

21 April 2017

Nathan Manufacturing Co. Maker of many(!) appliances for steam locomotives established 1864. With many older products from the Friedmann Co. in Austria.

General Information provided for part replacement and/or repairs or research of Nathan products. Compiled by C. B. Ahrens from the Nathan Collection at Steamtown National Historic Site and the offices of Richard 'Pat' McKnight, Historian and numerous volunteers. At this date, it is a work in progress.

This booklet is for understanding tolerances for dimensioned parts of detail drawings, information and tables for various appliances, casting materials and other information necessary to restore Nathan appliances as is available at present. When additional information becomes available, pages will be added to this booklet.

In order to fit "A" (9"x12") size drawings on 8.5' x 11" paper, any dimensioned drawing that shows drawn to full size or scale, will have been reduced 10% from original. Some larger drawings have been split into two or more pages as necessary.

We have referred to these pages as Maintenance Instructions. With an abbreviation to cover the general type of appliance or application. Pages are identified as such for ease of reference. Beware: Some drawings are a combination of metric & English (Imperial) dimensions. And, not all drawings were numbered or dated. SK-Sketch with date.

Nathan's Standard Practices": (not all 1949 issued SP's have come to light at present.)

- MI-SP-1 Standard Practice (SP) 6M Tolerances for Shop Detail Drawings  
Dated July 7, 1949 page 1 of 2
- MI-SP-2 SP 6M ibid pg 2 of 2
- MI-SP-3 SP 3M Standard Steam Metals July 7, 1949 pg 1 of 2
- MI-SP-4 SP 3M Ibid pg 2 of 2
- MI-SP-5 SP 5M Thread & Thread Tolerance Standardization pg 1 of 2
- MI-SP-6 SP 5m Ibid pg 2 of 2
- MI-SP-7 Letter-STE A Ahrens Notes on Nathan Thread Form rev. Jan 9, 2017  
pg 1 of 2.
- MI-SP-8 Ltr Ibid pg 2 of 2
- MI-SP-9 Nathan Thread Form drawing (drg) 1038 dated 1939 rev 1947 &  
partial copy of thread tolerances on SP-1.
- MI-SP-10 Nathan note of NYCRR ltr of SK 5-5-1942 concerning their thread  
fits on Nathan 11 Simplex R type Lifting Injectors, using Nathan Thread  
Form (profile) on Nathan DR'G 2774. Second copy (bottom) of SK-1-  
28-38 indicating Thread Fits – General & Valve for drg 962. (Not  
available at present.)

Cont

- MI-SP-11 Nathan Drg 2774 of Nov-7-1929 Form of Thread used on Nathan.  
Products pg 1 of 2. Penciled note indicating 2774 obsolete as 10-22-54 and to use Gen'l Info Sheet #1038 (as of the 1954 date).
- MI-SP-12 Drg 2774 Ibid pg 2 of 2
- MI-SP-13 Nathan Ltr dated 4-19-49 from Ward Grantham to C.F Erickson Asking for opinion about abandoning use of Nathan Thread Form and C.F.E.'s response. (CFE was Chief Mechanical Engineer and he revised all of Nathan's drawings and engineering systems during the late 1940's.)
- MI-SP-14 Nathan Thread Table U.S. Form dated 4-22-28 for Converting pitch diameters into Micrometer reading using the 3-wire method pg 1 of 2.
- MI-SP-15 Same pg 2 of 2.
- MI-SP-16 Nathan table of USS Screw Threads and gen'l bolt information.  
Not dated or numbered.
- MI-SP-17 Nathan Table Showing Double Depths Of Threads of various Thread Forms in Inches & Millimeters. Not dated or numbered.
- MI-SP-18 Nathan Helix Angle For Threads, dated 1-16-42 Used for determining side clearance when cutting threads forms of certain single or multiple lead threads on Nathan products.
- MI-SP-19 Nathan Standard Coupling Ends (Injectors & Lubricators (connections) including those used on Pennsylvania Railroad (PRR). Nathan did a lot of work for PRR, from the early days through the end of PRR steam.
- MI-SP-20 Nathan information drawing giving reference to DRG 2495 to determine thread tolerances & fits in injectors (see next page).
- MI-SP-21 Nathan Drg 2495 Table Of Fits For Screw Connections On The Type Simplex HW Non-Lifting (NL) Locomotive Injectors Special For The P.R.R. dated Aug 1, 1929.
- MI-SP-22 Nathan Drg 2496 Table Of Fits For Screwed Connections On Type Simplex BH Lifting Locomotive Injectors Special For The P.R.R. Dated June 8, 1928.

