GWR

4000 'Star'

Class Locomotive

skyhook
GAMES STUDIO

Contents

1 Background

1.1 Background

After finally converting the last broad gauge lines in 1892, the GWR began a period of modernization as new cut-off lines shortened its routes to west of England, South Wales and Birmingham. During the first decade of the twentieth century, the new Chief Mechanical Engineer, George Jackson Churchward designed or acquired a number of experimental locomotives with different wheel arrangements and boiler designs to help him plan for the future motive power needs of the railway. Following the success of the prototypes of his two-cylinder Saint class 4-6-0 locomotives, introduced in 1902, Churchward became interested in developing a more powerful 4-cylinder type for the longer non-stop express services. He therefore persuaded the GWR to acquire three French 4-cylinder 4-4-2 compound locomotives, 102 La France (1904) and 103 President and 104 Alliance (both 1905) for comparison purposes.

1.2 Prototype

In addition to acquiring the French compound locomotives Churchward built and tested his own prototype 4-cylinder locomotive simple-expansion locomotive, No. 40 North Star in 1906. As with some early members of the Saint class it was built as a 4-4-2 but designed so that it could easily be converted to a 4-6-0. It was completed at the Swindon Works of the GWR (Lot 161) in April 1906. It was numbered 40 and later that year was named 'North Star'. In November 1909 it was converted to 4-6-0. The new design incorporated many ideas from the French locomotives including a domeless taper boiler and Belpaire firebox. The design had divided drive with the outside cylinders connected to the second set of driving wheels whilst the inside cylinders were connected to the front set of driving wheels. The valve gear was an unusual design, called scissors gear, which eschewed the use of eccentrics, but was basically a variation on Walschaerts gear. The prototype locomotive was rebuilt as a member of the Castle Class in November 1929.

1.3 Production series

During initial trials the prototype proved to be largely successful although Charles Rous-Marten commented that 'there were indications that with heavier loads, and less favourable weather, greater adhesion would be needed.' The production series were therefore all built with a 4-6-0 wheel arrangement. In service they proved better suited to high-speed express trains than the 'Saints' with not just a smoother ride but also working more efficiently at the top end of the speed range. The 'Stars' cost more to build, maintain and service than the 'Saints', but they nevertheless quickly established themselves as the GWR's flagship locomotive class until the 'Castle' class came into service in 1923.

Between 1907 and 1923, 73 locomotives were built within the 'Star' class, split into 7 series, each with detailed differences from the others. Star, Knight, King, Queen, Prince, Princess and Abbey.

The first series of ten locomotives were built at Swindon in 1907 (Lot 168) numbered 4001-4010 and named after well-known Stars, perpetuating the names of the earlier broad gauge GWR Star Class of 1838. All except for No. 4010 Western Star were built without superheaters. No. 4010 received a 'Swindon No. 1' superheater and the remainder received superheated boilers between and August 1909 and October 1912. No. 4009 Shooting Star was rebuilt as a member of the Castle Class in April 1925.

The surviving members of the series were withdrawn between 1932-1951. Luckily, one example of the 'Star' class, No. 4003 Lode Star was preserved by British Railways, and is now a static, non-working exhibit on loan to STEAM, the “Museum of the Great Western Railway” in Swindon, UK, from the “National Railway Museum” in York, UK.

References;

The Great Western Archive - http://www.greatwestern.org.uk/m_in_str.htm

GWR 4000 Class. Wikipedia - https://en.wikipedia.org/wiki/GWR_4000_Class

1.2 Design & Specification

Type and origin

Power Type:	Steam
Cylinders:	(4) 15 x 26 in
Designer:	George Jackson Churchward
Builder:	GWR Swindon Works
Build Date:	1906 - 1923
Total Built:	73

