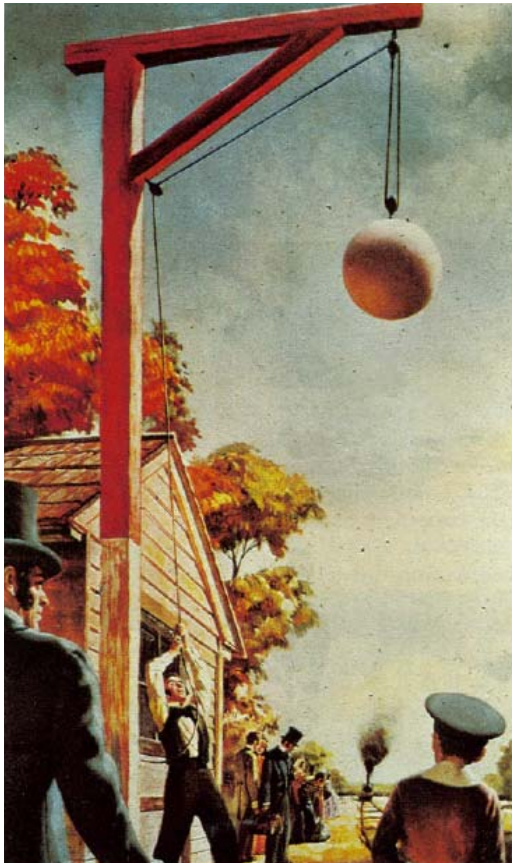


A BRIEF HISTORY OF RAILROAD OPERATING RULES, SIGNALING AND TRAIN CONTROL

Operation of a railroad is governed by rules, issued to employees in the form of the “Book of Rules”. Usually they follow a more or less standard form.

They specify general duties of various employees in the Operating Department and attempt to systematize their actions in any situation that may arise in operating trains.

Like the Rules of the Road when driving an automobile.

There are several “Books of Rules” currently used by railroads in the United States.

All rule books currently in use evolved from the:

Uniform Train Rules and Rules for the Movement of Trains by Telegraphic Orders

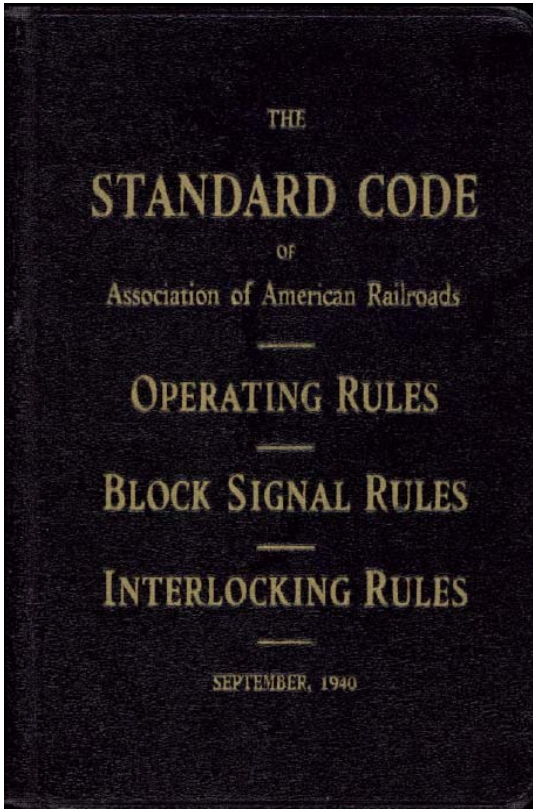
Adopted by the General Time Convention of the American Railroad Association in July of 1889 as the authorized **Standard Code**.

Originally, the General Time Convention was responsible for the establishment of Standard Time and the Time Zones in the United States on November 18, 1883.

Congress officially adopted Standard Time and the Time Zones by the Standard Time Act of 1918.

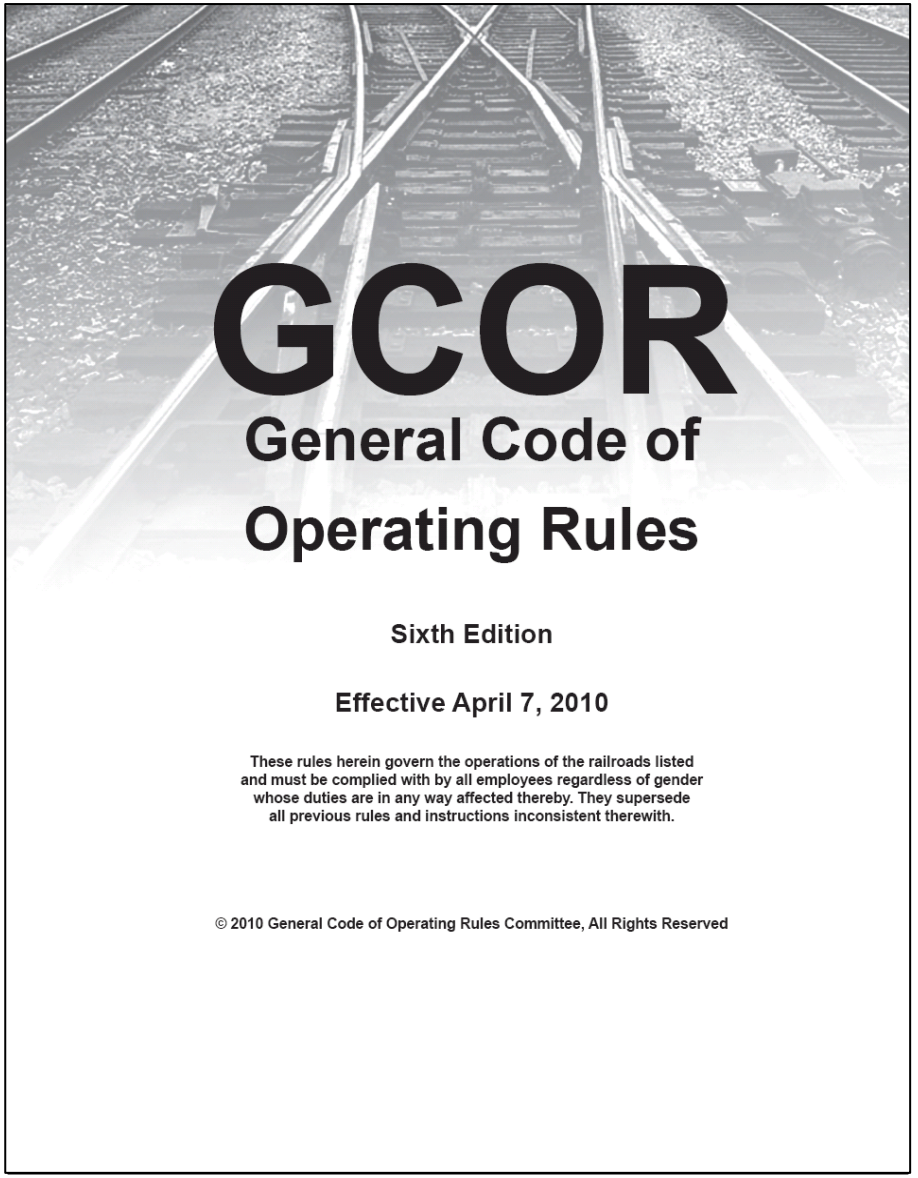
The American Railroad Association became the Association of American Railroads in 1937.

In 1938, the ***Uniform Train Rules and Rules for the Movement of Trains by Telegraphic Orders*** was renamed the ***Standard Code of Operating Rules***.

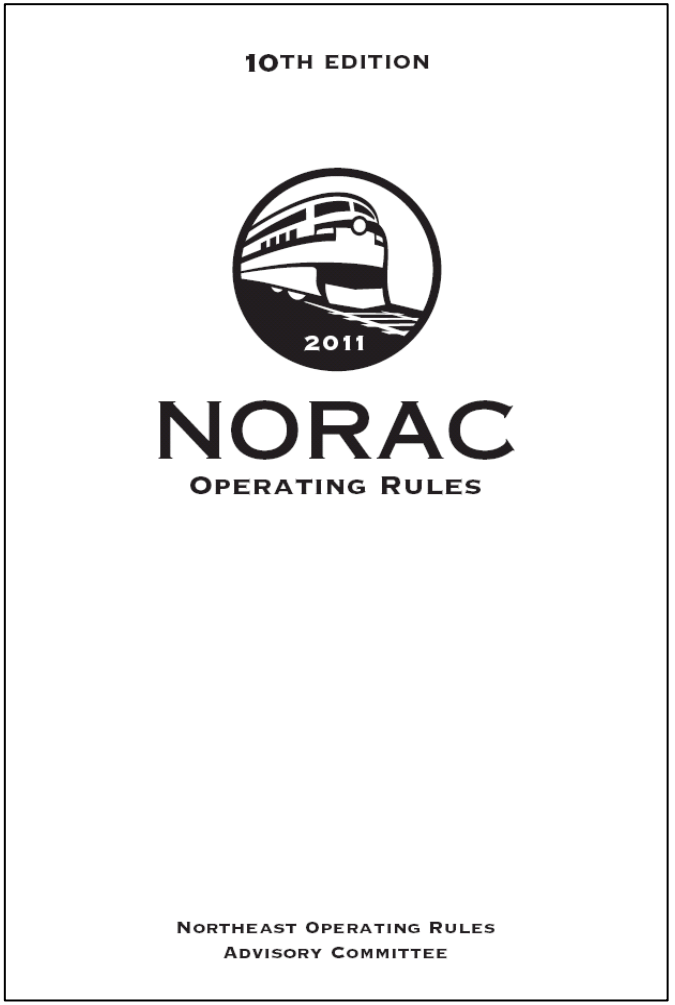


Metra has adopted the General Code of Operating Rules.

Over 300 other railroads, including the BNSF Railway, Canadian Pacific and Union Pacific Railroad have also adopted the GCOR.

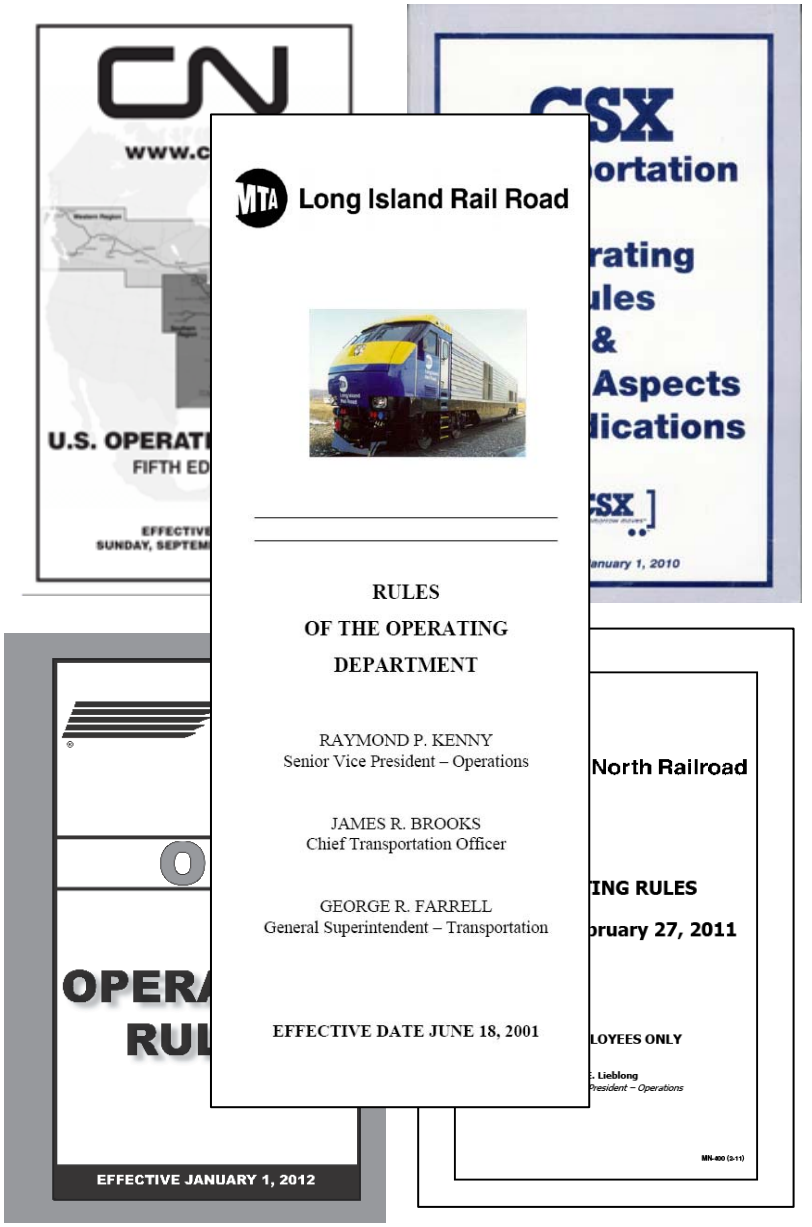


Approximately 60 eastern railroads have adopted the Northeast Operating Rules Advisory Committee (NORAC) Operating Rules.



Several railroads continue to maintain their own rule books:

- CN
- CSX Transportation
- Norfolk Southern
- Metro-North Railroad
- Long Island Railroad



How did this come about or how did we get to where we are today?

The process could best be described as evolution or by what is called Westinghouse's Law:

"THE MORE THINGS WE INVENT,

THE MORE THINGS WE NEED TO INVENT."

