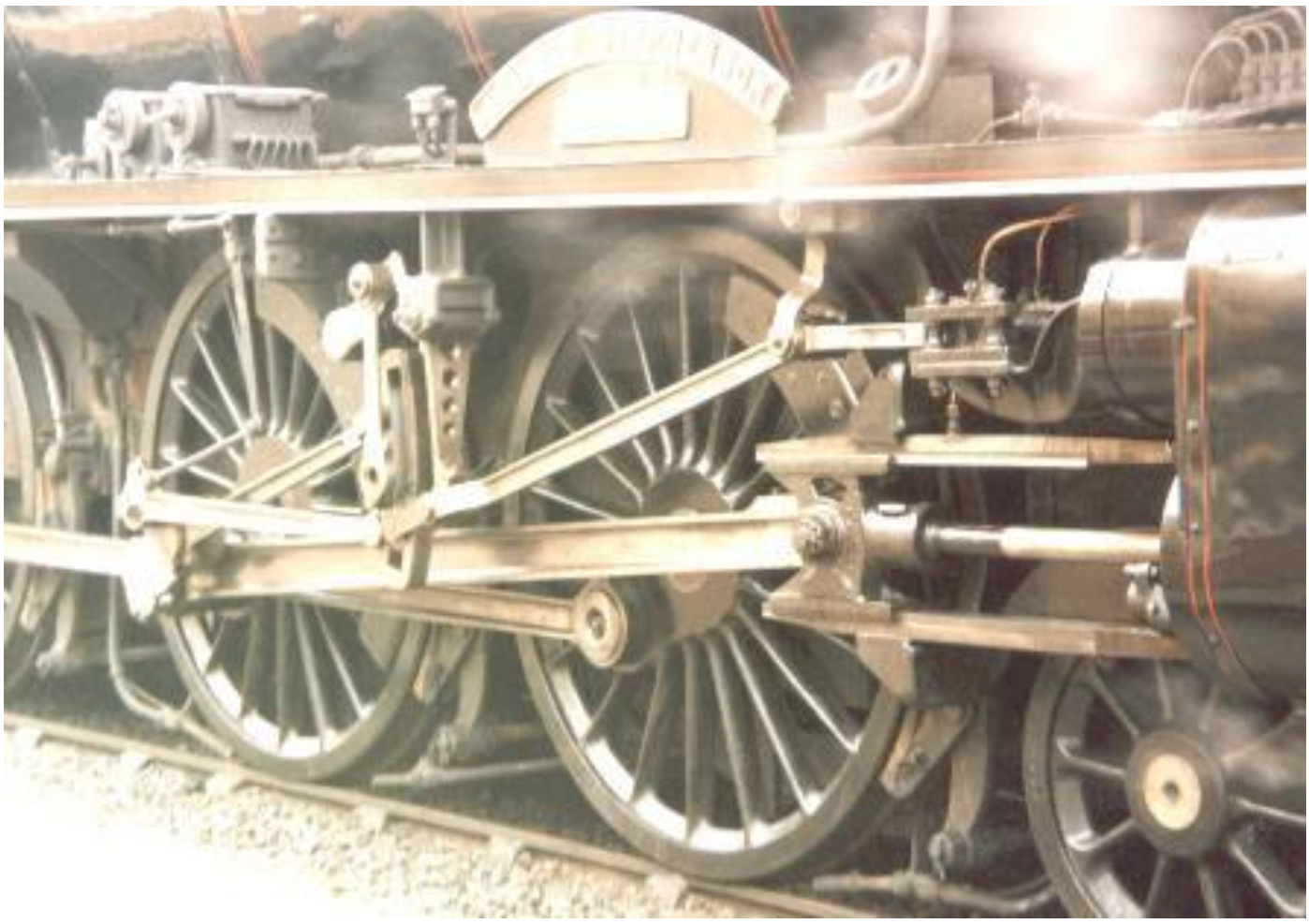
Kent & East Sussex Railway

Operating Department Mutual Improvement Class

Andyh@kesr.org.uk

www.kesr-operating.co.uk

Stephenson's Link Valve Gear



Created by: Andrew Hardy

Authorised by: Pete Salmon

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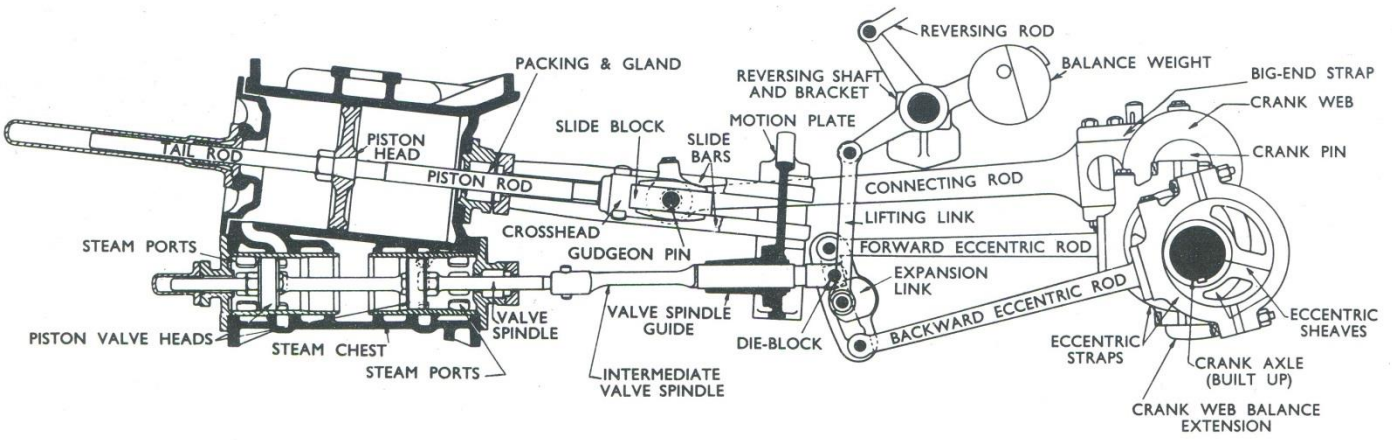
The Stephenson's link motion on locomotives is a development from the single eccentric used to move the valve of a stationary engine, which would normally only run in one direction. However on a locomotive the valve gear must be able to provide variable cut-off and also allow the engine to be reversed. To do this the Stephenson's valve gear derives its motion from two eccentrics fitted to a crank axle, for each valve, one eccentric for forward and one for backward working.

The backward and forward movement of the eccentrics is transmitted through the eccentric rods to a slotted link known as the expansion link, the fore gear eccentric rod usually being coupled to the top and the back gear rod being coupled to the bottom of the link. The links are suspended from a common reversing shaft by lifting links. These may be raised or lowered as required by the reversing gear in the cab via the reverser reach rod.

Fitted in the slot of the expansion link is a die block, which is connected to the valve spindle by an intermediate valve rod. When the link is lowered to bring the fore gear eccentric rod into line or almost in line with the intermediate valve rod or spindle rod, the movement of the eccentric is transferred to the valve. Conversely, if the links are raised, the movement of the back gear eccentric rod will be transferred to the valve. With the link placed with the die block in the centre of the link, the mid gear position, the link simply oscillates with a to and fro movement equal to the steam lap plus the lead of the valve, from its central position. The full travel in the mid gear position is equal to twice the steam lap plus twice the mid gear lead.

Intermediate positions of the die block in the link will allow for a variation of valve gear travel, according to the position of the reversing gear, varying the cut-off of steam to the cylinders and making use of the expansive properties of steam.



With the arrangement of Stephenson's valve link motion the lead of the valve increases as the gear is notched up to a maximum at mid gear and a minimum at full forward or backward gear. The increase of lead at early cut off positions is advantages at high speeds. With outside admission valves (both slide and piston) actuated directly by Stephenson's valve gear, the position of the eccentric on the crank axle is 90 degrees plus the angle of advance in front of the crank in each direction of travel. With inside admission valves operated directly, the respective eccentrics follow the crank by 90 degrees less the angle of advance. If a rocking shaft, which reverses the direction of movement, is interposed between the inside admission valve and the valve gear, the eccentrics are set as mentioned in the first example.