Specification

Configuration:	4-6-0 (prototype built as 4-4-2 but rebuilt as 4-6-0 in 1909)
Length:	16,100 mm (52 ft 10 in)
Locomotive Weight:	84 tonnes (185,000 lb)
Gauge:	1,435 mm (4 ft 8 ½ in)
Leading Wheel Diameter:	965 mm (3 ft 2 in)
Driving Wheel Diameter:	2045 mm (6 ft 8 ½ in)
Loco Weight:	77.0 t (75.8 long tons)
Tender Weight:	41t (40 long tons)
Water capacity:	16,000 – 19,000 l (3,500 – 4,000 imp gal)

Performance Figures

Maximum Tractive Effort:	111.61 – 123.66 kN (25,090 – 27,800 lbf)

*references from Wikipedia - https://en.wikipedia.org/wiki/GWR_4000_Class

2 Rolling Stock

2.1 GWR Star Locomotive

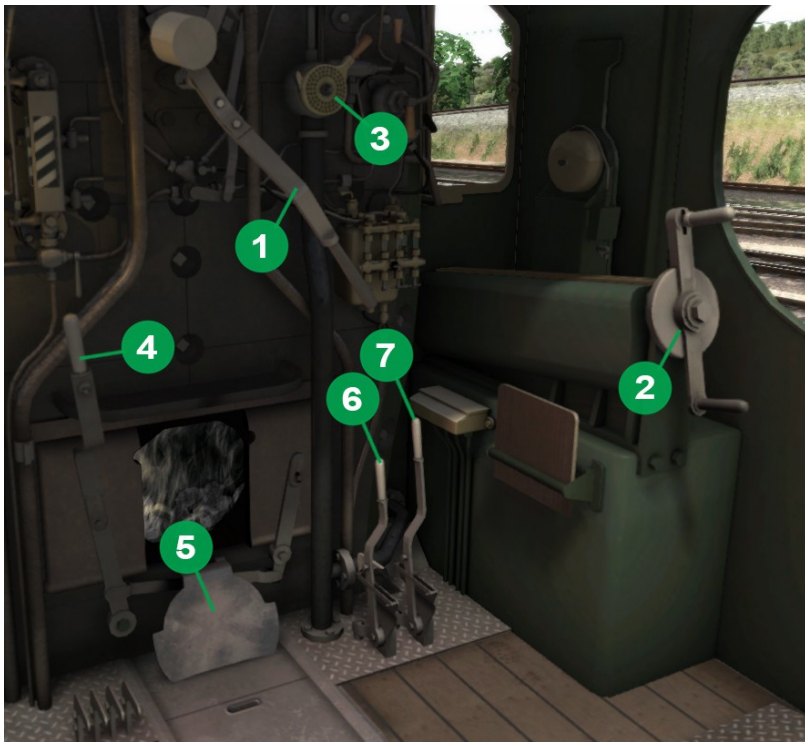
2.2 Collett 4000 Gallon Tender

(Both Locomotive and Tender supplied as an additional weathered version)