George Westinghouse

Problem Solving Procedure:

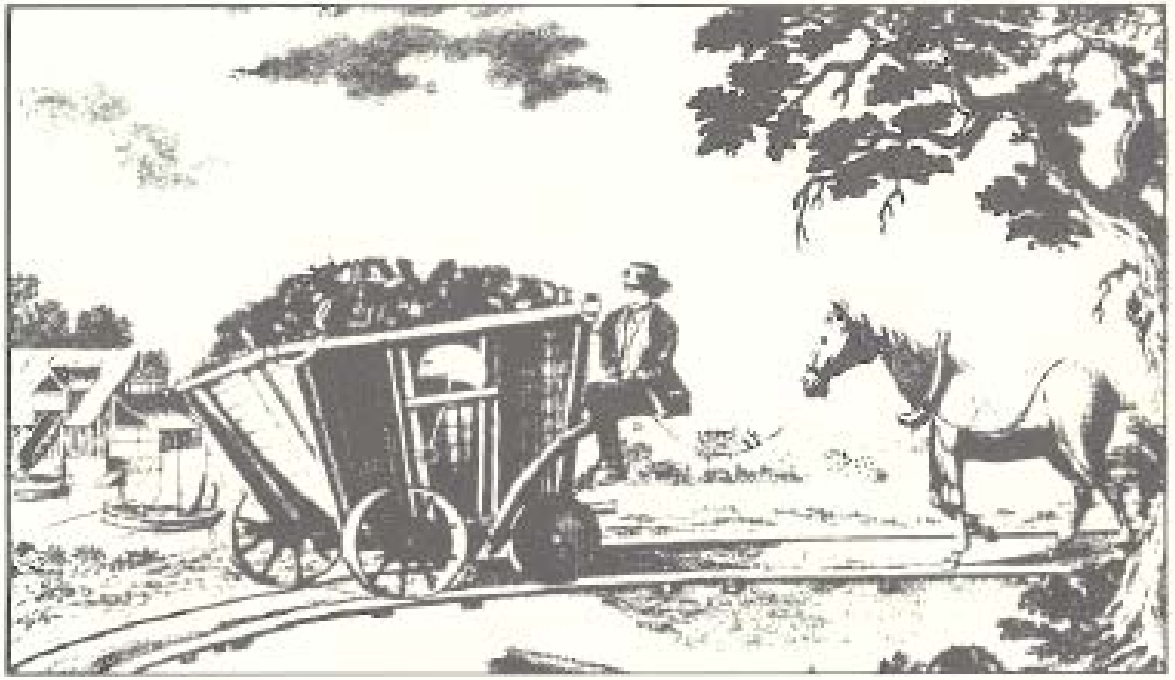
- Observe
- Critique
- Invent

Received a Patent for his Automatic Air Brake in 1869 at age 22.

Awarded 361 Patents during his 48 working years (1 every 1½ months)

Founder of Union Switch and Signal Company in 1881.

The original railroads consisted of wooden tracks where cars were pulled by horses.



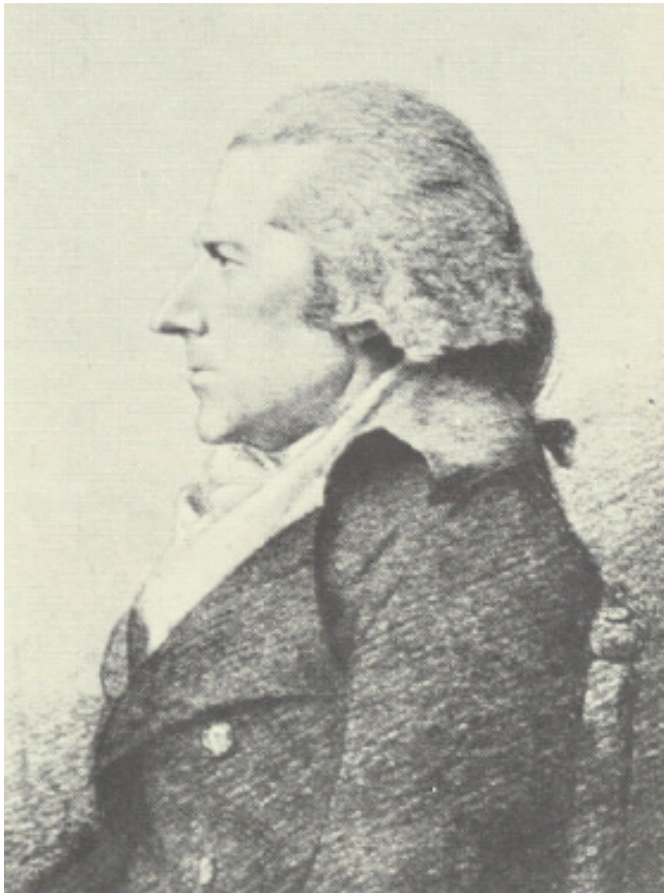
In 1765, James Watt harnessed the power of boiling water when he perfected the steam engine.

James Watt
The father of the steam engine.

Richard Trevithick put the steam engine on wheels in 1800 and it replaced the horse for pulling the cars.

Richard Trevithick
The father of the locomotive engine.

In 1820 William Jessup introduced the cast iron edge rail on which flanged wheels were used and railroads as we know them came into being.



William Jessup

On September 26, 1825, the 26 mile Stockton and Darlington Railway, built in 4½ years by George Stephenson, opened in England.

The world's first public railway created for carrying goods other than coal – plus passengers.

George Stephenson

Stephenson was also one of the first advocates of railroad safety. In 1841 he suggested a speed limit of 40 MPH, self acting brakes and uniformity of signals on the various lines.

Not everyone embraced the railroad. Philadelphians were warned that a "locomotive rail road" through their "beautiful streets" would ruin their trade and annihilate their rights – and perhaps worst of all, make them a suburb of New York!

MOTHERS LOOK OUT FOR YOUR CHILDREN!

ARTISANS, MECHANICS, CITIZENS!

When you leave your family in health, must you be hurried home to mourn a

DREADFUL CASUALITY!

PHILADELPHIANS, your RIGHTS are being invaded! regardless of your interests, or the LIVES OF YOUR LITTLE ONES. THE CAMDEN AND AMBOY, with the assistance of other companies without a Charter, and in VIOLATION OF LAW, as decreed by your Courts, are laying a

LOCOMOTIVE RAIL ROAD!

Through your most beautiful Streets, to the RUIN of your TRADE, annihilation of your RIGHTS, and regard less of your PROSPERITY and COMFORT. Will you permit this? or do you consent to be a

SUBURB OF NEW YORK!!

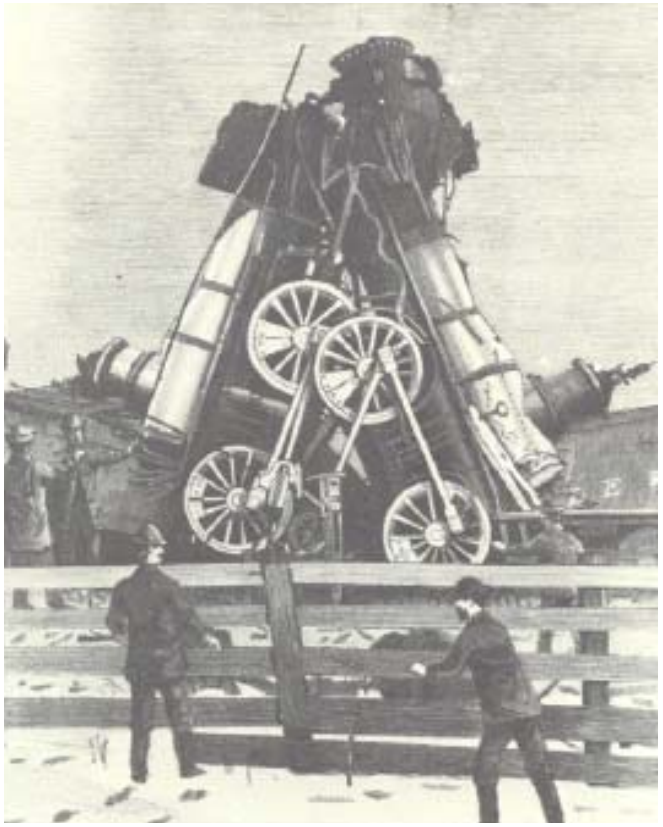
Rails are now being laid on BROAD STREET to CONNECT the TRENTON RAIL ROAD with the WILMINGTON and BALTIMORE ROAD, under the pretence of constructing a City Passenger Railway from the Navy Yard to Fairmount!!! This is done under the auspices of the CAMDEN AND AMBOY MONOPOLY!

RALLY PEOPLE in the Majesty of your Strength and forbid THIS

OUTRAGE!

In the beginning railroads consisted of one engine on one track.

With the coming of the second engine, provisions had to be made to prevent movements in opposite directions from colliding with each other.



The steam railroad was the first system where speeds could be high enough for stopping distance to exceed sighting distance.

A clear track had to be assured by some means other than an alert engine driver.

At that time, the first operating rules came into existence.

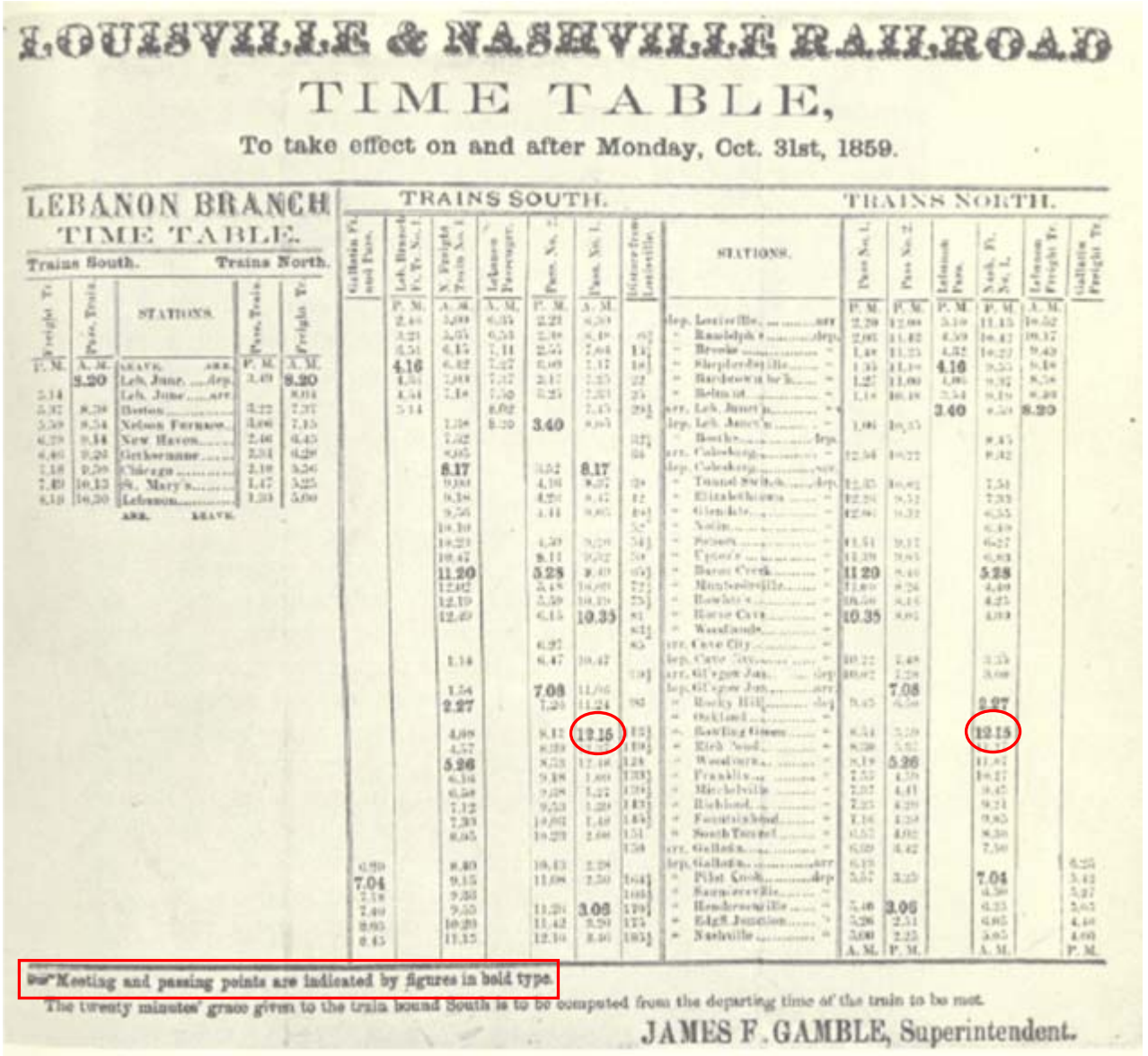
They were comparatively simple and as traffic increased they became progressively more complicated.

It can be said that the advent of railroad operating rules coincided with the need for them.

One of the first systems to prevent collisions between opposing movements was the Timetable Schedule.

Each train was given a printed time schedule (Time Table).

Meeting points were established between trains moving in opposite directions.



LOUISVILLE & NASHVILLE RAILROAD

TIME TABLE,

To take effect on and after Monday, Oct. 31st, 1859.

LEBANON BRANCH TIME TABLE.

Trains South. Trains North.

Freight Tr.	Pass. Train	STATIONS.	Pass. Train	Freight Tr.
P. M.	A. M.	LEAVE. ARR.	P. M.	A. M.
	5.20	Leb. June. ...dep.	3.40	9.20
5.14		Leb. June.....arr		8.04
5.32	8.20	Boston.....	3.22	7.37
5.59	8.54	Nelson Furnace..	2.46	7.15
6.29	9.14	New Haven.....	2.26	6.45
6.46	9.30	Gethsemane.....	2.14	6.29
7.18	9.50	Chicago.....	2.10	5.56
7.40	10.13	St. Mary's.....	1.47	5.25
8.10	10.30	Lebanon.....	1.33	5.00
		ARR. LEAVE.		

