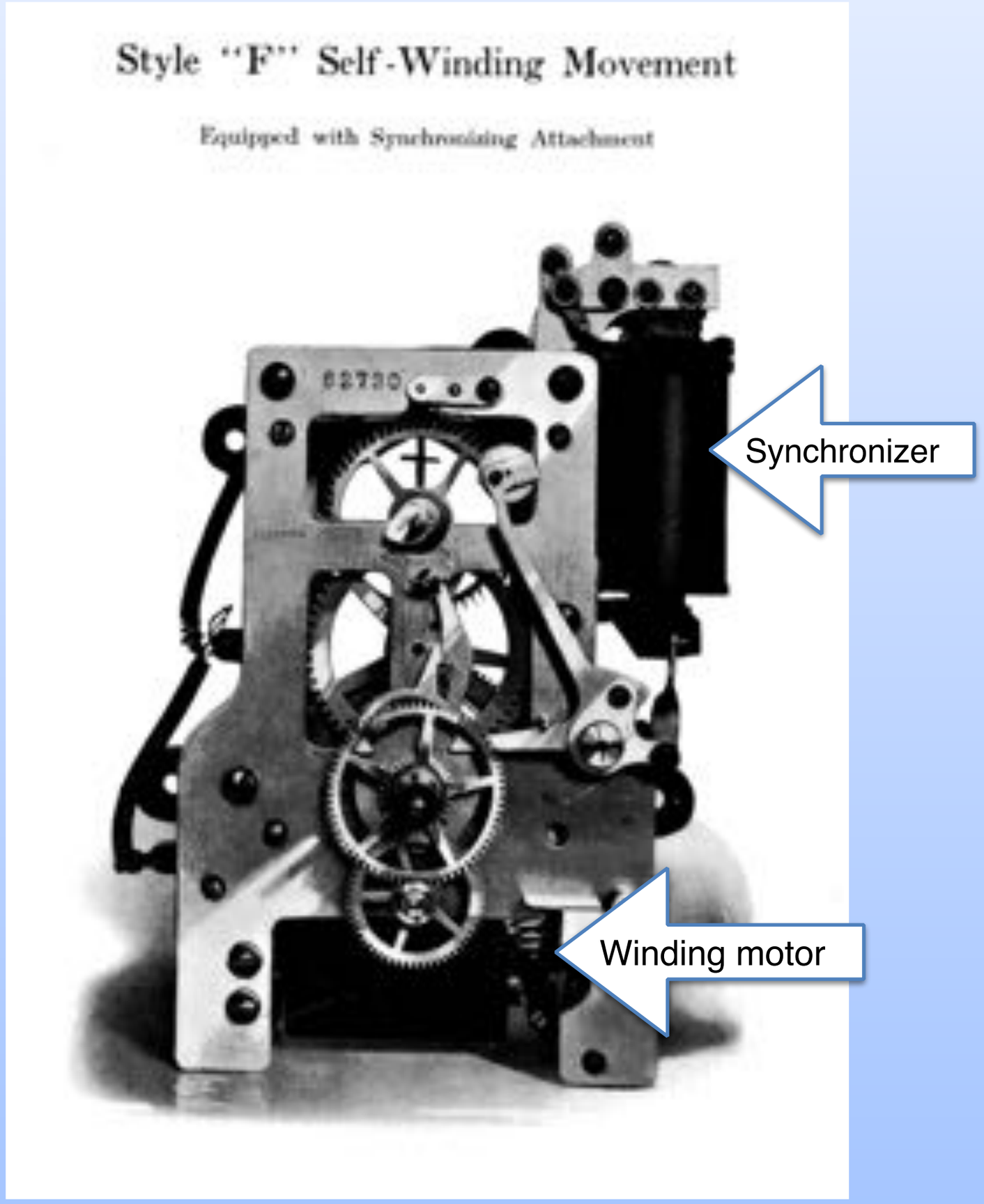
based on P H Dudley's design

Electricity and Clocks

By 1908 the Self Winding Clock Company had installed Electrically wound and Electrically synchronized clock systems
for more than 60 railroads

**By far more than any other company….why….
the clocks were self winding and each remote clock (subsidiary clock) was a fully functioning clock**