Note: It is not known if all threaded parts for PRR injectors/hydrostatic lubricators were the same as on many other Nathan products. However, the thread profile shown is basically the "V" type with portions truncated as shown in tables. While some information is available, more research is required to compare with other Nathan threaded products of the same type.

- MI-SP-23 Nathan Drg 2636 Table Of Screwed Connections On Bull's Eye (Hydrostatic) Locomotive Lubricators Types 166, PRR, 1918, P.  
Dated October 4, 1929.
- MI-SP-24 Nathan Drg 2773 Table Of Fits For Screwed Connections On Bull's Eye Locomotive Lubricators Type 166-2 Feed-2Pints and No. 31-5 Feed-5 Pints, Type 1918-No 31-5 Feed 5 Pints. Dated Nov. 9, 1929

Reference Material

- MI-REF-1 Nathan Decimal Equivalent. Not dated or numbered.
- MI-REF-2 Nathan Decimal Equivalents of Millimeters. Not dated or numbered.
- MI-REF-3 Nathan Equivalents of Millimeters to Inches. Not dated or numbered.
- MI-REF-4 Nathan Rev'd Millimeter Equivalents of inches & fractions of.  
Not Dated or numbered.
- MI-REF-5 Nathan Inch & Millimeter Equivalents Of Twist Drills & Steel Wire  
Gauge Sizes & Areas. Not dated or numbered.
- MI-REF-6 Nathan Equivalent Angles Of Tapers & Taper On Lathe Per Foot.  
Not dated or numbered.
- MI-REF-7 Nathan Equivalent Angles Of Tapers. Not dated or numbered.
- MI-REF-8 Nathan Tapers in M/M for Flat Cutters. (Used for roughing internal  
tapered surfaces of castings.) Not dated or numbered.
- MI-REF-9 Nathan Taper To Set Grinding Machine to Sharpen Square  
Reamers. The square reamers were used to finish scrape a true hole in the  
bores of tapered bronze injector nozzles. A necessary operation for  
correct function of locomotive injectors. Not dated or numbered.
- MI-REF-10 Nathan Tapers Per Foot & Corresponding Angles. Not dated or  
numbered.
- MI-REF-11 Nathan Angles & Corresponding Tapers Per Foot (TPF). Not dated  
or numbered.
- MI-REF-12 Nathan TPF & Corresponding Angles and Table for Dividing  
Circles of Laying Out Geometrical Figures. Not dated or numbered.
- MI-REF-13 Nathan Untitled table of 15 degree angels and its elements in  
inches & m/m's. Not dated or numbered.
- MI-REF-14 Nathan Angle Chart-Known Sides & Angles In Full (and)  
Unknown Sides & Angles Dotted. Dated March 3, 1925 Not numbered.
- MI-REF-15 Nathan Diagonals of Hexagons & Squares Not dated or numbered.
- MI-REF-16 Nathan Weights Of Brass & C.R.ST. Rods In Pounds Per Running  
Inch. Not dated of Numbered.
- MI-REF-17 Nathan Wire & Sheet Metal Gages In Approximate Decimals Of An  
Inch. Not dated or numbered.
- MI-REF-18 Nathan Standard Sizes & Dimensions For Iron Pipes. Not dated or  
numbered.
- MI-REF-19 Nathan British Standard Pipe Threads. Dated Mar.20,1916 & not  
numbered.
- MI-REF-20 Nathan Whitworth Standard Thread For Gas & Water Piping,  
Standard Taper  $\frac{3}{4}$ " in 12". Not dated or numbered.