Galletin Fr. and Pass.	Leb. Branch Pass. Tr. No. 1	N. Freight Train No. 3	Lebanon Passenger.	Pass. No. 5	Pass. No. 1	Distance from Louisville.	STATIONS.	Pass No. 4	Pass No. 2	Lebanon Pass.	Nash. Fr. No. 4	Lebanon Freight Tr.	Galletin Freight Tr.
	P. M.	A. M.	A. M.	P. M.	A. M.			P. M.	P. M.	P. M.	P. M.	A. M.	
	2.40	1.00	6.35	2.23	8.50		dep. Louisville, ... arr	2.20	12.00	3.10	11.15	10.52	
	3.21	2.05	6.55	2.59	8.49	62	" Rauldph's .....dep.	2.05	11.42	2.50	10.42	10.17	
	3.51	2.45	7.11	3.21	7.04	11	" Brooks ..... "	1.49	11.25	2.32	10.27	9.49	
	4.16	3.02	7.22	3.40	7.17	16	" Shepherdsville..... "	1.35	11.10	4.16	10.11	9.34	
	4.51	3.40	7.37	4.17	7.33	22	" Barbourville..... "	1.27	11.00	4.06	9.32	9.26	
	5.14	4.04	7.50	4.35	7.43	25	" Belmont..... "	1.14	10.48	3.54	9.19	9.09	
			8.02		7.45	29½	arr. Leb. June'n..... "			3.40	9.00	8.20	
		7.38	8.20	3.40	8.05		dep. Leb. June'n..... "	1.06	10.35				
		7.52				37½	" Rowlo..... dep.				8.45		
		8.05				38	arr. Caledonia..... "	12.54	10.22		8.32		
		8.17		4.52	8.17		dep. Caledonia..... arr						
		9.00		4.16	8.37	39	" Tunnel Switch..... dep.	12.35	10.01		7.51		
		9.18		4.20	8.42	42	" Elizabethtown..... "	12.20	9.52		7.33		
		9.56		4.44	9.05	49½	" Glendale..... "	12.00	9.32		6.55		
		10.10				52	" Nolin..... "				6.40		
		10.23		5.20	9.29	54½	" Potters..... "	11.51	9.17		6.27		
		10.42		5.11	9.52	59	" Upton's..... "	11.39	9.05		6.03		
		11.20		5.28	9.40	65½	" Bacon Creek..... "	11.20	8.46		5.28		
		12.02		5.48	10.00	72½	" Munfordville..... "	11.00	8.26		4.49		
		12.19		5.59	10.19	75½	" Rowlett's..... "	10.50	8.15		4.25		
		12.49		6.15	10.35	81	" Horse Cave..... "	10.35	8.01		4.09		
						85½	" Woodlands..... "						
		6.27				85	arr. Cave City..... "						
		6.47					dep. Cave City..... arr	10.22	7.48		3.55		
						100	arr. Glasgow Jun..... dep	10.07	7.28		3.08		
				7.08			dep. Glasgow Jun..... arr		7.08				
		7.50		7.24		98	" Rocky Hill..... dep	9.45	6.50		2.27		
							" Oakland..... "						
		8.12			12.15	113	" Bowling Green..... "	8.54	5.39		12.15		
		8.39				119	" Rich Pond..... "	8.30	5.15				
		8.53				124	" Woodburn..... "	8.19	5.26				
		9.18				133	" Franklin..... "	7.57	4.59				
		9.38				139	" Bucksville..... "	7.37	4.41				
		9.53				145	" Richland..... "	7.25	4.29				
		10.02				148	" Fountainhead..... "	7.16	4.20				
		10.23				151	" South Tunnel..... "	6.57	4.02				
						158	arr. Gallatin..... "	6.30	3.42				
		10.43					dep. Gallatin..... arr	6.15					
		11.08				164	" Pilot Creek..... dep	5.57	3.20		7.04		
						168	" Summerville..... "						
		11.31			3.06	179	" Hendersonville..... "	5.46	3.05				
		11.42				174	" Edgefield Junction..... "	5.36	2.51				
		12.10				185½	" Nashville..... "	5.00	2.22				
								A. M.	P. M.				

Meeting and passing points are indicated by figures in bold type.

The twenty minutes' grace given to the train bound South is to be computed from the departing time of the train to be met.

JAMES F. GAMBLE, Superintendent.

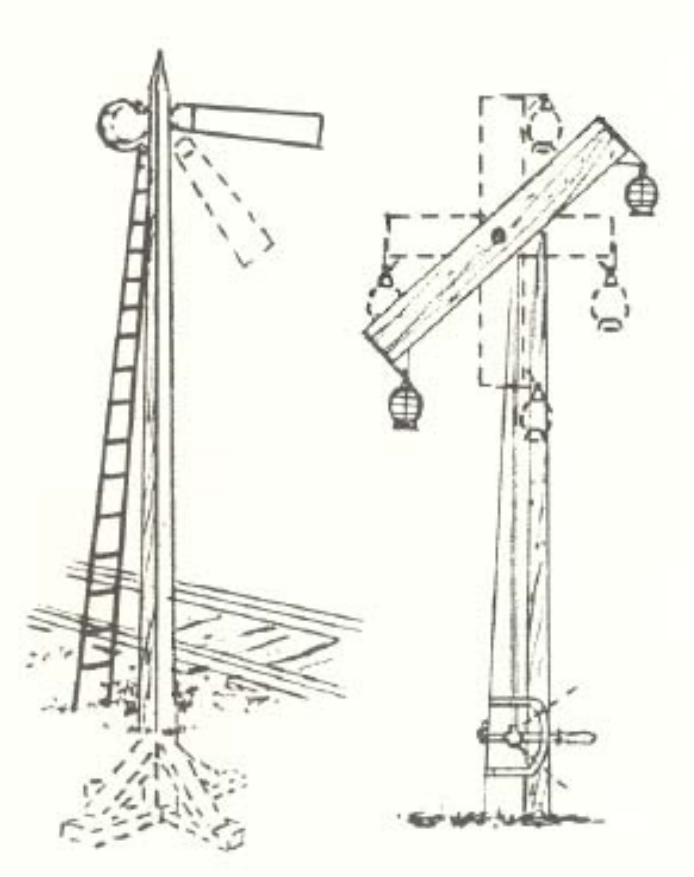
Neither train could leave the meeting point until the other train arrived.

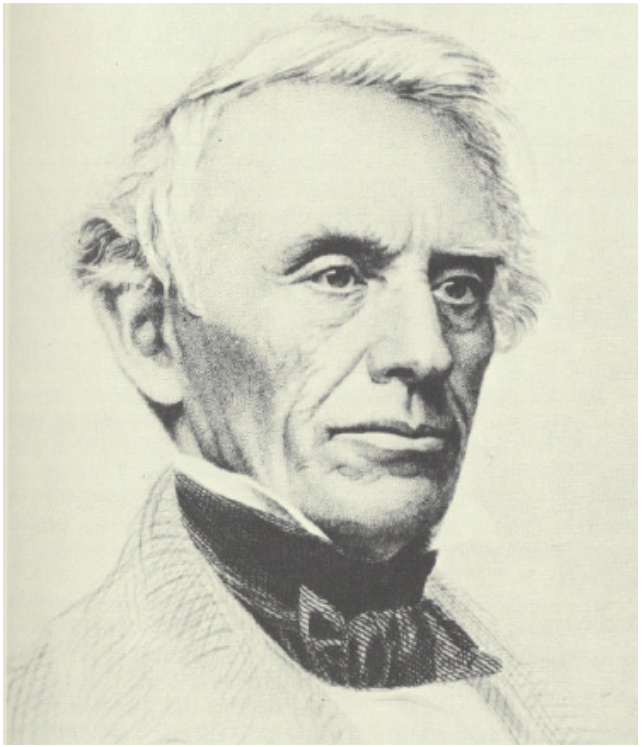
The system worked well as long as the trains ran on schedule.

If one train was delayed in arriving at the meeting point, delays to many trains could result and eventually paralyze the railroad.

The Timetable Schedule also provided time separation of trains moving in the same direction.

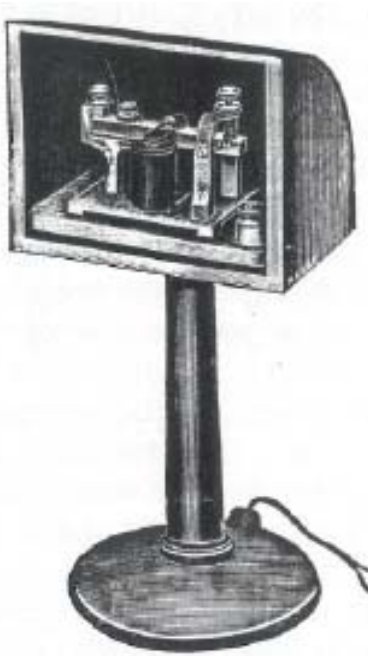
As traffic increased, tracks were divided into blocks and train separation was by space interval through use of manually controlled signals at the entrance to each block.

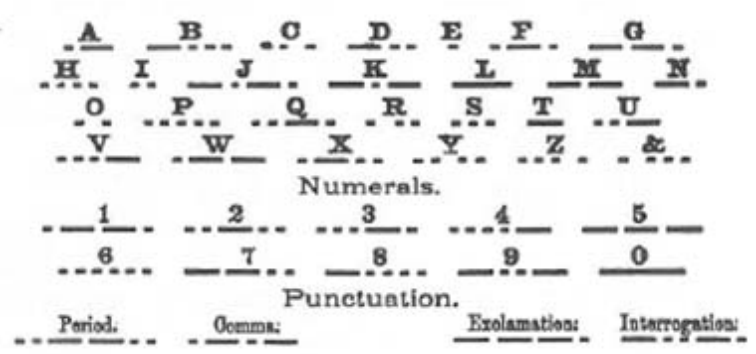




Samuel F. B. Morse

In 1837, Samuel F. B. Morse invented the electric telegraph. A simple apparatus for sending and receiving electric impulses by wire.





A quick demonstration.

It was only a matter of time before the telegraph would be used by the railroads.

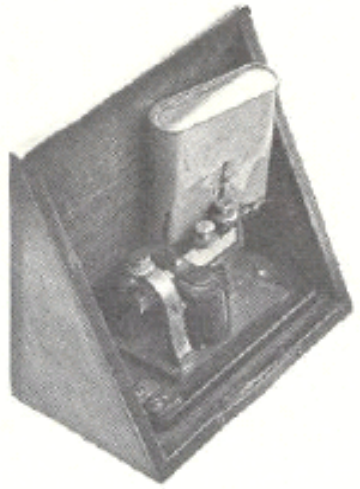
On September 22, 1851 the historic event occurred on the New York & Erie Railroad.

Charles Minot

Superintendent Charles Minot was on a westbound train that was stopped at Turner's, New York waiting for a meet with an eastbound express.

A telegraph line had recently been installed along the railroad.

Time passed and when the eastbound express did not arrive Mr. Minot, who was known as one of the most progressive railroad officials of his day, asked the station operator to telegraph Goshen, New York, 14 miles west, to determine if the express had arrived.



On being advised that the express had not arrived, Mr. Minot issued the first telegraphic train order which read:

To the agent and operator at Goshen:

Hold the eastbound train for further orders.

Chas. Minot, Superintendent

He then wrote an order which he handed to Conductor Stewart on his train:

To conductor and engineer, Day Express:

Run to Goshen regardless of opposing train.

Chas. Minot, Superintendent

Mr. Isaac Lewis, the engineer of the train, refused to run the train on such an order saying he would *"run the train according to time card rules, and no other way."*

Mr. Minot took charge and ran the engine himself.

Upon arriving at Goshen the eastbound express had not arrived.

He repeated his orders and was able to reach Port Jervis, New York at the same time the eastbound train was arriving.

Minot's procedure was developed into rules for running trains by telegraph.

RULES AND REGULATIONS

GOVERNING THE

RUNNING OF TRAINS

OF

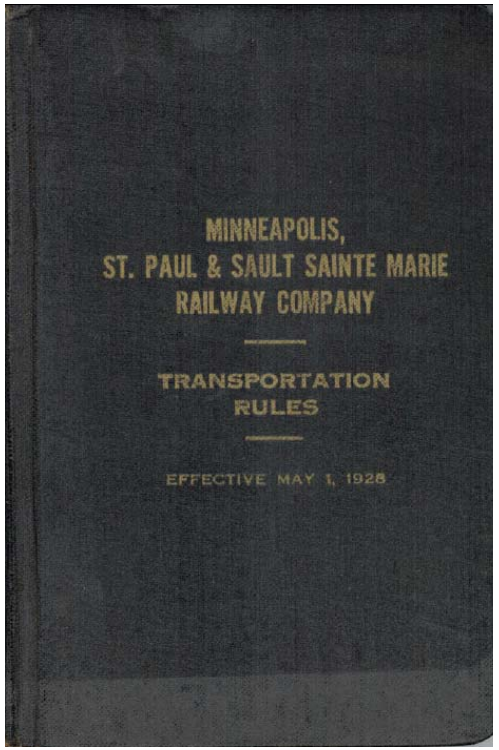
SOUTH CAROLINA RAILWAY.

JOHN B. PECK,
General Manager.

ISSUED APRIL 1st 1885.

CHARLESTON, S. C.
WALKER, EVANS & COGSWELL, PRINTERS,
Nos. 3 Broad and 109 East Bay Streets,
1885.

Those procedures were further refined and evolved into a set of rules known as Timetable and Train Order Operation.



Time Table – The authority for movement of regular trains subject to the rules. It contains the classified schedules of trains with special instructions relating thereto.

Regular Train – A train authorized by a time-table schedule.

Schedule – That part of a time-table which prescribes class, direction, number and movement for a regular train.

Extra Train – A train not authorized by a time-table schedule. It may be designated as –

Extra - for any extra train, except work extra;

Work extra – for work train extra.

201. For movements not provided for by time-table, train orders will be issued by authority and over the signature of the chief train dispatcher, and only contain information or instructions essential to such movements.

They must be brief and clear; in the prescribed forms when applicable; and without erasure, alteration or interlineation.

Chicago & Iowa R. R. Train Order.

Conductors must not leave Station, when directed to run by special order, without having the same be writing, in their possession, which must always be read by the Engineer before starting.

Aurora, Mar 8th 187 2

From Aurora To Conductor and Engineer No. Extra

At Aurora Station.

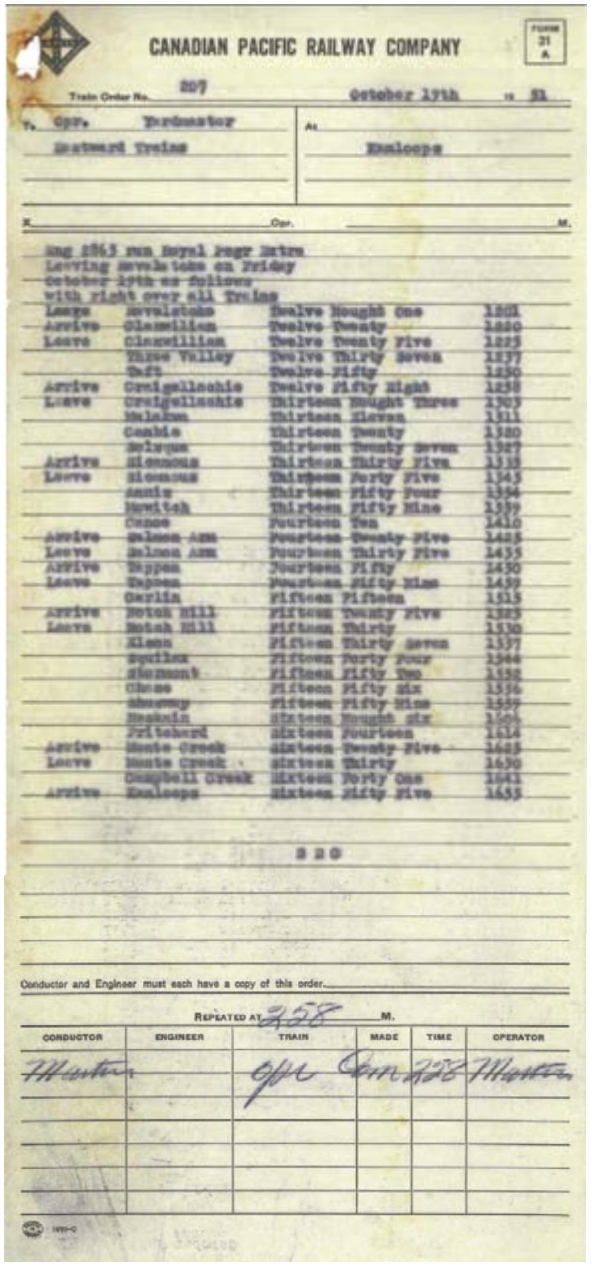
Destroy order
Holding Extra
Forest
OK

Answer how you understand, and get my answer before starting.