If the telegraph wires failed the clock still functioned



1898

Style “F” movement self-winding, synchronizing movement used in SWCC clocks

Commonly referred to as the “vibrator” movement

SWCC Movements with Synchronizer

MASTER

SUBSIDIARY

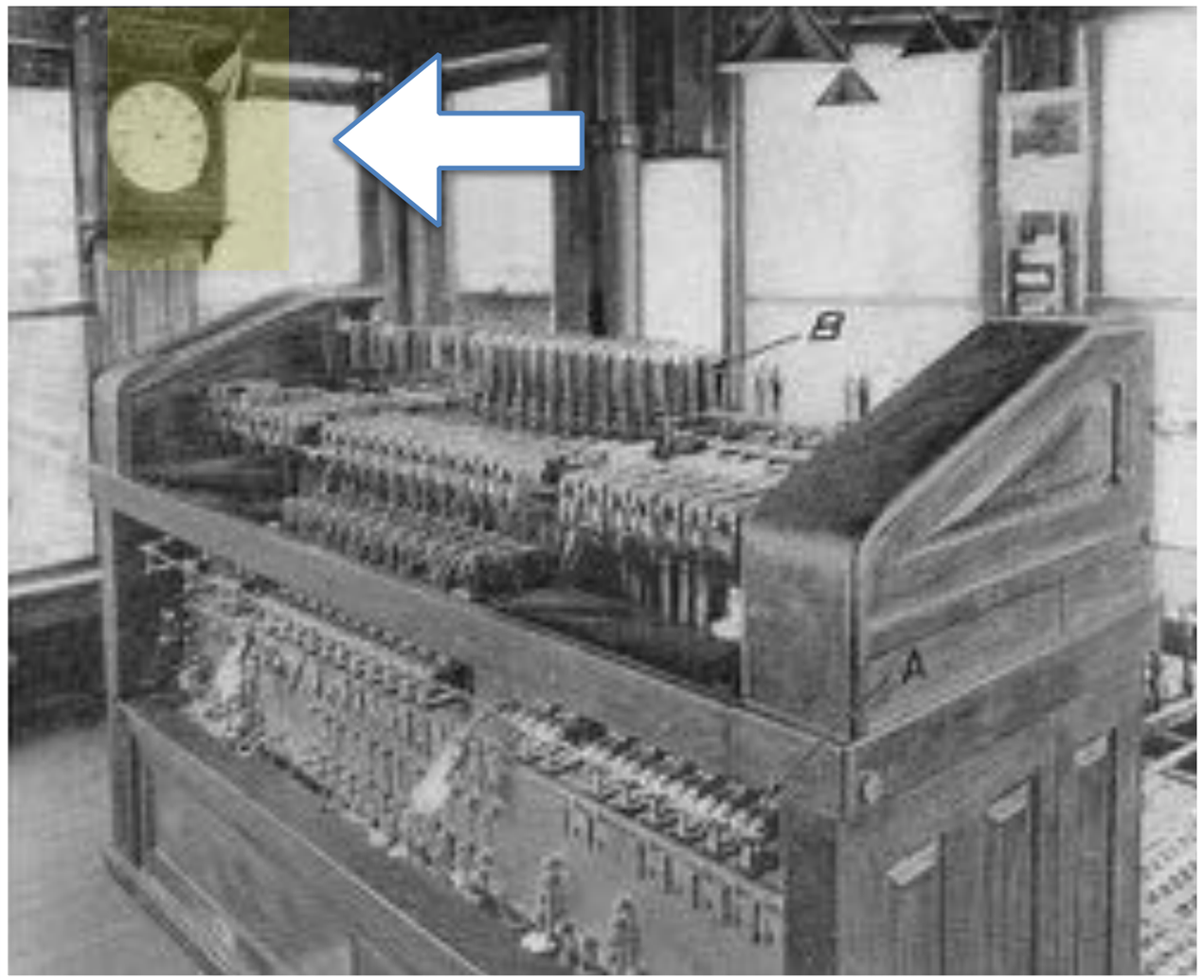
**They look the same because they are the same,
each is a fully functioning clock movement**

SWCC Railroad Master Clocks

Hoboken RR master clock

Canadian Pacific RR master clock

Subsidiary SWCC clock in signal tower



New York Central RR signal tower-
This clock is synchronized
hourly by a master clock

Subsidiary 80 beat SWCC
RR clock with synchronizer-
color panel is promoting
Atlantic City & the Pennsylvania RR

Union Pacific RR Standard Clock
Kelso, California

Self Setting Self Winding Clock Co. 1913

Provided synchronized time systems to northern railroads west of the Mississippi

Their time signal came from Goodsell Observatory Northfield, Minnesota

The clock movement is very similar to Self Winding Clock Co.

What is different? a flag shows thru a hole in the dial confirming a synchronizing impulse has been received