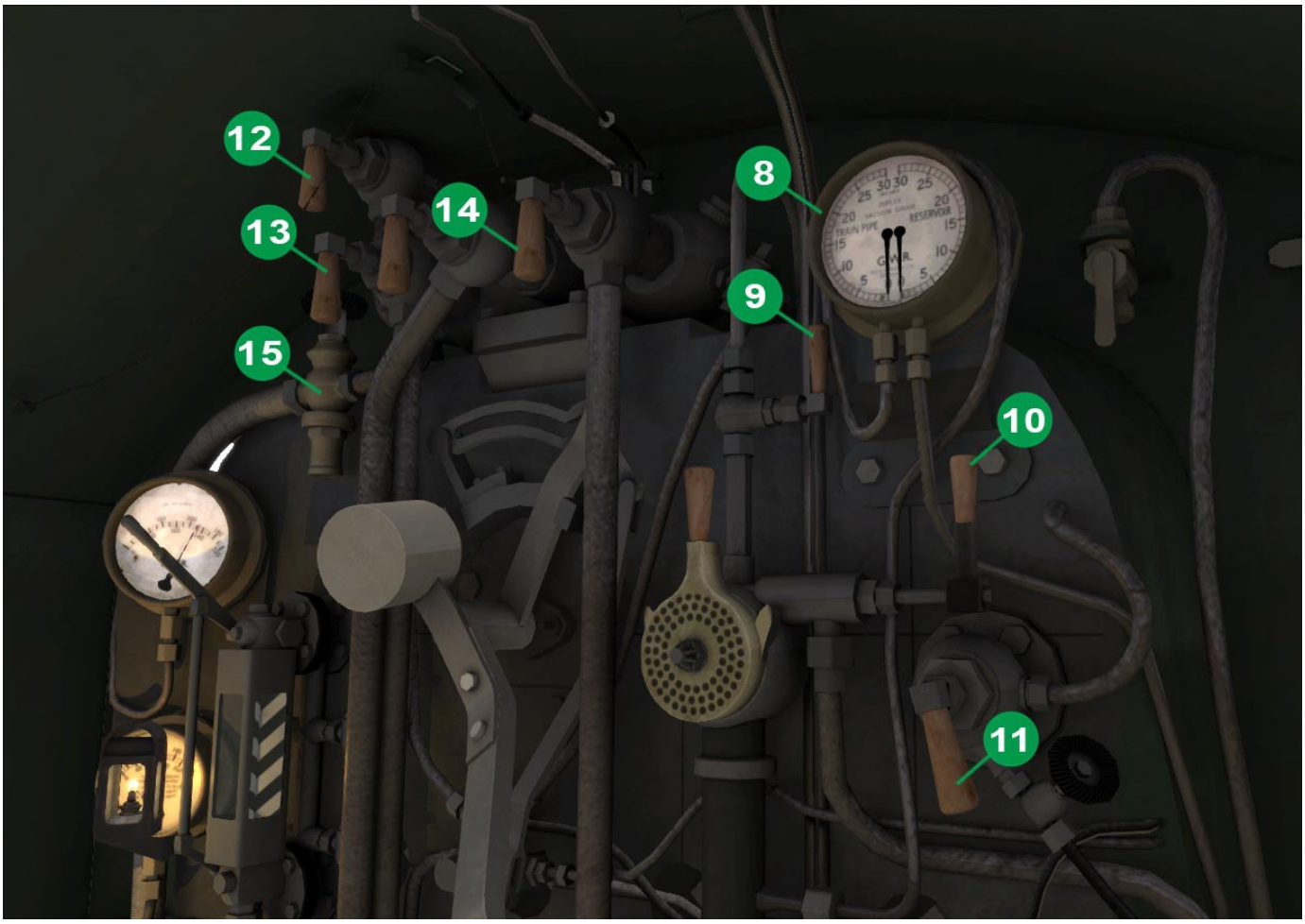
2.3 Collett Coaches in GWR 'Shirtbutton' Livery