Signed D. P. Smith

Received 5 45 P M. by Smith Operator.

NOTE.—Operators must exercise the greatest care and watchfulness in sending and receiving messages in regard to running trains. Blanks will be furnished each Operator to copy all orders upon, in regard to running trains by telegraph, which must be kept in readiness for use at all times.



CANADIAN PACIFIC RAILWAY COMPANY

FORM 31 A

Train Order No. 207 October 17th 19 31

To Opr. Penticton At Enderby

Eastward Trains

X Opr. M.

Eng 2863 run Royal Pugr Extra
Leaving Revelstoke on Friday
October 17th as follows
with right over all Trains

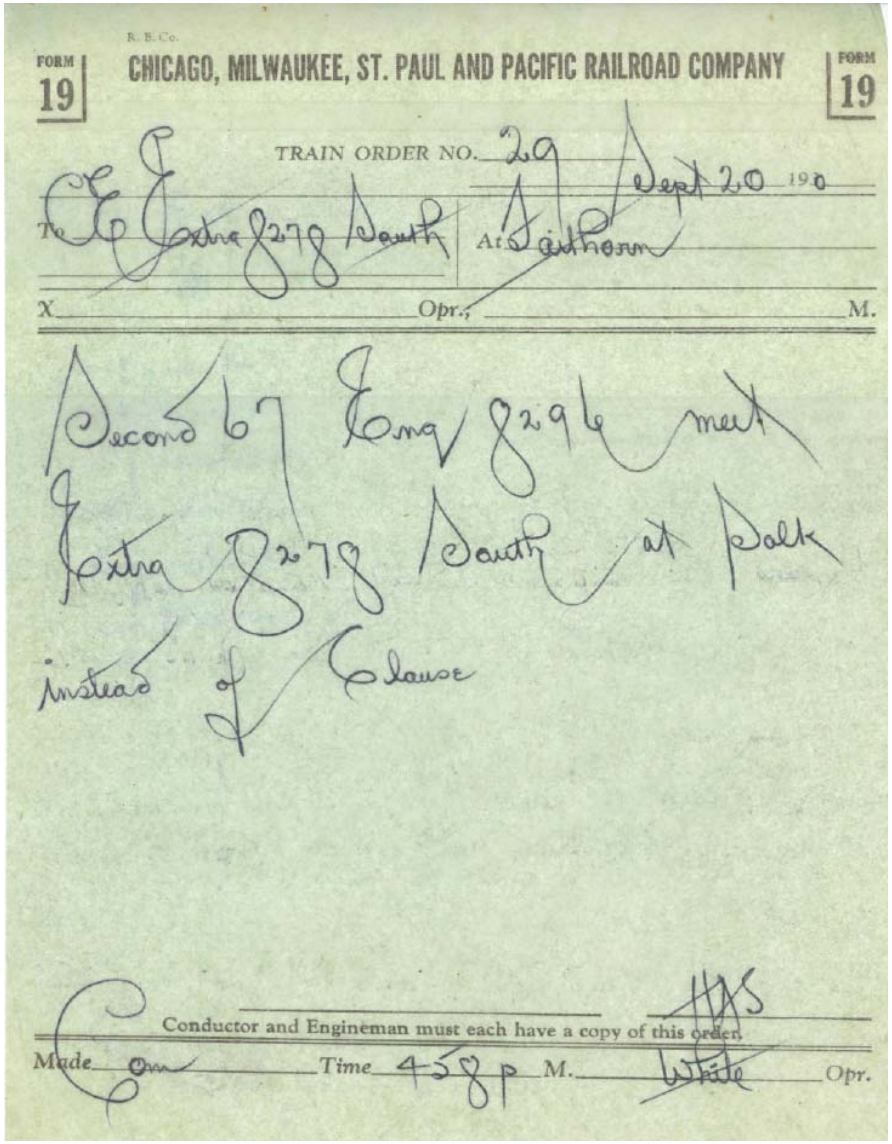
Leave	Revelstoke	Twelve Nought One	1201
Arrive	Clanwilliam	Twelve Twenty	1220
Leave	Clanwilliam	Twelve Twenty Five	1225
	Three Valley	Twelve Thirty Seven	1237
	Taft	Twelve Fifty	1250
Arrive	Craigellachie	Twelve Fifty Eight	1258
Leave	Craigellachie	Thirteen Nought Three	1303
	Malakwa	Thirteen Eleven	1311
	Cambie	Thirteen Twenty	1320
	Sulzapa	Thirteen Twenty Seven	1327
Arrive	Sicamous	Thirteen Thirty Five	1335
Leave	Sicamous	Thirteen Forty Five	1345
	Annis	Thirteen Fifty Four	1354
	Hewitch	Thirteen Fifty Nine	1359
	Canoe	Fourteen Ten	1410
Arrive	Salmon Arm	Fourteen Twenty Five	1425
Leave	Salmon Arm	Fourteen Thirty Five	1435
Arrive	Tappen	Fourteen Fifty	1450
Leave	Tappen	Fourteen Fifty Nine	1459
	Garlin	Fifteen Fifteen	1515
Arrive	Notch Hill	Fifteen Twenty Five	1525
Leave	Notch Hill	Fifteen Thirty	1530
	Klaso	Fifteen Thirty Seven	1537
	Squilax	Fifteen Forty Four	1544
	Shuswap	Fifteen Fifty Two	1552
	Chase	Fifteen Fifty Six	1556
	Shushmy	Fifteen Fifty Nine	1559
	Neskain	Sixteen Nought Six	1606
	Pritchard	Sixteen Fourteen	1614
Arrive	Monte Creek	Sixteen Twenty Five	1625
Leave	Monte Creek	Sixteen Thirty	1630
	Campbell Creek	Sixteen Forty One	1641
Arrive	Kamloops	Sixteen Fifty Five	1655

320

Conductor and Engineer must each have a copy of this order.

REPEATED AT 358 M.

CONDUCTOR	ENGINEER	TRAIN	MADE	TIME	OPERATOR
Hunter		Opr Penn	358		Hunter



R. B. Co.

FORM 19

CHICAGO, MILWAUKEE, ST. PAUL AND PACIFIC RAILROAD COMPANY

FORM 19

TRAIN ORDER NO. 29 Sept 20 1900

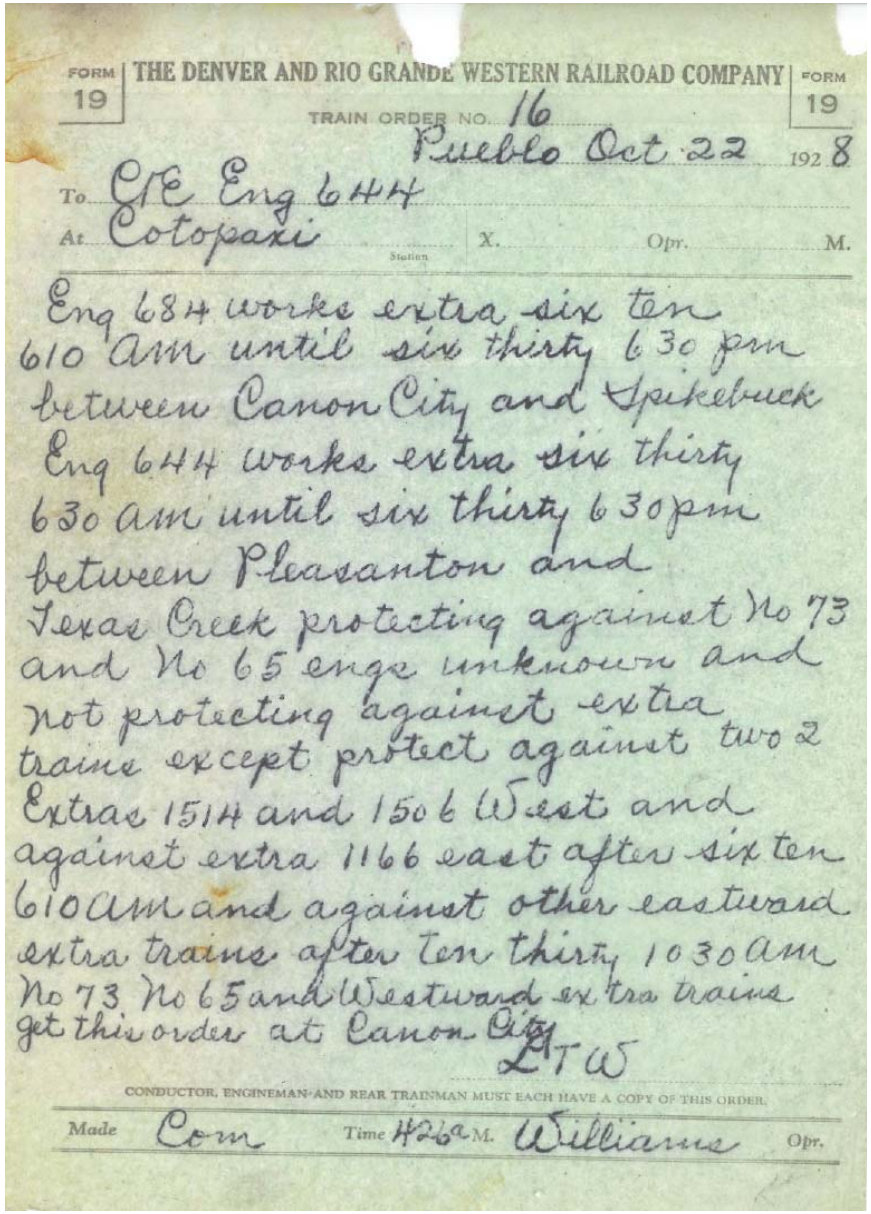
To EE Extra 278 South At Saltair

X Opr. M.

Second 67 Eng 296 meet
Extra 278 South at Polk
instead of Clause

Conductor and Engineman must each have a copy of this order.

Made Opr Time 458p M. White Opr.



FORM 19 THE DENVER AND RIO GRANDE WESTERN RAILROAD COMPANY FORM 19

TRAIN ORDER NO. 16

Pueblo Oct 22 1928

To C&E Eng 644

At Cotopaxi Station X. Opr. M.

Eng 684 works extra six ten
610 am until six thirty 630 pm
between Canon City and Spikebuck
Eng 644 works extra six thirty
630 am until six thirty 630 pm
between Pleasanton and
Texas Creek protecting against No 73
and No 65 engs unknown and
not protecting against extra
trains except protect against two 2
Extras 1514 and 1506 West and
against extra 1166 east after six ten
610 AM and against other eastward
extra trains after ten thirty 1030 am
No 73 No 65 and Westward extra trains
get this order at Canon City
LTW

CONDUCTOR, ENGINEMAN AND REAR TRAINMAN MUST EACH HAVE A COPY OF THIS ORDER.

Made Com Time 426a M. Williams Opr.

Eng 684 works extra six ten
610 am until six thirty 630 pm
between Canon City and Spikebuck
Eng 644 works extra six thirty
630 am until six thirty 630 pm
between Pleasanton and
Texas Creek protecting against No 73
and No 65 engs unknown and
not protecting against extra
trains except protect against two 2
Extras 1514 and 1506 West and
against extra 1166 east after six ten
610 AM and against other eastward
extra trains after ten thirty 1030 am
No 73 No 65 and Westward extra trains
get this order at Canon City

Timetable and Train Order Operation remained in common use until the 1980s.

CHICAGO, MILWAUKEE, ST. PAUL AND PACIFIC RAILROAD CO.

THE MILWAUKEE ROAD

NORTHERN DIVISION AND SOUTHERN DIVISION

TIMETABLE No. 3

Taking Effect at
1:01 A.M. Central Standard Time
2:01 A.M. Eastern Standard Time

Sunday, Oct. 31, 1982

For the information and government of employees only

N. H. McKEGNEY
Superintendent,
Northern Division

J. W. STUCKEY
Superintendent,
Southern Division

W. F. PLATTENBERGER
Assistant Vice President — General Manager

12 NORTHWARD—SOUTHERN DIVN—SECOND SUBDIVN—NORTHWARD

FIRST CLASS 2147 NRPC Passenger Daily	FIRST CLASS 2109 NRPC Passenger Daily	FIRST CLASS 2111 NRPC Passenger Daily	Siding Footage	Station Mile Post	STATIONS	SEE RULE 6-A	Radio Base Station and Train Order Office Hours Also See Page 15 for other Assigned Hours	FIRST CLASS 2113 NRPC Passenger Daily Ex. Sat. & Sunday	2115 NRPC Passenger Daily	2601 NRPC Passenger Saturday only	2117 NRPC Passenger Daily Ex. Sat. & Sunday	2121 NRPC Passenger Daily Ex. Sunday
A.M.	A.M.	A.M. 2126			RONDOUT			P.M. 2130	P.M. 2132	P.M. 2127	P.M. 2129	P.M. 2136
S 1:19	S 9:30	S 10:48		32.3	2.0	BJKOPQRTV	Continuous	S 12:00	S 1:19	S 2:55	S 3:00	S 4:50
				34.3	JUNCTION SWITCH 1.3	P	None					
S 1:24	S 9:35	S 10:51		35.6	LIBERTYVILLE 1.4	P	None	S 12:05	S 1:24	S 3:00	S 3:05	S 4:56
				39.9	(Use Line Crossing) 4.3	AP						
S 1:31	S 9:42	S 10:58	4368	41.0	GRAYS LAKE 1.1	P	None	S 12:12	S 1:31	S 3:07	S 3:12	S 5:04
S 1:36	S 9:46	S 11:02		44.0	ROUND LAKE 3.0	P	None	S 12:16	S 1:35	S 3:11	S 3:16	S 5:09
S 1:40	S 9:50	S 11:06		46.0	LONG LAKE 2.0	P	None	S 12:19	S 1:39	S 3:14	S 3:19	S 5:12
S 1:42	S 9:53	S 11:09		47.0	WILSON ROAD 1.0		None	S 12:22	S 1:42	S 3:17	S 3:22	S 5:15
		S 11:11		47.8	INGLESIDE 0.8	P	None		S 1:44	S 3:20	S 3:25	S 5:18
A 1:47 S A.M.	2126 A 10:00 S A.M.	2128 A 11:15 S A.M.	4868	49.8	FOX LAKE 1.7	BKOPQRWY	4:45 am to 1:15 pm 2:00 pm to 10:30 pm Daily	2130 A 12:30 S P.M.	2132 A 1:50 S P.M.	A 3:25 S P.M.	A 3:30 S P.M.	A 5:23 S P.M.
				50.2	(Fox River drawbridge) 0.5							
				50.7	SPRING GROVE 2.1		None					
				52.8	SOLON MILLS 5.1		None					
				57.9	BELDEN 1.5		None					
				59.4	ZENDA 6.1		None					
			5312	73.5	WALWORTH	P	None					

NORTHWARD TRAINS ARE SUPERIOR TO SOUTHWARD TRAINS OF THE SAME CLASS

SPEED RESTRICTIONS (MILES PER HOUR) — PSGR / OTHER

MAXIMUM, between Rondout and Fox Lake: 90 / 40
MAXIMUM, between Fox Lake and Walworth: 30 / 25
Over Soo Line Crossing 1.1 miles south of Grays Lake: 50 / 30
Maximum weight restriction loaded freight cars: 263,000 lbs
Minimum flagging distance (Rule 99): one mile

ABS is in use between Rondout and north siding switch at Walworth.