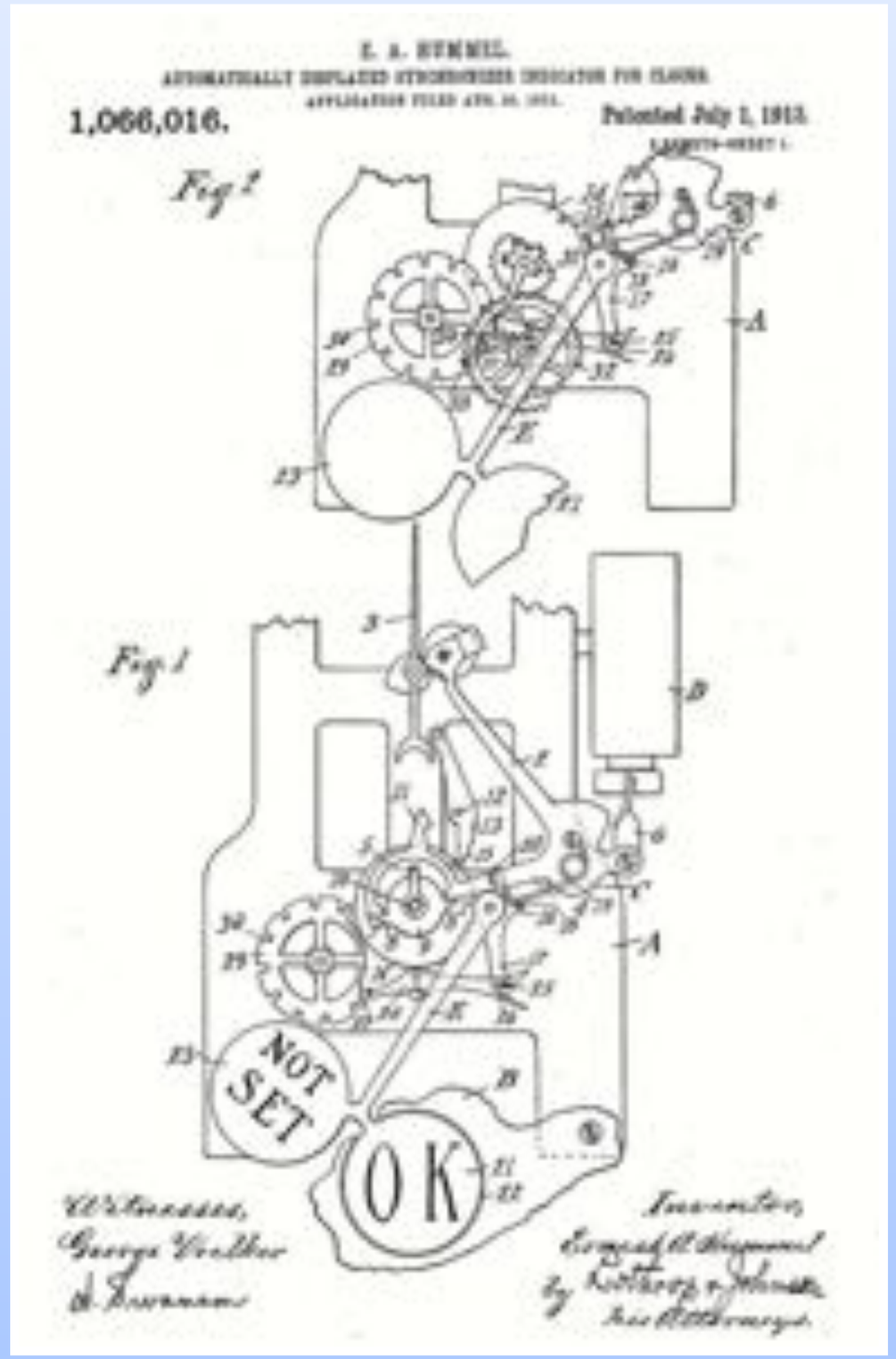
Self Setting Self Winding Clock from Great Northern Railway

Synchronizer flag remains green if the clock is synchronized

A safety feature added to the clock movement

Contains a patented pendulum tie down

Red flag drops if no synchronization in 24 hours



**Self Winding Clock Co.
railroad clocks
are synchronized regularly
however there is no
way to assure the
synchronization was
successful**

**This 1913 patent addition to
a Self Setting Self Winding Co.
railroad clock automatically
indicates the synchronizer
is operating correctly**

SWCC clocks after 1935 could be equipped with an indicator light that was illuminated when the clock received the synchronizing signal

The hands can be moved 15 +/-seconds - precisely to the hour

The light indicates the the clock received the hourly synchronizing signal

Many Railroad Master Clocks were self winding & advanced minute impulse Slave Clocks

Blodgett Clock Co.

These clocks were synchronized manually

Manufactured by:

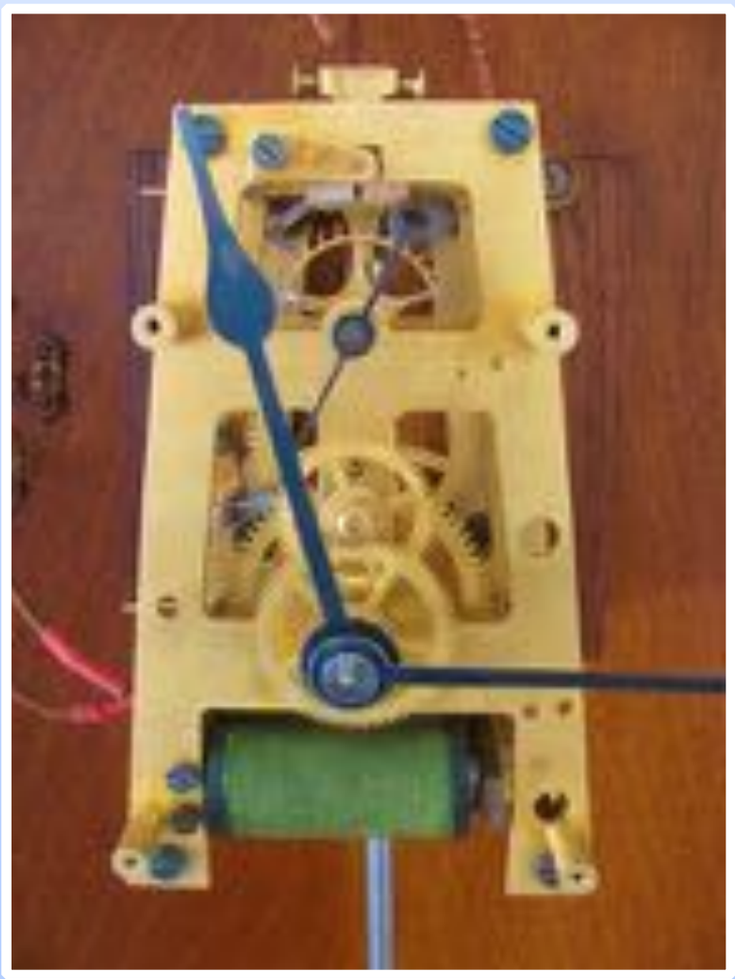
International Time Recorder Co.(IBM)

Standard Electric Time Co.