Cont.

MI-REF Cont.

MI-REF-21 Nathan British Standard Pipe Threads For Gas, Water & Steam.  
Not dated or numbered.

MI-REF-22 Nathan Sizes Of Steel Taper Pins – Pratt & Whitney Standard.  
Not dated or numbered.

MI-REF-23 Nathan Pressures & Corresponding Velocities Of Air Currents.  
Not dated or numbered.

MI-REF-24 Nathan How Leaks Run Up Costs (air, steam & water).  
Drg A-28758 May 10,1937

MI-REF-25 Nathan Weights In Pounds Of Standard Nathan Products.  
Not dated or numbered. Note: This table was apparently produced before  
WW-I as there are no "1918" appliances listed.

MI-Gen'l Use & Info, etc, providing additional information.

MI-GU-1 Nathan Foundry Estimate sheet – Not dated or numbered.

MI-GU-2 Nathan Handwheel H-5307 Nov. 23,1951

MI-GU-3 Nathan Standard Wire Handwheels dated 4-10-26, Not numbered  
Except for part numbers for use on different size valves.

MI-GU-4 Nathan Hand wheel K-14248 May 10,1912 Used originally on  
St. Val. 10-12 Monitor Injectors – Special.

MI-GU-5 Nathan Universal Joints, Type "N" 3337, last rev'd 8-31-38, with  
tabled sizes & part numbers.

MI-GU-6 Nathan Universal Joints, 11137-11139 Dec.21,1912 (from) ALCo  
Rogers Works Card N, table of different Styles & ALCo patt. Number.

MI-GU-7 Nathan Standard Practice For The Use of Soft Copper Tubing, Not  
dated or numbered, Table of C. P. sizes used at BLW & ALCo for  
different uses.

MI-GU-8 Nathan Drop Plugs for use on Locomotives and Stationary Boilers.  
March 30,1945 Page not numbered – Individual parts are numbered.

MI-GU-9 Nathan Gasket Drg 40316-C Last rev'd 8-21-51. Tabled sizes, where  
used & materials. Outside purchase.

MI-GU-10 Nathan Dimensions Of Packing Rings, Drg 175 Oct.21,1905  
Individual part numbers to suit use on appliance.

MI-GU-11 Nathan Cotter Pins Drg F-631-B Last rev'd 1-24-52, Tabled with  
individual part number, sizes, materials & where used.

MI-GU-12 Nathan Plain Washers (Brass & Copper) Drg C-20951-D, 10-28-60  
Tabled with individual part numbers, sizes, materials.

Cont.

MI-GU Cont.

- MI-GU-13 Nathan Ball Bearings Drg E-20882-C Last rev'd 10-25-53, Tabled with description, sizes & mfg'rs.
- MI-GU-14 Nathan Drive Screws Drg E-21059-C Last rev'd 5-17-61, Tabled with description, sizes & materials.
- MI-GU-15 Nathan Groov-Pin (or equal) Drg E-21083-D Last rev'd 6-3-54, Tabled with individual part numbers, types, sizes & materials.
- MI-GU-16 Nathan "O" Ring (Commercial) Pg-1 Drg E-21084-B Last rev'd 12-15-52 Tabled with individual part numbers, sizes, material & use.
- MI-GU-17 Nathan "O" Ring Pg-2 same. Split of over size sheet.
- MI-GU-18 Nathan Fillister Head Machine Screws X-1207-15-E, Last rev'd 3-12-52, Tabled with individual part numbers, sizes & materials.

MI-Lubricators, Mechanical

- MI-ML-1 Nathan Manufacturing Tolerances On Piston Operation & Regulating Unit Of Air Compressor Class LB, Drg 4535-A, Last rev'd 4-14-50.