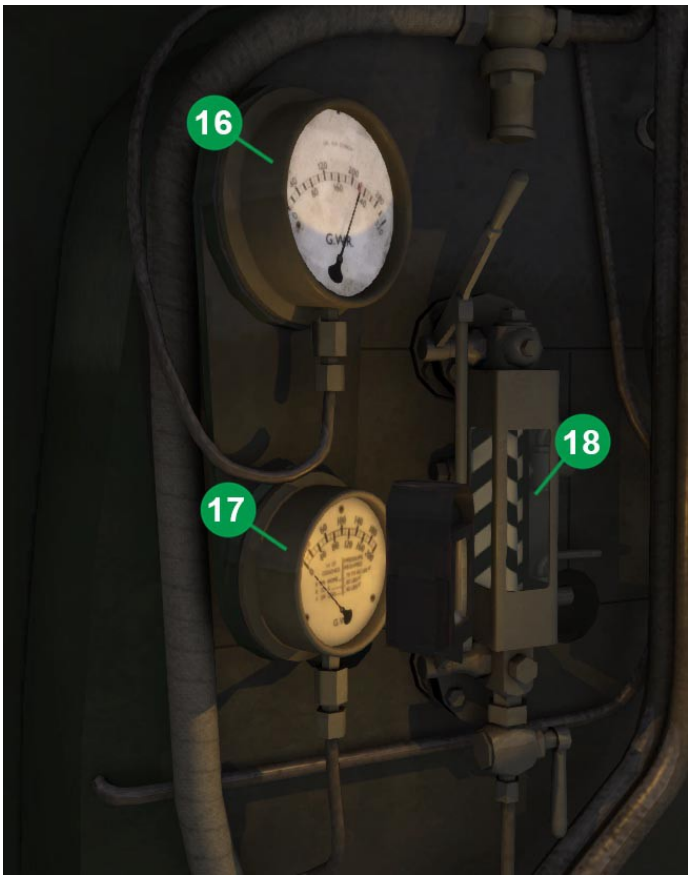
3 Driving the Star Class

3.1 Cab Controls

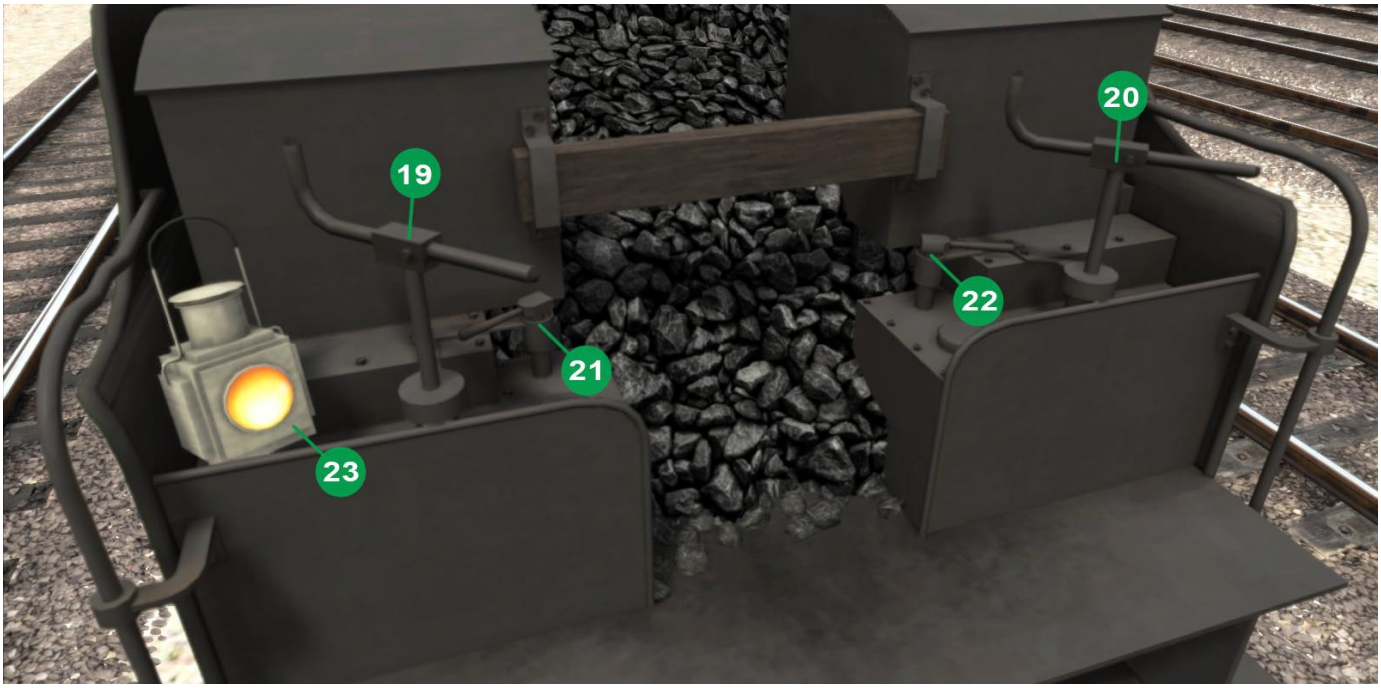


1	Regulator (A / D)
2	Reverser (W / S)
3	Train Brake (; / ')
4	Firebox Doors (F / SHIFT + F)
5	Firehole Flap (CTRL + SHIFT + F)
6	Cylinder Drain Cocks (C)
7	Sander (X)
8	Vacuum Gauge
9	Small Vacuum Ejector (J)
10	Large Vacuum Ejector
11	Blower Valve (N / SHIFT + N)
12	Steam Heat Master Cock (Y / SHIFT + Y)
13	Exhaust Steam Injector (I)
14	Live Steam Injector (O)
15	Mason's Valve (U / SHIFT + U)





16	Boiler Pressure
17	Steam Heat Pressure
18	Water Gauge
19	Waterscoop Handle
20	Handbrake (/)
21	Live Injector Water Valve (L / SHIFT + L)
22	Exhaust Injector Water Valve (K / SHIFT + K)
23	Lamp



3.2 Injectors

Injectors use steam from the boiler or cylinders to force water into the boiler via a series of cones. These cones increase the velocity of the steam/water mixture to overcome the boiler pressure fighting against it, thus increasing the water level in the boiler.

When do I use the Injectors?: Injectors are used to top up the water in the boiler. When stationary or coasting the Live Steam Injector can be used to top up the boiler and also to avoid blowing off steam from the safety valves. When the locomotive is in motion with the regulator open it is more efficient to use the Exhaust Steam Injector as this uses steam which has already been used in the cylinders; this injector can be left on for most of the time the engine is in motion, with occasional use of the Live Steam Injector to add more water to the boiler if needed.

Live Steam Injectors: The controls for the Live Steam Injector are situated on the Driver's side of the footplate (right-hand side). This injector uses steam directly from the boiler. To operate the Live Steam Injector open the Live Injector Water Valve (21) (key to open: L, key to close: SHIFT+L) and then open the Live Injector Steam Valve (14) (key: O). When you have finished using the injector, close the steam valve and then close the water valve on the tender so as not to waste water.