Stromberg Electric Co.

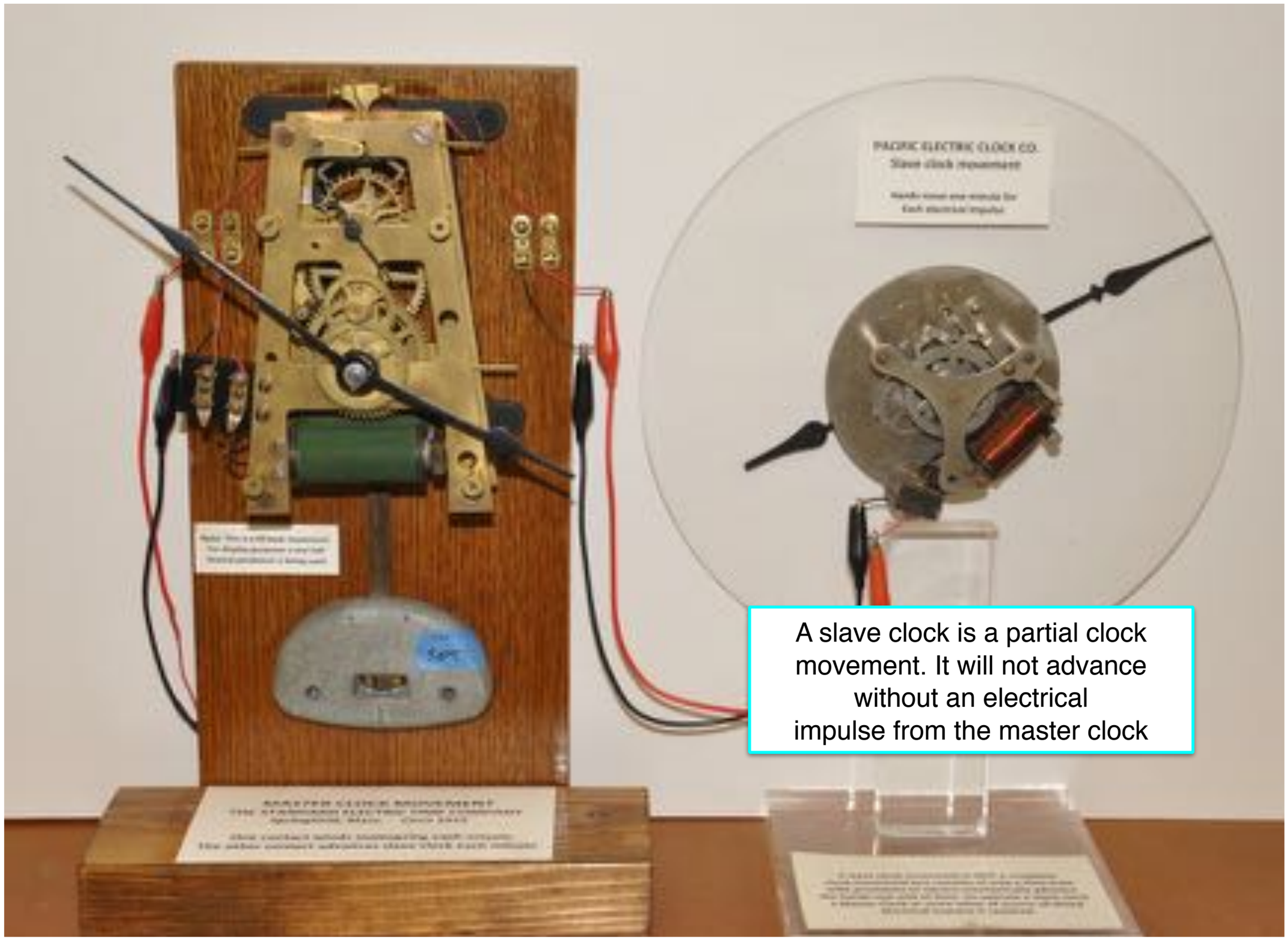
Blodgett Clock Co.