MI-Lubricators, Hydrostatic

- MI-HL-1 Nathan Diagram Of Steam Connestions For The Various Types Of Nathan Bull's Eye Locomotive Lubricators Drg 1253 April 11,1921.
- MI-HL-2 Nathan Terminal Choke Plugs Drg 1699-B July 17,1924.
- MI-HL-3 Nathan Steam Connections For B.E. Lubricators, Drg 2041 Nov 2,1925. With styles & dimensioned connections.
- MI-HL-4 Nathan No.6 Bull's-Eye Lubricator Showing Sight Glass Asssembly. Drg 3356 Oct 16, 1933. With part numbers for new style.
- MI-HL-5 Nathan Coupling Nuts & Tailpieces For Steam Connection Nathan Type 166 & 1918 Bull's Eye Lubricators Drg 4283 July 28,1941, with part numbered & pipe sizes provided.
- MI-HL-6 Nathan Coupling Nuts & Tail Pieces For Delivery Connection Nathan Type 166 & 1918 Bulls Eye Lubricators. Drg 4284 July 29,1941, with part numbers & pipe sizes.
- MI-HL-7 Nathan New Style Delivery End Used On Bull's Eye Lubricators No. 9-3 Feed To No. 61-8 Feed After Feb. 28-1927. Drg 4621 Names & part numbers.
- MI-HL-8 Nathan Steam Pipe Spud For Use With Hydrostatic Lubricators. Drg. 4493 Nov.10, 1942 Names & numbers of parts of reference in ordering, also dimensioned drawing.

Cont.

MI-HL Cont

- MI-HL-9 Nathan Filling Plug Complete For Bulls Eye Lubricators. Drg 4715  
Jan. 31, 1945 Tabled list of nominal sizes for S.P.R.Y. Note: Should be  
useable for all hydrostatic lubricators with replaceable or slightly worn  
oversize filler hole bushings in body. Parts are named & numbered.
- MI-HL-10 Nathan Steam Pipe Connection For No. 9 Bull's Eye Lubr'r.  
Drg 3913 Sept. 14, 1938. Drawing supercedes SK-5-10-38-A. Named &  
numbered parts and proper application of copper pipe to tailpiece.
- MI-HL-11 Nathan Sight Glass Assembly For Nathan Type Bull's Eye Lub.  
Drg 3933-A Dec. 20, 1938 Names & numbered parts with gen'l  
dimensions.
- MI-HL-12 Nathan Union Coupling For 2-1/4" O.D. Copper Pipe Drg 3966.  
Names & numbered parts with gen'l dimensions. Note: The appliance  
that this application is used on has not been determined.
- MI-HL-13 Nathan Table Of Interchangeable Parts For Bull's Eye Lubricators.  
Drg 1393-B(?) Last rev'd 3-30-36 This is an extensive table of parts for  
hydrostatic lubricators. Original drawing was not scanned correctly so drg  
number may not be correct.
- MI-HL-14 Nathan Table Of Interchangeable Parts For Bull's Eye Lubricators  
Used on P.R.R. Locomotives. Drg 2413 Dated 21, 1927. Another  
extensive list due to amount of steam locomotives used on the  
Pennsylvania Railroad.
- MI-HL-15 Nathan Table Of Interchangeable Parts For Bull's Eye Lubricators  
For P.R.R. Drg & date due to poor scanning and original tracing  
condition. Note: Appears to be an earlier table.

MI Boiler Checks & Intermediate Checks – Boiler Types: (Early) Goose Neck Angle,  
Angle, Straight, (Later) 293 (Double Back Head), 280A, 287A-Scewed, 287A-Flanged  
(Early 287A also known as "Reversible"), 2870 (modernized 287A), FWR, FWS, FWC,  
1918, "G", "H or Phillip", "M", "T", FWP (Feed water pump check), FWT, etc.

Intermediate Checks Types: 142 and "Stem Guided". Not inclusive.

- MI-BIC-1 Nathan Table Of Interchangeable Parts For Boiler Checks. Drg 4673  
Not dated. Probably during the early 1920's as no 3" size or later types  
are included.
- MI-BIC-2 Nathan Lifts For Boiler Checks, Drg 3612 dated June 18, 1936.  
Special drg for Advisory Mechanical Committee covering C&O, Erie, PM  
& NYCh&StL Rys.