Exhaust Steam Injectors: The controls for the Exhaust Steam Injector are situated on the Fireman's side of the footplate (left-hand side). This injector uses steam which has already been used in the cylinders. It is more efficient to use this injector whilst on the move. To operate the Exhaust Steam Injector open the Exhaust Injector Water Valve (22) (key to open: K, key to close: SHIFT+K) and then open the Exhaust Injector Steam Valve (13) (key: I). When you have finished using the injector, close the steam valve and then close the water valve on the tender so as not to waste water.

Steam Heating

Most passenger engines in the UK were fitted with steam heating to provide heating to the coaches. GWR Stars were fitted with steam heating at the rear only as it was very rare that these locos would haul a train tender first in service.

To operate the steam heating, open the Steam Heat Master Cock fully (12) (key to open: Y) and then slowly open the Mason's Valve (15) (Key to open: U) until you begin to see the pressure on the Steam Heat Gauge (17) begin to increase. You will also notice the coaches will begin to leak steam. On the gauge it states how much pressure is needed for the amount of coaches you are pulling. To regulate the pressure use the Mason's Valve using U to increase and SHIFT+U to decrease. Make sure the pressure doesn't get too high! To switch it off close the Mason's Valve and shut the Steam Heat Master Cock (key: SHIFT+Y).

4 Lamps & Headboards

4.1 Lamp Codes

In Steam days, the lamps on the front of the locomotive weren't used to shine the way ahead for the driver as they were far too dim. Instead, they were used to indicate to others both the presence of the train and the nature of the train (was it a fast passenger or a slow unfitted freight for example). The Star locomotive in this product contain lamps on the front of the locomotive that can be cycled through using the HUD lights button, or pressing H, SHIFT + H.