& Others



Minute impulse movement- winds mainspring & advances slave clocks

Master Clock-Slave Clock Movements comparison



Santa Fe Railroad sells all Standard Clocks 1968-72

AT&SF never used electrically synchronized clock systems

AT&SF railroad sells all Standard Clocks

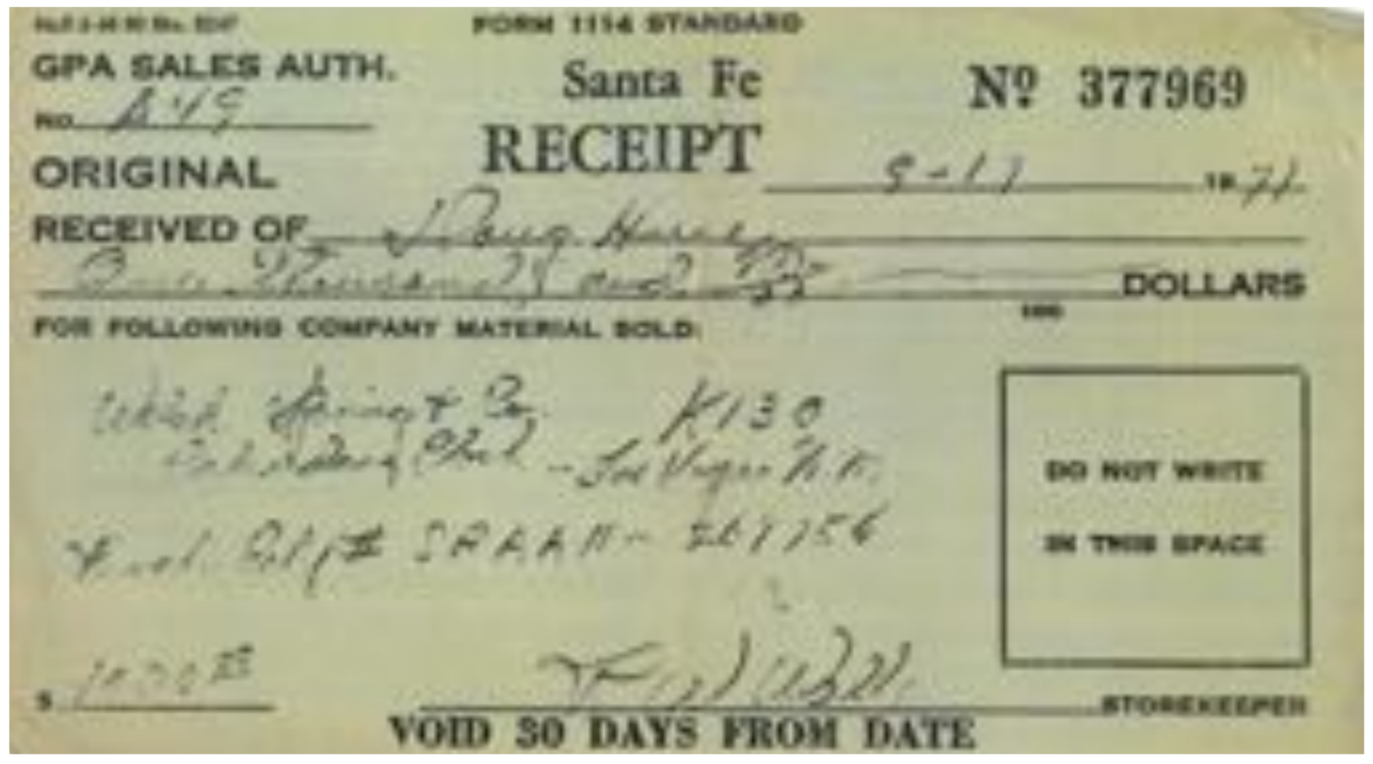
**This model #72
E. Howard regulator
was in use in
Atchison, Kansas
by the Santa Fe
Railroad**

**The clock never had
a “Montgomery” type dial
but retained the
original E. Howard dial**

**This clock was
purchased from Santa Fe RR
in 1970 when
Santa Fe sold all of
their Standard clocks**

**E. N. Welsh Spring & Co.
Regulator # 1
was located in the
Santa Fe RR
Passenger Agents/Telegraph
office in
Las Vegas, New Mexico**

Receipt from Santa Fe



FORM 1114 STANDARD

GPA SALES AUTH.
NO. 845

Santa Fe
RECEIPT

№ 377969

ORIGINAL

9-17 19 71

RECEIVED OF

DOLLARS

FOR FOLLOWING COMPANY MATERIAL SOLD:

K130

DO NOT WRITE
IN THIS SPACE

$

STOREKEEPER

VOID 30 DAYS FROM DATE

Ball Watch Company Railroad Clocks

Ball's Railroad Office Clocks

Ball Clocks and Watches were manufactured by others to Ball's strict standards

Oops - Not all railroad accidents are time related

Standard Time is displayed on the station Standard Clock

Standard Time – Time derived from a specific source.

The time to which all other clocks and watches are compared.

What was the specific source?

Observatories via telegraph
By 1937 - came from wwv radio signal

Standard
Clocks
in AT&SF
telegraph
office
Seligman, AZ
1943

Each Station had a Standard Clock

Railroad Watches were set to the Standard Clock

In addition to accurate Standard Clocks, the quest for railroad safety led to the Certification of Railroad Watches