At Fox Lake, the time of northward trains terminating applies at the north switch of the siding.

Rondout, and Fox Lake are register stations only for trains originating or terminating.

Rule 93(B) does not apply at Walworth.

At Fox Lake, northward trains do not exceed 10 M.P.H. approaching Oak Street crossing and must be certain the highway signals are operating, in addition to complying with Rule 103 (D), before crossing is occupied.

At Fox Lake, southward trains do not exceed 10 M.P.H. approaching Grand Avenue crossing and must be certain the highway signals are operating in addition to complying with Rule 103 (D) before crossing is occupied.

At Fox Lake, on all tracks except main track, movements in either direction, do not exceed 5 M.P.H. approaching Grand Avenue crossing and must be certain the highway signals are operating, in addition to complying with Rule 103 (D) before crossing is occupied.

CHICAGO, MILWAUKEE, ST. PAUL AND PACIFIC RAILROAD COMPANY

TRAIN ORDER NO. 115

Ft Lake — April 28 — 83

To C&E Extra RTA 148 South

All first class trains due at Ft Lake at or before 1130 AM have arrived or left

WWF

CHICAGO, MILWAUKEE, ST. PAUL AND PACIFIC RAILROAD COMPANY

TRAIN ORDER NO. 114

Ft Lake — April 28 — 83

To C&E Extra RTA 148 South

No 2113 met extra RTA 148 South at Grayslake

WWF

FORM 214 REV.

Chicago, Milwaukee, St. Paul and Pacific Railroad Company

CLEARANCE

Ft Lake — April 28, 1983

To C&E Extra RTA 148 South

Clearance No. 116 To Rondout

(This line to be used in connection with Rule 85 or Rule 97(A))

I have 2 orders for your train.

No. 114 No. 115 No. ____ No. ____ No. ____ No. ____

Do not leave before ____

(This line to be used when required as prescribed by Rule 91(A))

OK 1132 AM — WWF — Brennan

TIME — SUPERINTENDENT — DISPATCHER

Con — Time 1129 Hr — Brennan — Opr.

It is still in use on the Long Island Railroad.

Long Island Rail Road

RULES
OF THE OPERATING
DEPARTMENT

RAYMOND P. KENNY
Senior Vice President – Operations

JAMES R. BROOKS
Chief Transportation Officer

GEORGE R. FARRELL
General Superintendent – Transportation

EFFECTIVE DATE JUNE 18, 2001

TIMETABLE

TIMETABLE – The authority for the movement of regular trains subject to the rules. It contains classified schedules with special instructions relating to the movement of trains.

TIMETABLES

4. Each timetable, from the moment it takes effect, supersedes the preceding timetable. A train of the preceding timetable thereupon loses both right and schedule and can thereafter proceed only as provided by Rules S-97 or D-97.
Schedules of the new timetable take effect at the leaving time and date from their initial station.
Not more than one schedule of the same number and day shall be in effect.

5. Not more than two times are given for a train at any station. Where one is given it is, unless otherwise indicated, the leaving time. Where two times are given they are the arriving and leaving times.
Unless otherwise specified, time applies as follows: On single track, at the first switch where an opposing train clears. Where there is no switch, time will apply at the station. On two or more tracks, time will apply at the station.
Scheduled meeting times are indicated by figures in full-faced type. The numbers of trains to be met are shown in small figures adjoining, in brackets.
Both the arriving and leaving times of a train are in full-faced type when one or more trains are to be met between those times.

MOVEMENT BY TRAIN ORDERS

201. Train orders will be issued by the Train Dispatcher over the signature of the General Superintendent – Transportation.
Train orders must be brief, clear and issued in the prescribed forms when applicable. They will contain only the information essential to the safe movement of trains. They must be without erasure, alteration or interlineation.
Figures in train orders must not be surrounded by brackets, circles or other characters.

202. Each train order must be given in the same words to all employees or trains addressed.

203. Train orders must be numbered consecutively each day, beginning at 12:01 AM.
Train orders used for slow orders or similar instructions shall remain in effect until a general notice containing the required information is placed in effect. When impracticable to issue a general notice, train orders used for this purpose will be reissued each day, as soon as possible after 12:01 AM.

204. Train orders must be addressed to those who are to execute them, naming the place at which each is to receive a copy. Train orders for a train must be addressed to the conductor and engineer and to anyone who acts as the train's pilot.

FORM 19 FORM 19

LONG ISLAND RAIL ROAD
TRAIN ORDER NO.....

OFFICE OF THE
GENERAL SUPERINTENDENT
TRANSPORTATION

20 _____

_____

To _____

_____

_____

_____

_____

_____

_____

_____

_____

_____

Made Time M Block Operator

_____

Rev. 01-2000

(To be printed on yellow page 6 ¾" x 7 ¼".)

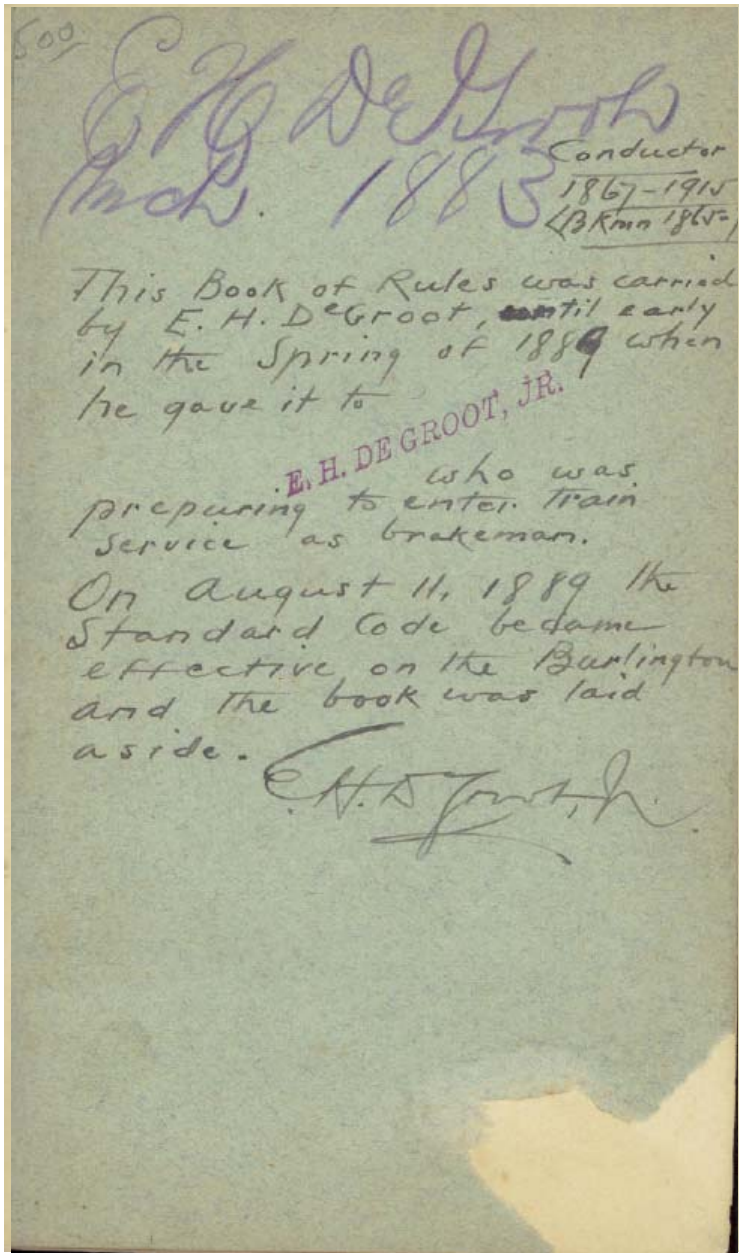
There was no coordinated effort to produce uniform rules on the various roads.

Each railroad contrived whatever rules it deemed necessary. This resulted in loopholes.

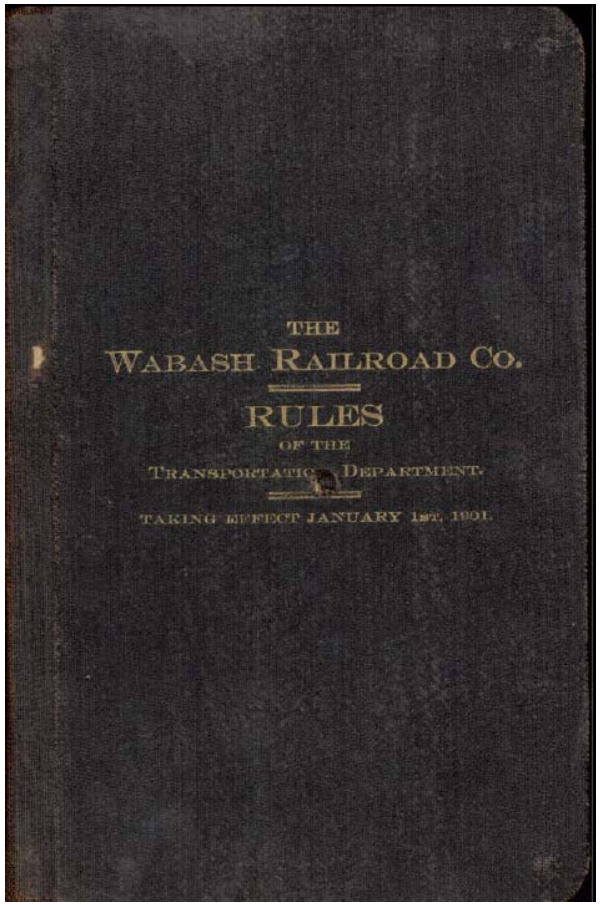
In 1900, 2,500 railroad employees died while on duty; many as a result of those loopholes.

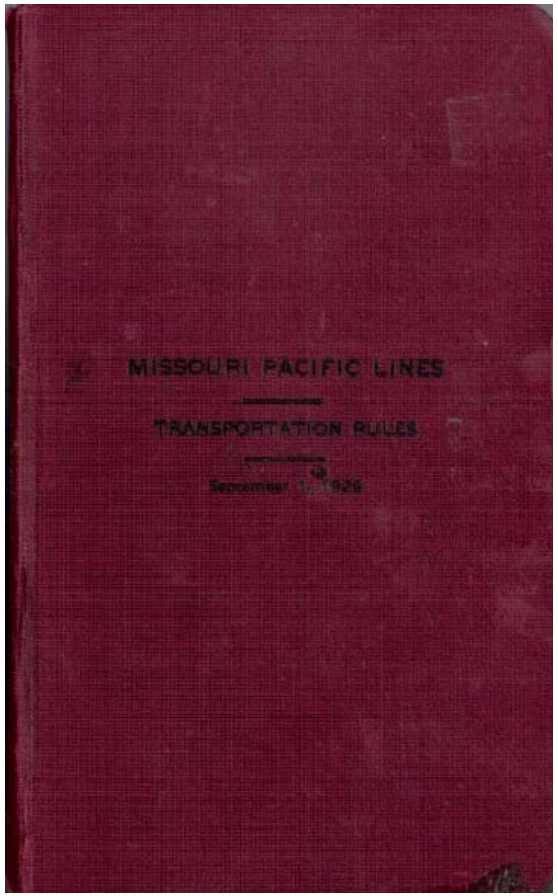
Standardization in the form of the ***Standard Code*** was the method to close the loopholes.

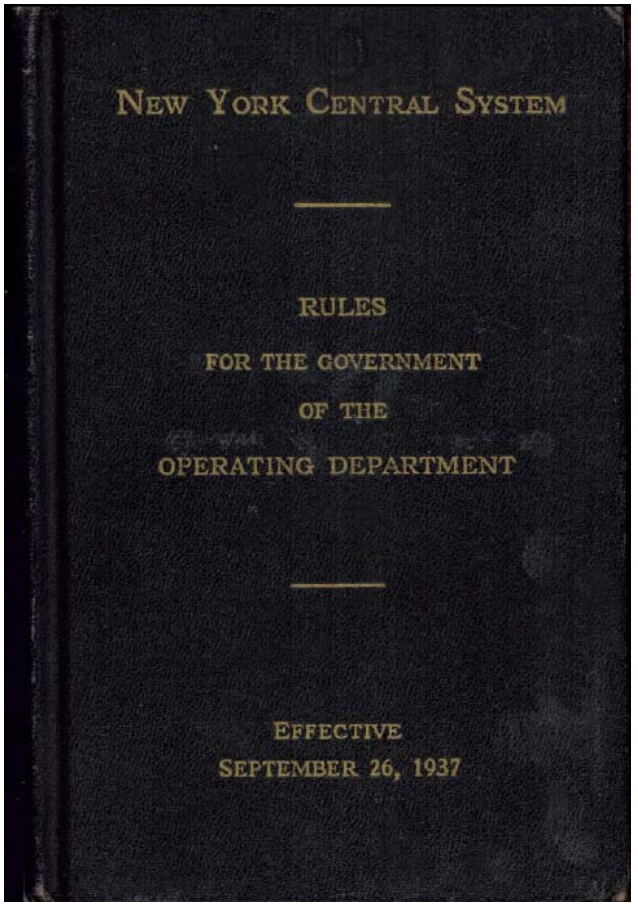
It served as the standard for consistency in understanding and applying operating rules from a conceptual standpoint and also for terminology, formatting, wording and numbering.