Class A Express Passenger, Breakdown Train or Snow Plough en-route to a job.	
Class B Stopping Passenger, Rail Motor or a Breakdown Train returning from a job.	
Class C Parcels, fish, Livestock, Milk, Fruit or perishables, all fitted stock.	

Class D Express freight or livestock with at least 30% fitted stock connected to the loco.	
Class E Express freight with at least four fitted vehicles connected to the loco, or a short unfitted express freight.	
Class F Express freight all unfitted stock.	
Class G Light engine, or engine with one or two brake vans attached.	

Class H Through Freight or Ballast train.	
Class I Not Used.	
Class J Through mineral or empty wagon train.	
Class K Pick-up or Branch freight, or mineral or ballast train on a short haul run.	

4.2 Headboards

19 examples of the Star Class have been included in this pack;

Number	Name	Loco Number for Scenario Editors
4000	North Star	4000a
4001	Dog Star	4001b
4002	Evening Star	4002c
4003	Lode Star	4003d
4004	Morning Star	4004e
4005	Polar Star	4005f
4006	Red Star	4006g
4007	Rising Star	4007h
4008	Royal Star	4008i
4009	Shooting Star	4009j
4010	Western Star	4010k
4011	Knight of the Garter	4011l
4012	Knight of the Thistle	4012m
4013	Knight of St. Patrick	4013n
4014	Knight of the Bath	4014o
4015	Knight of St. John	4015p
4017	Knight of Liége	4017q
4019	Knight Templar	4019r
4020	Knight Commander	4020s

6 Scenarios

The following scenarios all take place on “Riviera Line in the Fifties”

6.1 [Star] Introduction To The GWR 'Star' Locomotive

Description: Tutorial giving a run through of the main principles in driving the Star class locomotive.

Duration: Approx 10 Mins **Difficulty:** Easy

6.2 [Star] A Knight For A Winters Night

Description: After finishing the last service of the day for locomotive 4020 'Knight Commander', you will run light, tender first, from Paignton to Newton Abbot where your loco will be stabled for the night. Watch out though, it's dark, it's snowing, visibility is poor and to cap it all off, you are following another service to Newton Abbot.

Duration: Approx 30 Mins **Difficulty:** Hard

6.3 [Star] A Morning Star In The Morning

Description: Drive locomotive 4004 'Morning Star' on a semi fast service from Newton Abbot to Exeter St Davids on a lovely spring morning. Enjoy the drive.

Duration: Approx 40 Mins **Difficulty:** Easy

6.4 [Star] An Evening With The Evening Star

Description: Drive locomotive 4002 'Evening Star' on a lovely summers evening run from Paignton to Exeter. You start south of Paignton Station waiting for your coaches to arrive on the back of an ex Wolverhampton service.

Duration: Approx 45 Mins **Difficulty:** Easy

6.5 [Star] Royalty Goes To Kingswear

Description: Drive an afternoon express to Kingswear with locomotive 4009 'Royal Star' The weather is good and all services are running on time. Your service detail includes uncoupling two coaches at Newton Abbot.

Duration: Approx 60 Mins **Difficulty:** Medium

7 About Skyhook Games

Skyhook Games Studio is a creative production house based in Liverpool, UK. With over 40 years of games development experience, its founders have jointly worked across a wide range of titles and platforms from Playstation 1 – 4, Nintendo Wii and PC, to name but a few. Many of these titles were licensed products for major brands such as Jim Henson's, Disney and Sony.

They are now producing DLC for Dovetail Games and enjoying the challenge.

http://www.skyhookgames.com/

8 Credits

We would like to particularly thank the following people for their invaluable assistance in developing this locomotive;

- Phil Teare of Ballaugh Sims.
- DTG for testing, QA and publishing.

Best regards to one and all from the team at Skyhook Games.