Stations had clocks and train operators had pocket watches

1849 – Penn RR began issuing pocket watches to their engineers

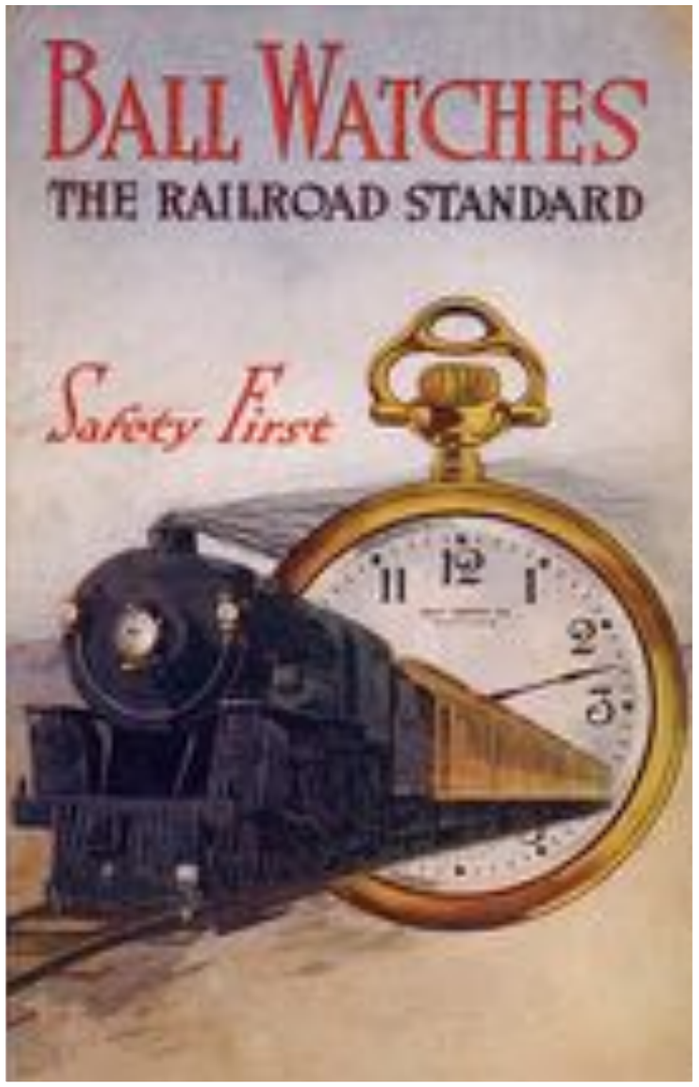
1853 – Boston & Providence RR hires Wm Bond & Sons as first RR Time Inspectors

1860's
Railroads are now requiring "Conductors and Engineers to compare daily their watches with a Standard Clock"

1883 Railroad Standard Time
all railroads are operating on this time

1886 General Time Convention
many railroads agree to principals related to watch accuracy

….“each conductor and engineer must have a reliable watch ….
it has to be certified and they must file the certificate
before they take charge of the trains or engines….”



Webb C. Ball

1891- as a result of a collision between Lake Shore and Michigan Southern Railway trains at Kipton, Ohio, which occurred because an engineer's watch stopped, Ball was commissioned as their Chief Time Inspector, in order to establish precision standards and a reliable time piece inspection system for railroad chronometers

1891

- Webb C. Ball hired as general time inspector by The Lake Shore & Michigan Southern Railway.
- Develops *Time Inspection Service* rules.
- Eventually controls 175,000 mile of railroad and 1-2 million watches.
- Markets BALL OFFICIAL RR STANDARD watches.

Railroad Watch requirements

- open-faced dials, with stem at 12 o’clock
- American made
- 17 jewels minimum
- 16 or 18 size only
- maximum variation of 30 seconds per week
- adjusted to 5 positions
- bold Arabic numerals, outer minute divisions, seconds dial, heavy hands
- others

Examples of elegant, approved Railroad watches

The first US made Railroad Watch 1866

Railroad Time-Keepers,

MANUFACTURED BY

The National Watch Co.,

OF ELGIN, ILLINOIS.

Read below what leading Railroad Superintendents say of them:

T. M. AVERY, Esq., President National Watch Co., Chicago:

Dear Sir—This Company has purchased and put in the hands of its engineers, eighty "Railroad Watches," which have given excellent satisfaction and proved to be very reliable time-keepers. In addition to these, quite a number of Elgin Watches have been purchased by officers and employes of this Company, all of whom have been well pleased with the efficiency and regularity of the movements manufactured by the National Watch Company.

Respectfully, EDWARD H. WILLIAMS, Gen. Supt.

The last US made Railroad Watch 1969

Railroad Wrist Watches were not approved for RR use until 1959

- Ball ‘Trainmaster’ approved
- 21 jewel, Swiss made, wrist watch

Railroad accuracy was a huge selling point for Clock & Watch manufacturers

"Better get a Telechron* Clock, Jim!"

The curious custom of beginning every business day with a desperate dash for the 8:17 is almost extinct. Digestions are better. Tempers are tamer. All because of Telechron electric time in hundreds of thousands of American homes and offices.

Those households never oversleep because some one forgot to wind the clocks the night before—Telechron Clocks never need winding, oiling, cleaning, or regulating. Those households never quarrel over which clock or whose watch is right—the accuracy of Telechron products ends all arguments.

Telechron Master Clocks, in America's power houses, are primarily responsible for this modern promptness and precision. By checking the speed of giant generators, they assure even, regular impulses of alternating current at the electric outlet in the home. Driven directly by these current impulses, every Telechron Clock delivers the same silent, accurate time. Telechron Clocks and Telechron Master Clocks were made for each other. No clock, unless it's marked "Telechron" on the dial, can give you true Telechron service.

There's a dealer near you (listed in the classified telephone directory) with many models on display. Skilfully designed for mantel, wall or table—for every room in the house. Priced moderately from $9.75 to $55. (The Revere Clock Company, of Cincinnati, manufactures distinguished chiming clocks with Telechron motors, priced from $40 to $1200.) Warren Telechron Company, Ashland, Massachusetts.

* Telechron is the trade-mark, registered in the United States Patent Office, of the Warren Telechron Company.