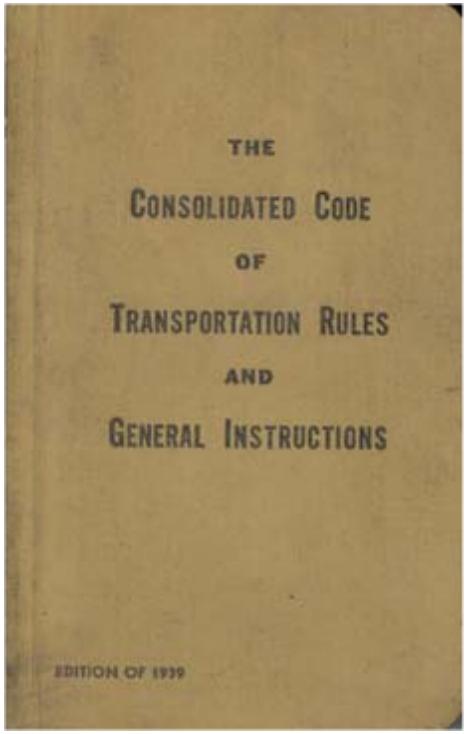


While not an actual rule book, although some railroads reprinted it verbatim and used it as such, the Standard Code served as a template from which railroads could deviate to suit their individual requirements.

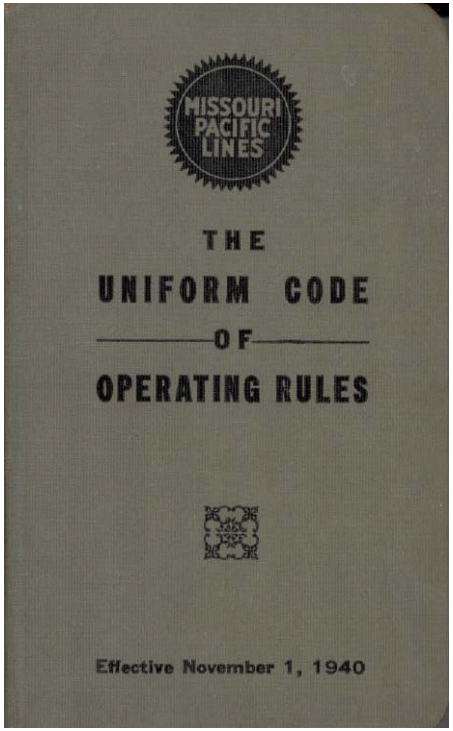






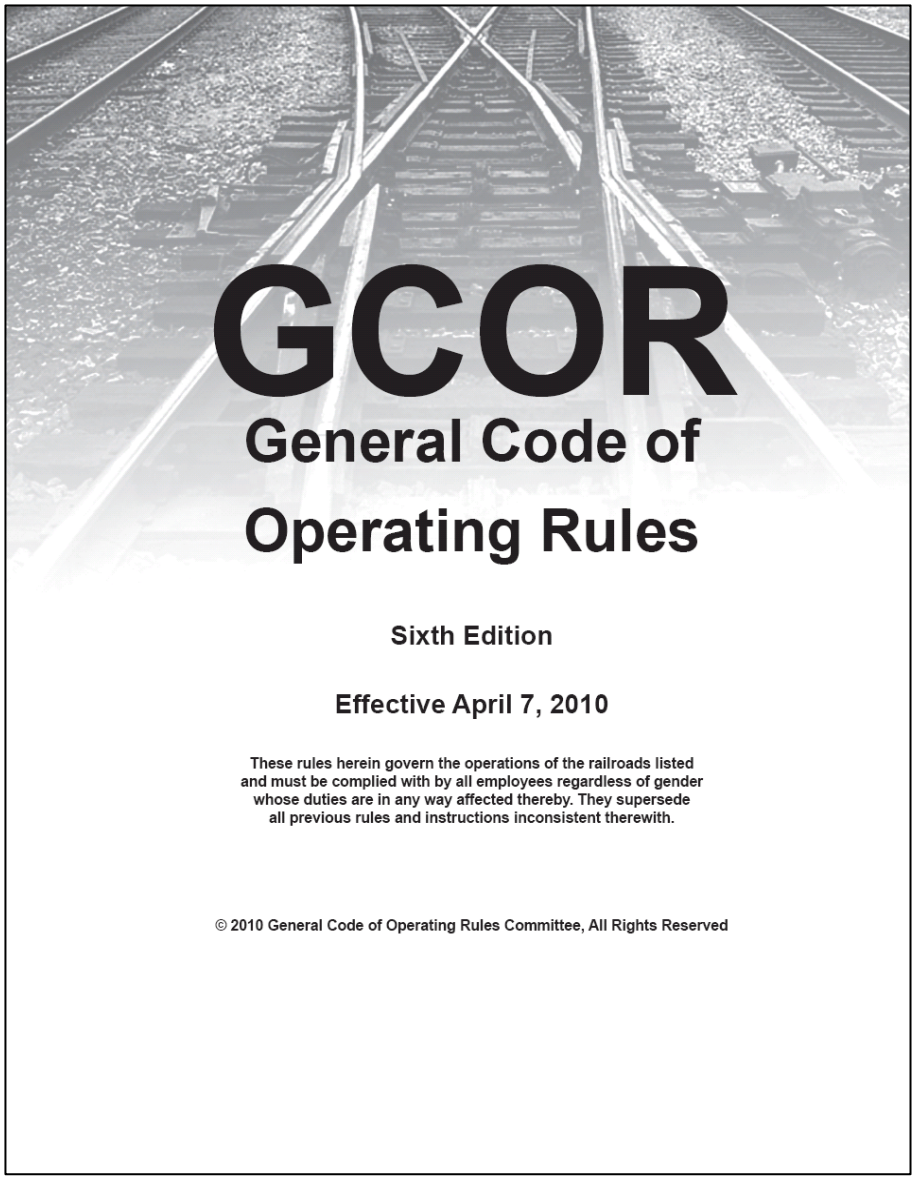


First issued in 1939 with reissues in 1945, 1959, 1967 and 1980 – Primarily used by railroads in the Upper Midwest and Northwest



First issued in 1940 with reissues in 1950 and 1968 and a revision supplement in 1981 – Primarily used by railroads in the Southwest

Both were superseded by the General Code of Operating Rules in 1985.



First Edition – 1985

Second Edition – 1989

- Rules for Movement by Train Orders Eliminated

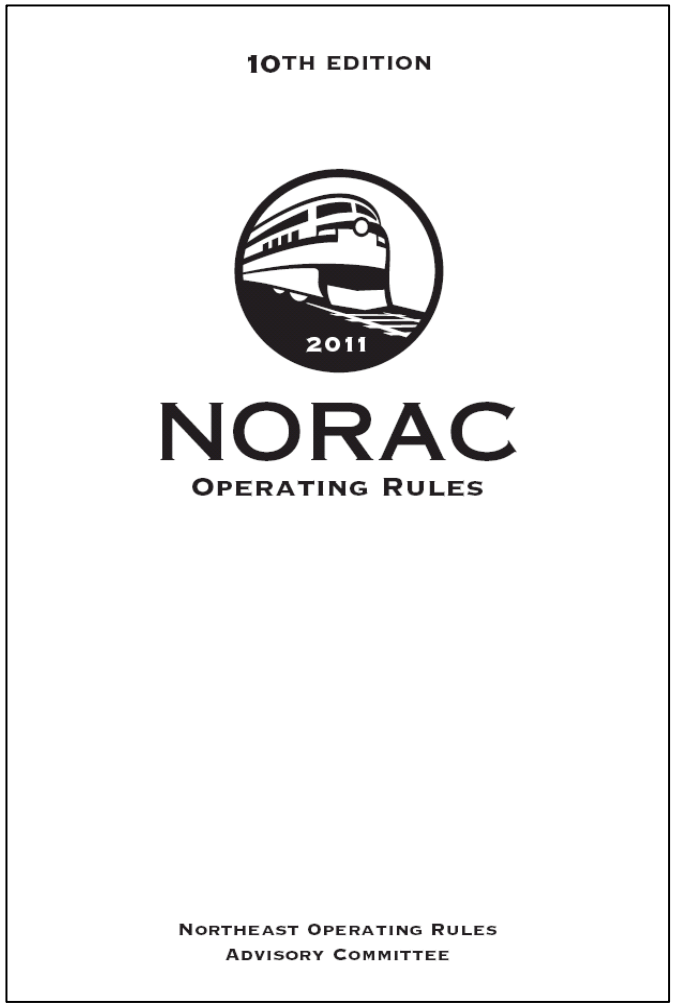
Third Edition – 1994

- Rules Reworded and Reorganized into 16 Chapters

Fourth Edition – 2000

Fifth Edition – 2005

Sixth Edition - 2010



First Edition – 1988

Second Edition – 1991

Third Edition – 1992

- Rules Consolidated and Streamlined to be More Readable

Fourth Edition – 1993

Fifth Edition – 1995

Sixth Edition – 1997

Seventh Edition – 2000

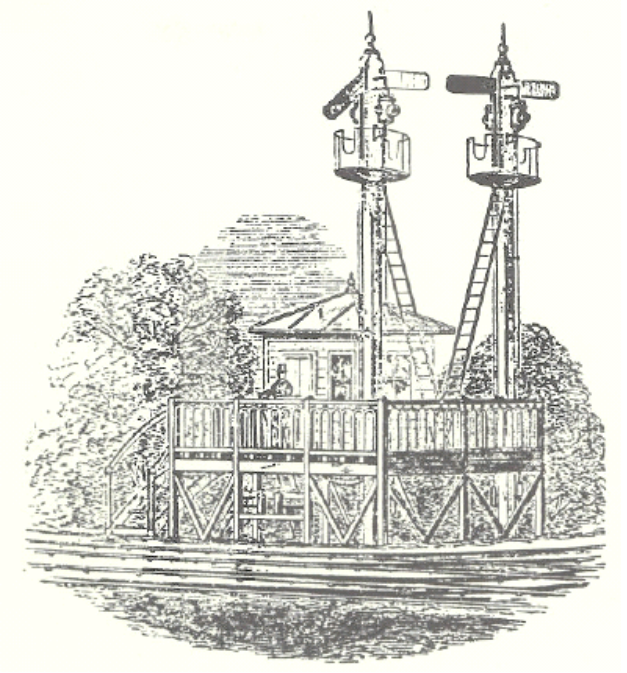
Eighth Edition – 2003

Ninth Edition – 2008

Tenth Edition – 2011

Once turnouts (switches) and crossings were developed so tracks could branch from and cross each other, a means to assure the route was clear had to be developed.

In 1843, at Bricklayer's Arms Junction in England, Sir Charles Hutton Gregory installed the first devices where signals and switches were controlled from a single location.



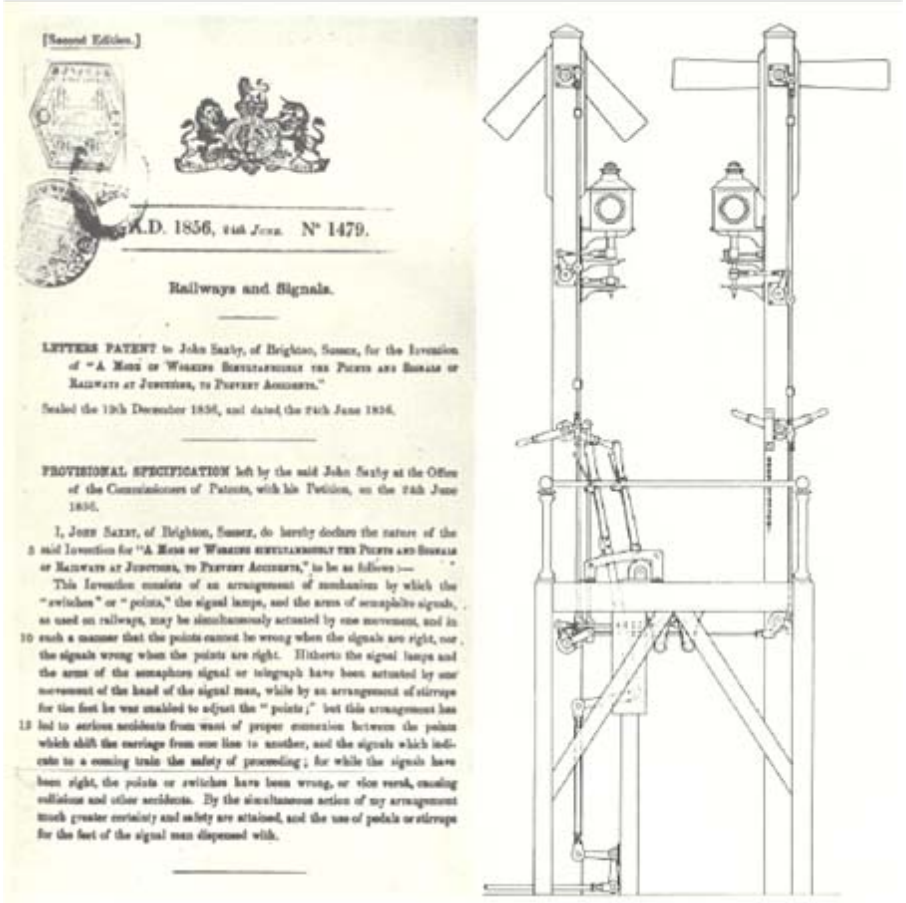
The switches and signals were operated, via pipe and wire pull, by a switchman using hand levers to operate the switches and foot stirrups to work the signals.

There was no interlocking among the switches and signals.

Switches were sometimes thrown under trains and signals cleared over open switches.

In 1856, the first mechanical interlocking was developed in England.

John Saxby invented and patented the system by which signals and switches are controlled by one operation.



[Second Edition.]

A.D. 1856, 24th June. N° 1479.

Railways and Signals.

LETTERS PATENT to John Saxby, of Brighton, Sussex, for the Invention of "A Mode or Modes of Working Simultaneously the Points and Signals of Railways at Junctions, to Prevent Accidents."

Sealed the 13th December 1856, and dated the 24th June 1856.

PROVISIONAL SPECIFICATION left by the said John Saxby at the Office of the Commissioners of Patents, with his Petition, on the 24th June 1856.