Cont.

MI-BIC Cont.

MI-BIC-3 Nathan Untitled drawing covering boiler checks lifts for four various sizes & types of boiler checks. No date or drawing number. Believed to be during the late 1920's.

MI-BIC-4 Nathan General Information Boiler Checks Clearance & Lift. No number dated Dec.18,1931. Table drawing, incomplete, but showing max clearance for new work.

MI-Injectors: Non-Lifting & Non-Lifting:

MI-Inj-1 Nathan Table of Interchangeable Parts For 1918 & Simplex HW Type P.R.R. Flanged Injectors. Drg 3393 Dated March 21, 1934. Covers sizes "A"=#12 & "B"=#13 non-lifting injectors.

MI-INJ-2 Nathan Table Of Nozzles For Non-Lifting Injectors. SK-10-5-37-C Last rev'd 1-14-43. Covers: "HW-F", "HW", "HWS", Simplex "NLF", 3871, Horizontal "HP", 4000-B-C & C-Spl (early version pre-6-1948) with each type's different sizes.

MI-INJ-3 Nathan Table Of Nozzles For Simplex "R" Injectors (Lifting). SK-10-4-37-C last rev'd Jun 2, 1949.

MI-Tools: Lists or tables for taps & dies, maintenance tools, gauges & (re-)seating (flat & 45 degree seats. In some cases, these may fit AAR injector threads. Not all drawing number shown are available.

MI-TL-1 Nathan Hand Sizing Taps & Dies. Drg 3823-B Last rev'd 7-21-38.

MI-TL-2 Nathan Nozzle Seat Spacing Gauges For Nathan Simplex 10 & 11 And 1918 A&B Injectors. Drg 3987 dated June 10, 1939. Tabled dimensions for these gauges.

MI-TL-3 Nathan Hand Sizing Taps & Dies. Drg 4188 dated Jan. 8,1941. Tabled drawing for various appliances.

MI-TL-4 Nathan Taps For No. 10-11-13 Simplex "R" Injector (&) No. 10 Simplex BH Injector. Drg 4446 dated Jun. 19,1942 Tabled drawing noting reference to Western Maryland Ry and Nathan thread form drg 2774.

MI-TL-5 Nathan Maintenance Tools For Nathan Simplex "R" Injectors. No number or date. Covers sizes 5-14.

MI-TL-6 Nathan Hand Tools #17 Simplex Non-Lifting Injector. Not numbered or dated. Covers Types "HW" & 3871.

Cont.

ML-TL Cont.

MI-TL-7 Nathan Hand Tools Type 1918 Combination Boiler Check & Stop Valve. Not numbered or dated. Covers 2" & 2-1/2" sizes.

MI-TL-8 Nathan Hand Tools Boiler Checks Used On Union Pacific Ry. Not Numbered or dated. Covers 287-A, "FWR" & "FWS" in 2", 2-1/2" & 3" sizes with UP ref drawing noted.

MI-TL-9 Nathan Gauge Cocks Types: 3297, 3417, 261-CA-24424 & 272-S-1580. Not numbered or dated. Covers (in-part) re-seating under pressure.

MI-TL-10 Nathan Water Column Drain Valves. Not numbered or dated. Covers types 3716, 2748 & 3458. Reseating under pressure.

MI-TL-11 Nathan Rail Washer Type 3431 Not numbered or dated. Covers reseating under pressure.

MI-TL-12 Nathan Hand Tools Type 1918 Balanced Injector Starting Valve. Not numbered or dated. Covers 2" & 2-1/2" sizes.

MI-TL-13 Nathan Hand Tools Type 1921 Balanced Injector Starting Valve. Not numbered or dated. Covers 2" & 2-1/2" valves (no 1-1/2").

MI-TL-14 Nathan Hand Tools Type 3540 Balanced Injector Starting Valve. Not numbered or dated. Covers 2", 2-1/2" & 3" sizes.