Apollo—Black case. Chrome fittings, $15

Telechron

Geneva—Mahogany case with maple burl panel, $15

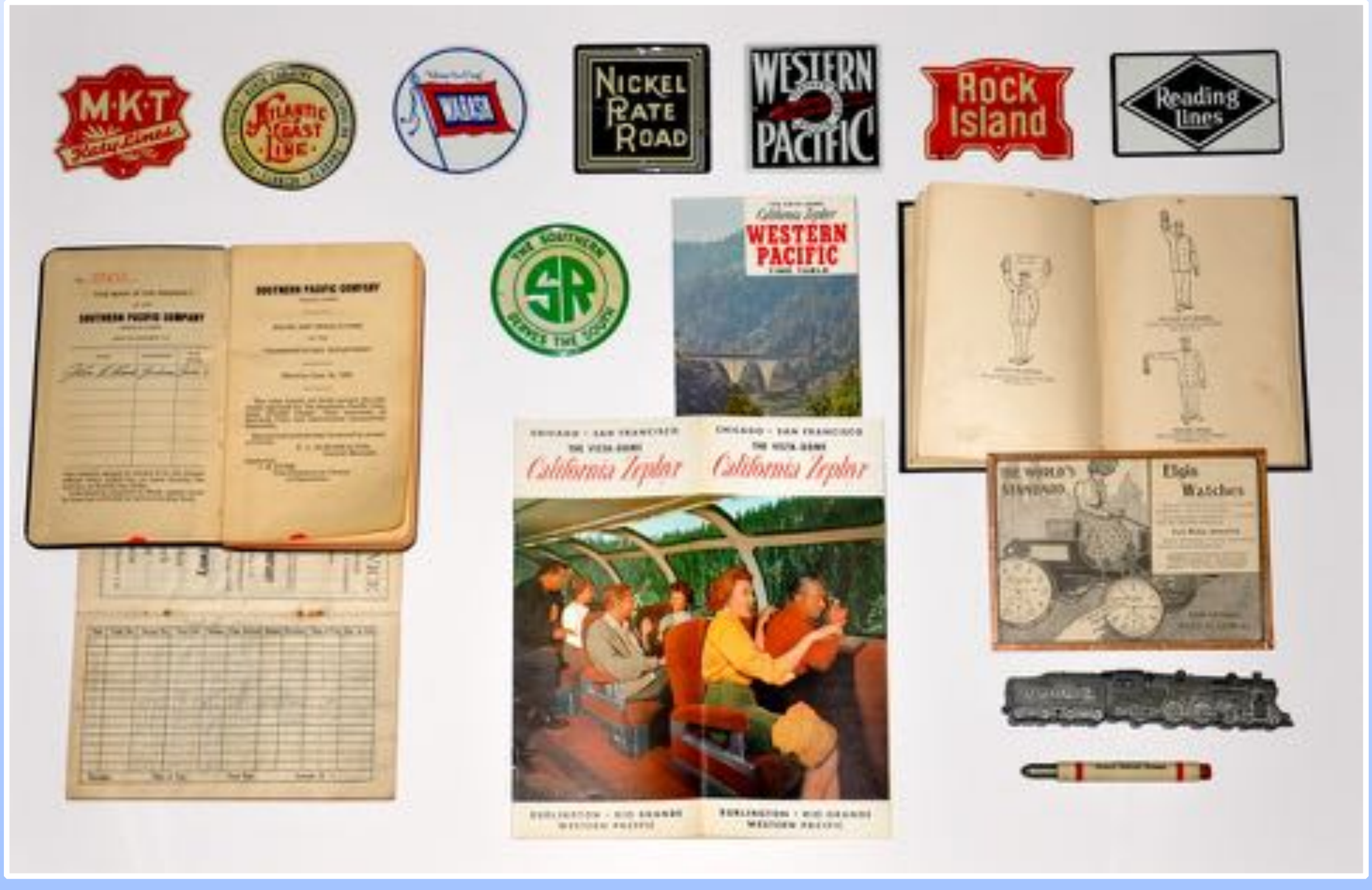
Waverly—Mahogany. Bronze fittings, $40

Telechron

promotes the accuracy of their clocks by showing that they are as timely as the Railroads

Schedules, Instructions, Rules & Logs

Travel brochures, operating instructions & advertising



The Railroad Station was an important, often very elegant, edifice in most major cities