I, John Saxby, of Brighton, Sussex, do hereby declare the nature of the said Invention for "A Mode or Modes of Working Simultaneously the Points and Signals of Railways at Junctions, to Prevent Accidents," to be as follows:—

This Invention consists of an arrangement of mechanism by which the "switches" or "points," the signal lamps, and the arms of semaphoric signals, as used on railways, may be simultaneously actuated by one movement, and in such a manner that the points cannot be wrong when the signals are right, nor the signals wrong when the points are right. Hitherto the signal lamps and the arms of the semaphore signal or telegraph have been actuated by one movement of the hand of the signal man, while by an arrangement of stirrups for the feet he was enabled to adjust the "points;" but this arrangement has led to serious accidents from want of proper connexion between the points which shift the carriage from one line to another, and the signals which indicate to a coming train the safety of proceeding; for while the signals have been right, the points or switches have been wrong, or vice versâ, causing collisions and other accidents. By the simultaneous action of my arrangement much greater certainty and safety are attained, and the use of pedals or stirrups for the feet of the signal man dispensed with.

John Saxby

The first interlocking in the United States, imported from England, was manufactured by Saxby and his partner John Stinson Farmer.

John Stinson Farmer

The Saxby & Farmer interlocking machine was put in service in 1870 at “Top of the Hill,” a **junction** in Trenton, New Jersey, on the Philadelphia and Trenton Railroad.

Originally, interlockings were totally mechanical. They relied on the brute strength of the control operator.

Levers in the control building or tower were connected to rods (pipes) on rollers which moved cranks and in turn moved signal arms and switches in the field.

Between the operating levers and the rods was the interlocking machine.

Inside the interlocking machine a system of slots and locking bars with latches (dogs) between the levers, known as the locking bed, prevented the levers from being moved except in proper sequence.

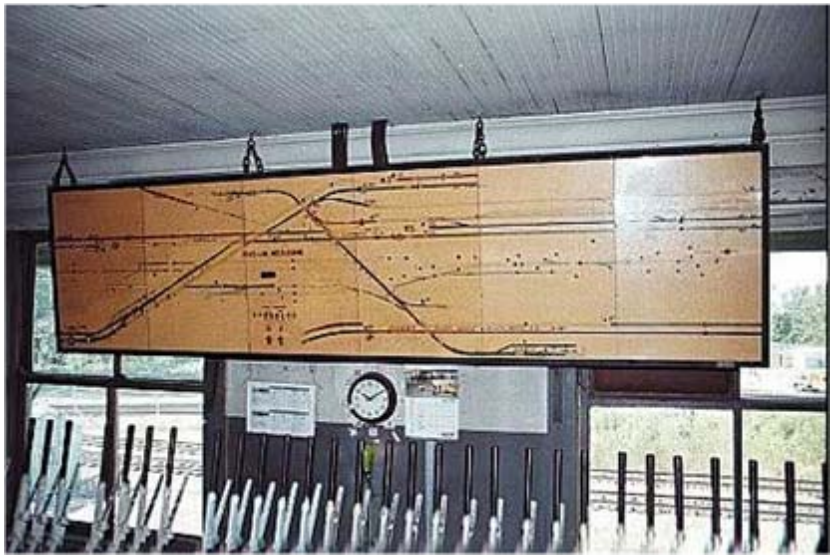
The arrangement prevented signals from being cleared until all switches in the route were properly lined and also prevented giving a signal to two opposing or crossing trains.

Largest Mechanical Interlocking in North America

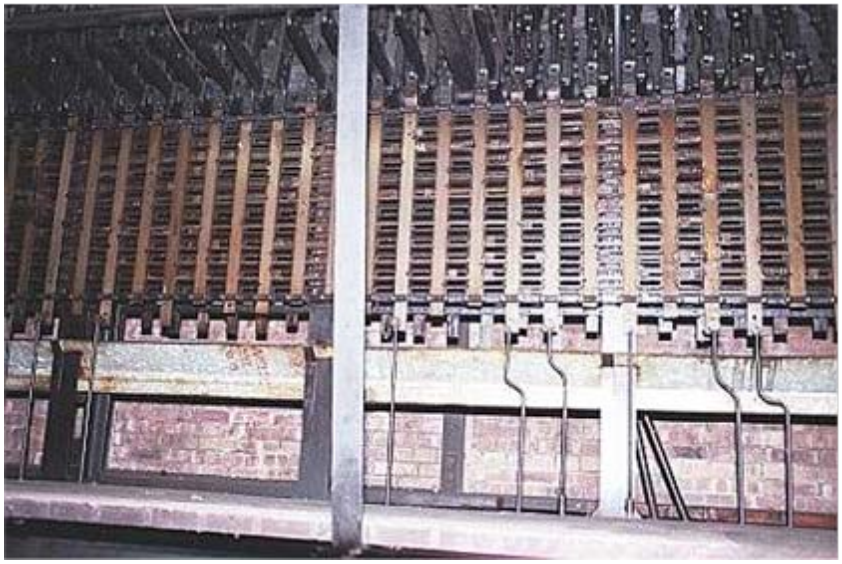
Installed: 1897

Retired: August 5, 2000

128 Working Levers



State Line Tower
Model Board

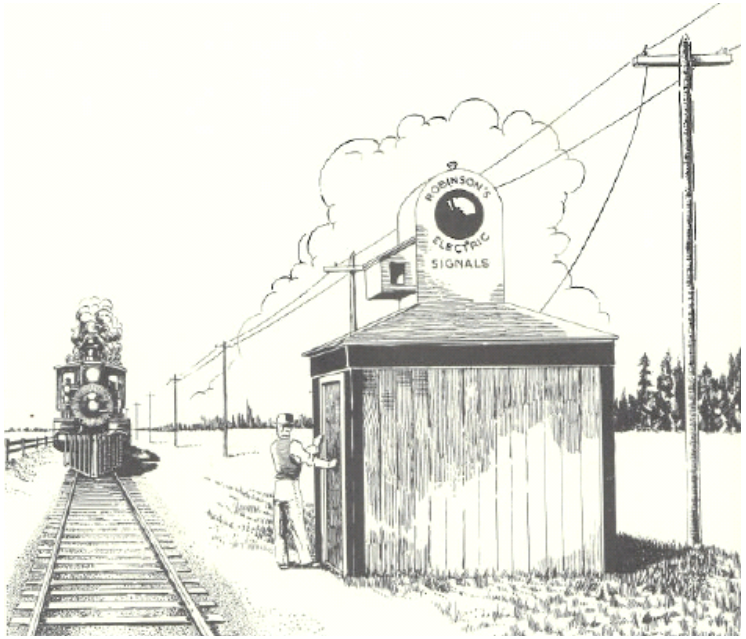


Locking Bed

In 1872, Dr. William Robinson invented the Closed Direct Current Track Circuit which provided the ability to electrically detect track occupancy and most track integrity problems, such as broken rails.

Dr. William Robinson

Robinson's Closed Rail Current System was installed at Kinzua, Pennsylvania on the Philadelphia and Erie Railroad in 1872.



ROBINSON'S

WIRELESS ELECTRIC SIGNALS,

THE SIMPLEST, CHEAPEST, and

Only Absolutely SAFE Electric Signals in Existence,

NOW IN SUCCESSFUL OPERATION ON THE

BALTIMORE AND OHIO,
PHILA., WILMINGTON & BALTIMORE,
PHILADELPHIA AND ERIE,
AND OTHER RAIL ROADS.

They work as AUTOMATIC BLOCKS with tell-tale alarms, OFFICE, STATION, ROAD CROSSING and SWITCH SIGNALS, and BROKEN RAIL DETECTORS. These signals have worked uninterruptedly through last winter regardless of rain, snow, slush or sunshine.

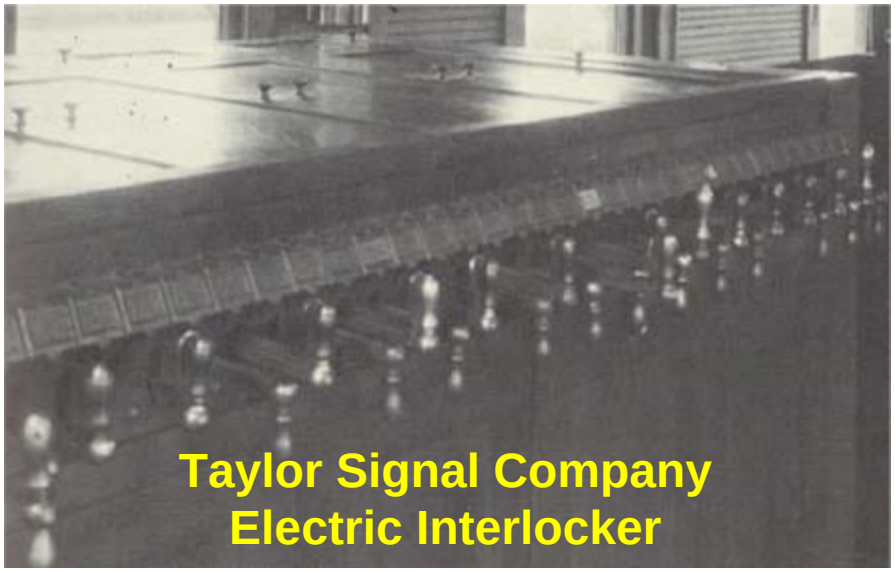
Descriptive circulars on application.

MAY 1873. WM. ROBINSON, St. Petersburg, Pa.

"He has created an epoch-making invention of incalculable value to the human race."

Robinson on Robinson

With the invention of the track circuit and an ever increasing understanding of electricity, mechanical locking evolved into electrical locking.



Installed in 1901

Still In Service

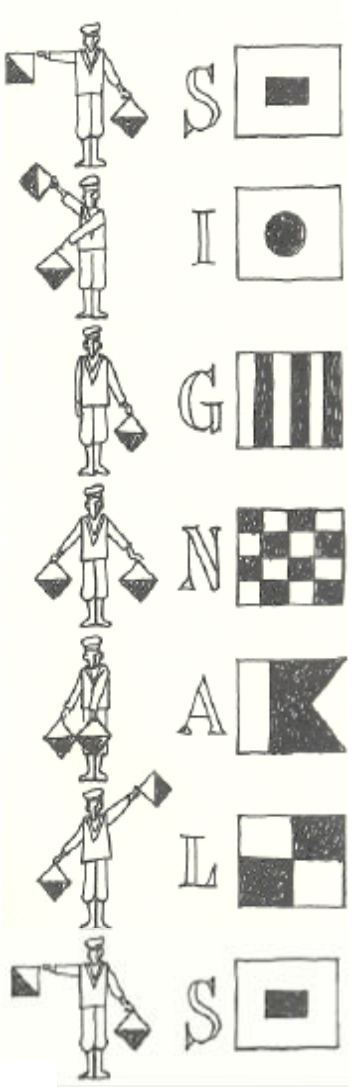
In 1911, the first Absolute Permissive Block System, more commonly called the Automatic Block Signal System (ABS) was installed on the Toronto, Hamilton & Buffalo Railway.

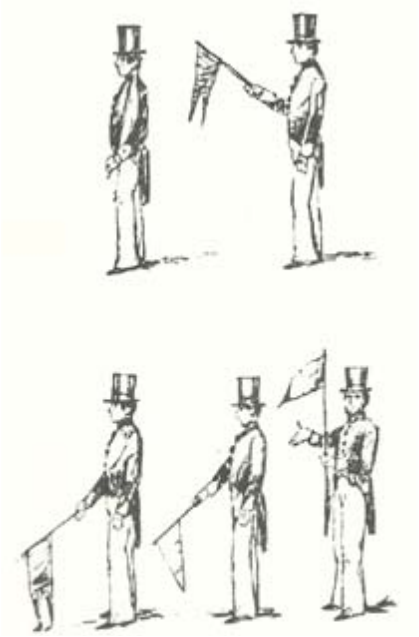
The system allowed trains to operate on single track in either direction with full signal protection for both opposing and following movements.

In 1927, combining the Absolute Permissive Block System with electric interlocking technology, the New York Central Railroad installed several small interlockings, remotely controlled from Fostoria, Ohio by a single dispatcher, in ABS territory on the Ohio Division between Stanley and Berwick, Ohio.

This created the first Centralized Traffic Control (CTC) System that allowed operation of trains on single track under centralized supervision without train orders.

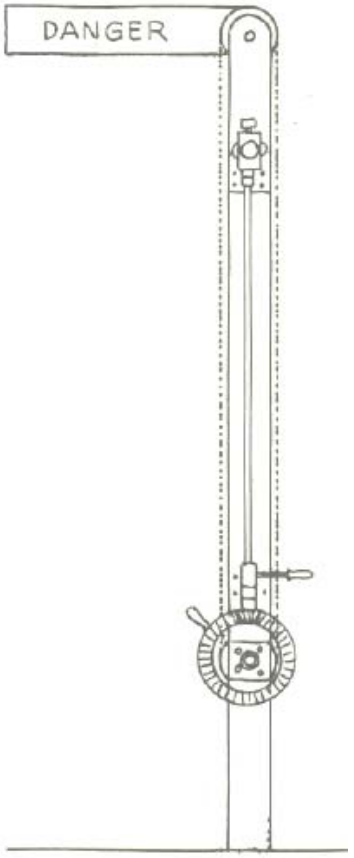
Semaphores - the visual “telegraph”





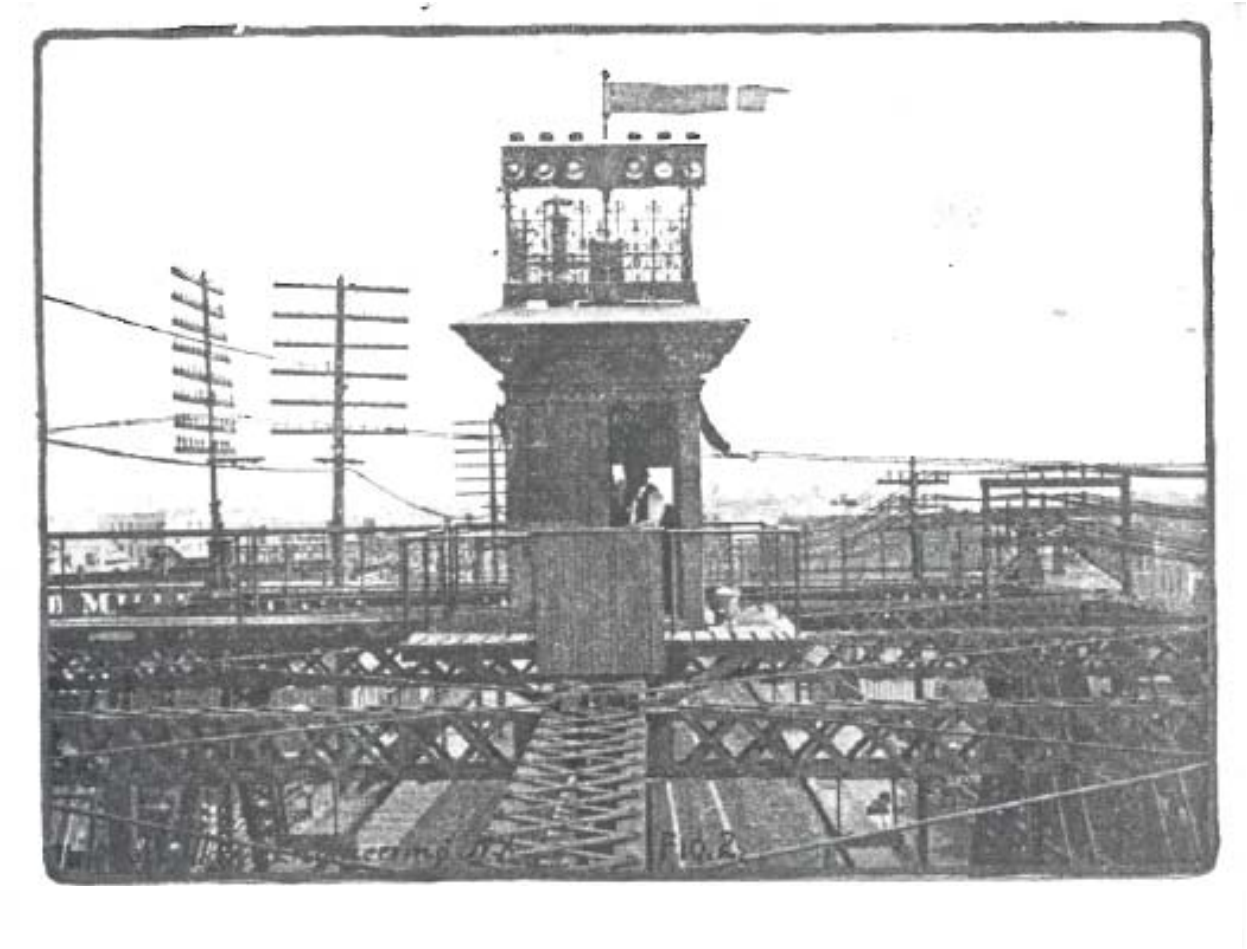
Early English railroads employed formally-attired traffic “policemen” to enforce schedules and advise trainmen of conditions ahead.