Railroads ran on time and the buildings were adorned with reliable

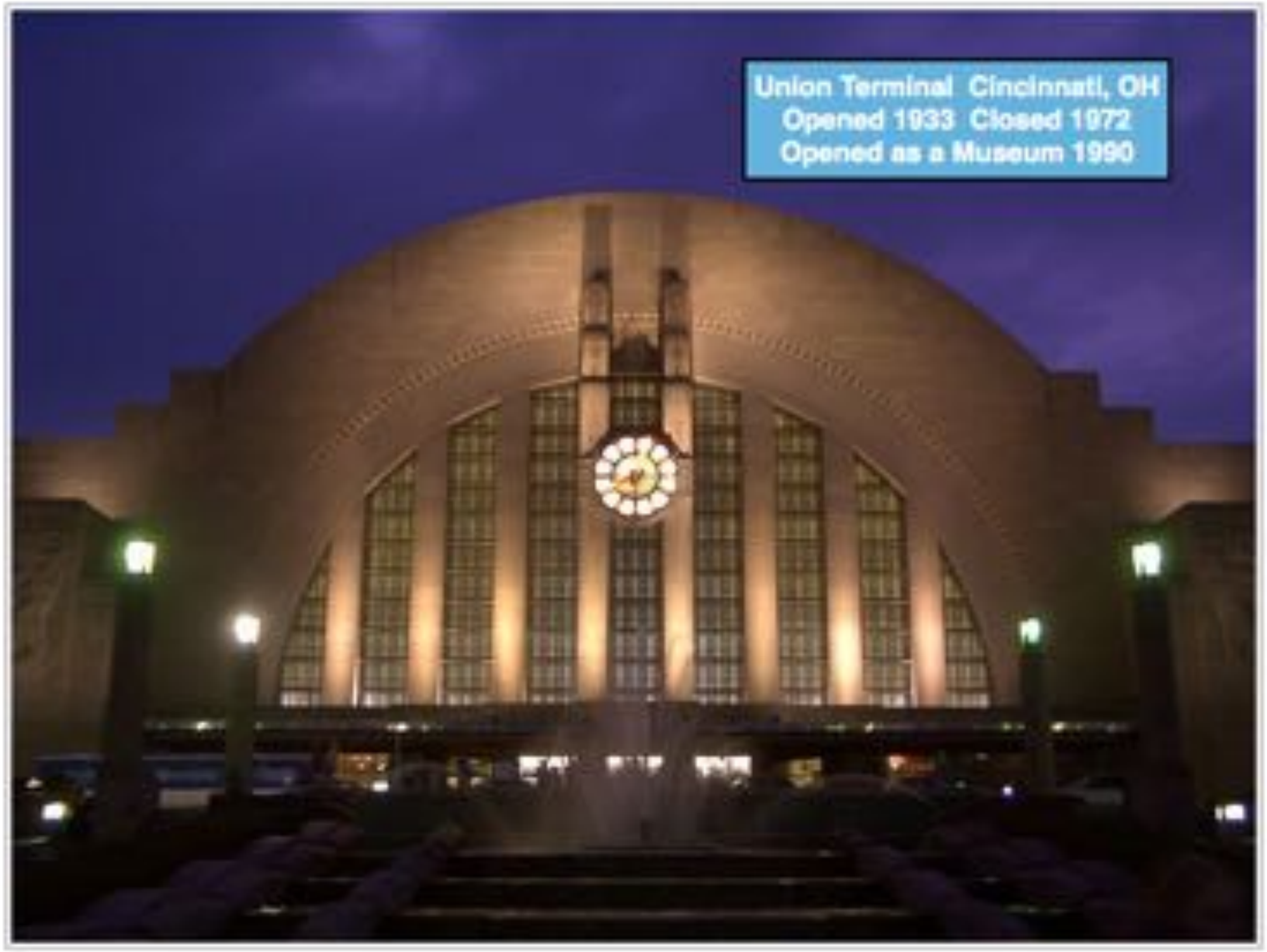
Public Clocks


Union Station
Portland, Oregon
Opened 1896
Rebuilt 1996
GO BY TRAIN


Union Station Los Angeles, CA
Opened 1939


Grand Central Terminal
New York, NY Opened 1913


Union Station Nashville, TN
Opened 1900 Closed 1979
Opened as a Hotel 1986


Union Terminal Cincinnati, OH
Opened 1933 Closed 1972
Opened as a Museum 1990

Clock Companies exit the synchronized clock business

The three major clock companies sell or close

- IMB sells time systems division 1958
- Standard Electric Time Co. sells business 1968
- Self Winding Clock Company closes business late 1960s

Railroad Operations Today

Communication - wireless

Navigation - GPS via satellites

Dispatching - central location

However….
all trainmen still need to have certified
RAILROAD WATCHES

Railroad operations today

No Standard Clock needed !

The Network Operations Center gives BNSF dispatchers the ability to "see" and manage train operations across the network, 24 hours a day.

Railroads today - communication is Wireless and-----
eventually locomotives may all be Driverless

The following images are of American Watch Company watches that pre-date Railroad Watch certification.

These watches would have met all requirements throughout the entire life of railroad watch certification.


A. W. Co.
WALTHAM


American Watch Co.
Waltham Mass.U.S.A.


A. W. Co.
WALTHAM


WALTHAM


American Watch Co
WALTHAM, MASS.
999568


American Watch Co
Waltham, Mass.
670044

Thank You for attending
GLAR 2015 &
Happy Collecting

Credits to follow

It took many dedicated people to create

RAILROAD TIME

Greater Los Angeles Regional Pasadena, CA. Jan. 29-31, 2015

Doug Huse - Railroad clocks
Les Lesovsky - Railroad clocks
Ernie Jenson - Railroad clocks
J. Alan Bloore - Railroad clocks
Bob Simon - Railroad clocks

Ray Brown - Mean Solar time

Richard Bates - Railroad watches
Tom McIntyre - Railroad watches

Tony & Karen Montella
Railroad Memorabilia

Exhibit Set-up
Dan Argento
Ernie Jenson
Ray Brown
J.Alan Bloore
Karen Montella

Slide Show - J. Alan Bloore
With thanks to:
Dave Coatsworth and Sue Gary

J. Alan Bloore, chairman
Chapters 190 & 133