“All right.” “Caution.” “Stop.”



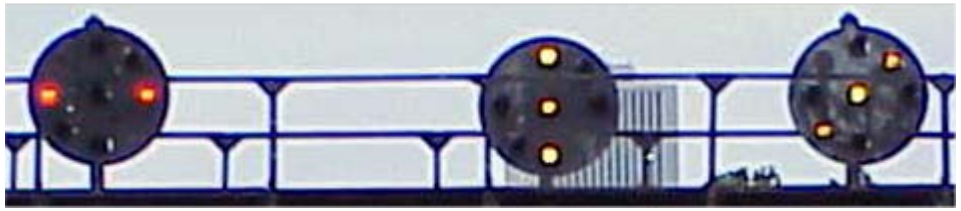
C. H. Gregory’s Semaphore 1841

Lattig’s Electric Semaphore Motor 1893



Another form of signal in which the arm above the lamps is used to designate which road may and which may not use the crossing. The crossing in this instance is at a very acute angle. Of the six lamps, three have red lenses and three green. The green lamps are on the side opposite the arm and designate at night which road has the right of crossing.

GCOR Rule 9.1 – Signal Aspects and Indications



Signal aspects are identified by the position of semaphore arms, color of lights, flashing of lights, position of lights, or any combination. Aspects may be qualified by marker plate, number plate, letter plate, or marker light.

Signals may display color light aspects or semaphore arms and color lights.

The human element in train control:

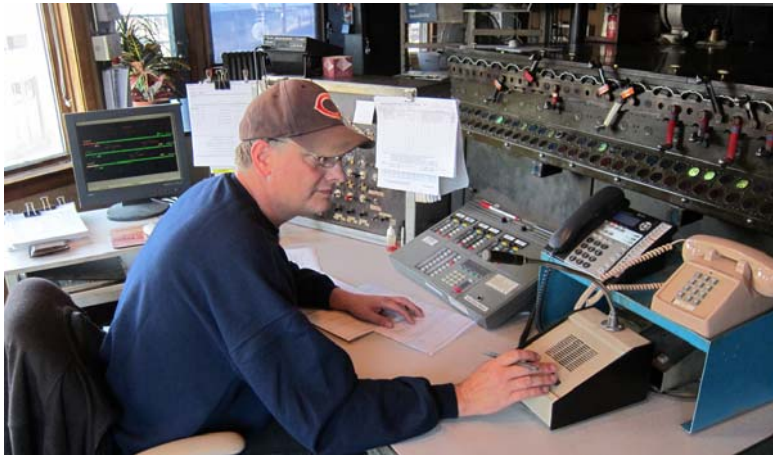
Control Operator

Train Dispatcher

Although they are variously called the Operator, Leverman, Towerman or Control Operator; the GCOR uses the term Control Operator which is defined as:

Employee assigned to operate a CTC or interlocking control machine or authorized to grant track permits.

GCOR Rule 1.45 - Duties of Control Operators and Operators states:



Control operators and operators are under the direction of the train dispatcher when their duties concern handling track warrants, track bulletins, lineups, the movement of trains and any other instructions issued by the train dispatcher.

GCOR Rule 1.44 - Duties of Train Dispatchers states:

Train dispatchers supervise train movement and any employees connected with that movement.

Simple and straightforward, but . . .

What do train dispatchers really do?

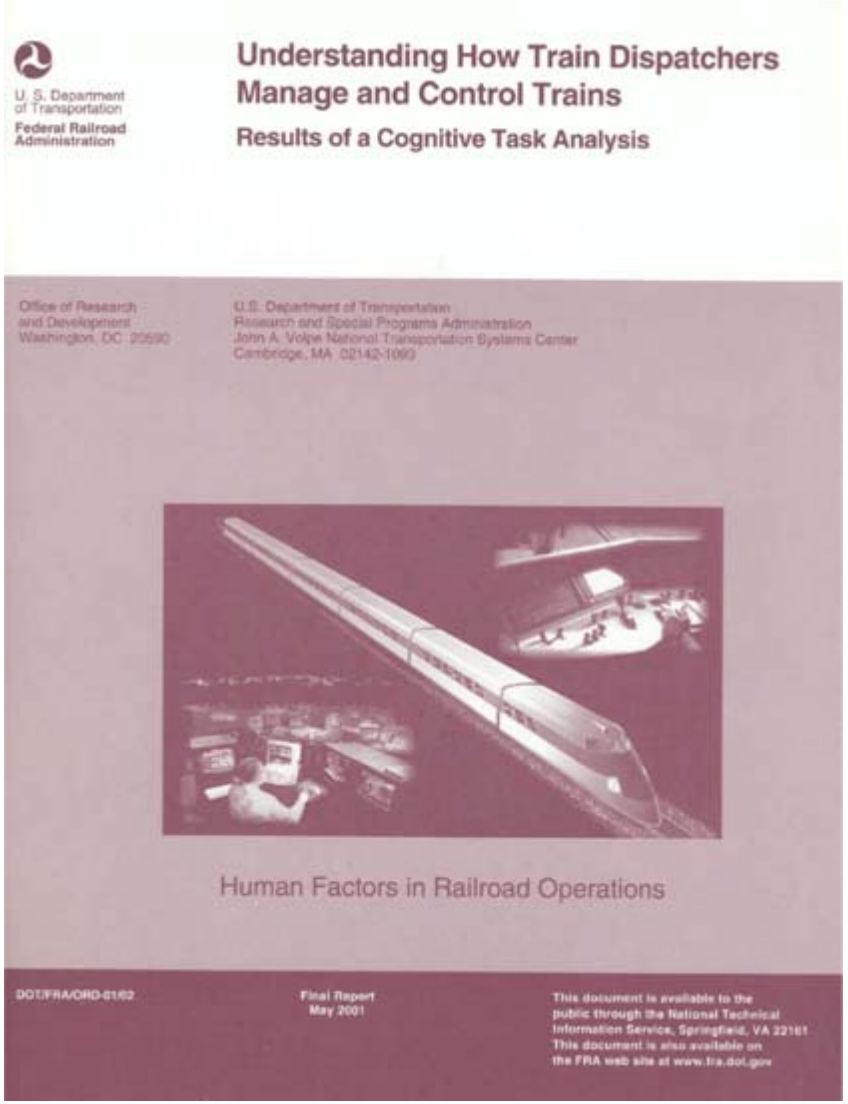
Between April and December of 1998, the Federal Railroad Administration - Office of Research and Development sponsored a Cognitive Task Analysis of how experienced train dispatchers manage and schedule trains in today's environment.

A cognitive analysis involves identifying the knowledge, mental processes and decisions required to perform a task.

Cognitive activities include:

- Monitoring.
- Situation assessment.
- Planning.
- Deciding.
- Anticipating.
- Prioritizing.

The final report entitled ***Understanding How Train Dispatchers Manage and Control Trains - Results of a Cognitive Task Analysis*** was published in May 2001.



Conclusions

The train dispatcher's job is a critical function to both the safety and efficiency of railroad operations.

Dispatchers are responsible for:

- Allocating and assigning track use.
- Ensuring trains are routed safely and efficiently.
- Ensuring the safety of personnel working on and around the track.

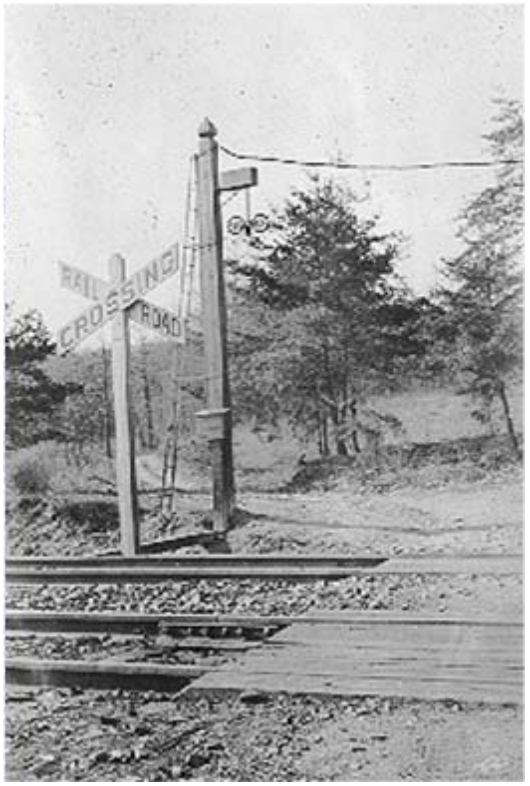
These are cognitively complex tasks that require:

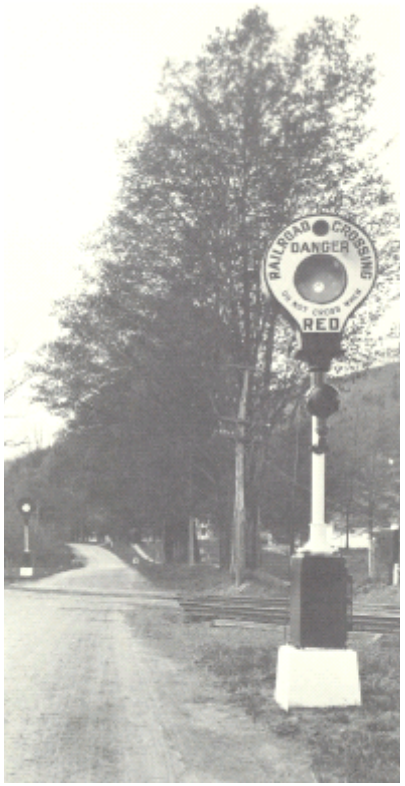
- Integrating multiple sources of information:
  - Train schedules.
  - Computer displays of current track status.
  - Radio communications with various personnel such as locomotive engineers.

- Projecting into the future - estimating when the train will arrive.
- Balancing multiple demands placed on track use:
  - The need for maintenance of way workers to have time to work on the track.
  - The need to make sure the track will be clear when a train is anticipated to arrive.

The Other Railroad Signal System

STOP - LOOK - LISTEN





Galena, IL
May 1, 2011

The “Skull and Crossbones”

Illinois Central Railroad
Grenada, Mississippi
In Service: 1940 - 1970

How far have we come?

In 1900, there were 2,500 on-duty railroad employee fatalities.

In 2011, there were 21 on-duty railroad employee fatalities.

The 10 year average from 2001 through 2010 is 20.6 on-duty railroad employee fatalities per year.

While on time performance is an important part of our service, the SAFETY of our employees, our passengers and the public is first and foremost.

No job is so important, no service is so urgent that we cannot take time to perform all our work safely!!

BIBLIOGRAPHY

A Centennial History of ALSTOM Signaling Inc. (2004) Pamphlet #1364 Printed by ALSTOM Signaling Inc.

Brignano, Mary and McCullough, Hax. (1981) *The Search for Safety: A History of Railroad Signals and the People Who Made Them.* Commissioned by Union Switch and Signal Division, American Standard Inc.

Elements of Railway Signaling. (1979) Pamphlet 1979 Printed by General Signal Corporation.

Elliott, W. H. (1896) *Block and Interlocking Signals.* New York, NY. Sinclair & Hill.

Federal Railroad Administration. (2011, 2012) *Accident/Incident Overview* Years 2001 thru 2011. Washington, D.C.: United States Department of Transportation, Federal Railroad Administration, Office of Safety Analysis.

Forman, Harry W. (1904) *Rights of Trains on Single Track.* New York, NY. The Railway Gazette.

French, Tom. (1991) *Railroad Telegrapher's Handbook.* Maynard, MA. Artifax Books.

Gamst, Frederick C. (1982) *The Development of Operating Rules.* Presentation at the Railway Fuel and Operating Officers Association Technical Conference.

Garrett, F. O. (1955) *Uniform Code Railroads – Rules Education Pamphlet.*

Indiana Harbor Belt Railroad. *State Line Tower Photographs.*

Josserand, Peter. (1945, 1957) *Rights of Trains.* New York, NY. Simmons-Boardman Publishing Company.

Klein, Maury. (1972) *History of the Louisville and Nashville Railroad.* New York, NY. The McMillan Company.

NBC Television. (2005) "Text Messaging vs. Morse Code." *The Jay Leno Show,* March 13.

Womack, Mark S. (1977) "Morse Memories." *Trains Magazine,* October.

Yachechak, Dennis R. (2010) *Standardization of Railroad Operating Rules – A Brief Look.* Presentation at the Chicago Railroad Superintendents Association Meeting, May 6.


THE END

Knowledge + Understanding + Application = Compliance