Kent & East Sussex Railway

Operating Department Mutual Improvement Class

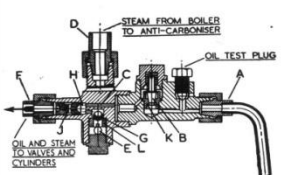
Andyh@kesr.org.uk

www.kesr-operating.co.uk

Wakefield Mechanical Lubricator

WAKEFIELD 7z PATTERN

Mechanical Lubricator with Anti-Carboniser



SECTIONAL SIDE ELEVATION OF ANTI-CARBONISER

Tapered valves "B" and seating 'K' are mated and are not interchangeable. Care must be taken when renewing seating 'K', as distortion may occur if screwed in too tightly.

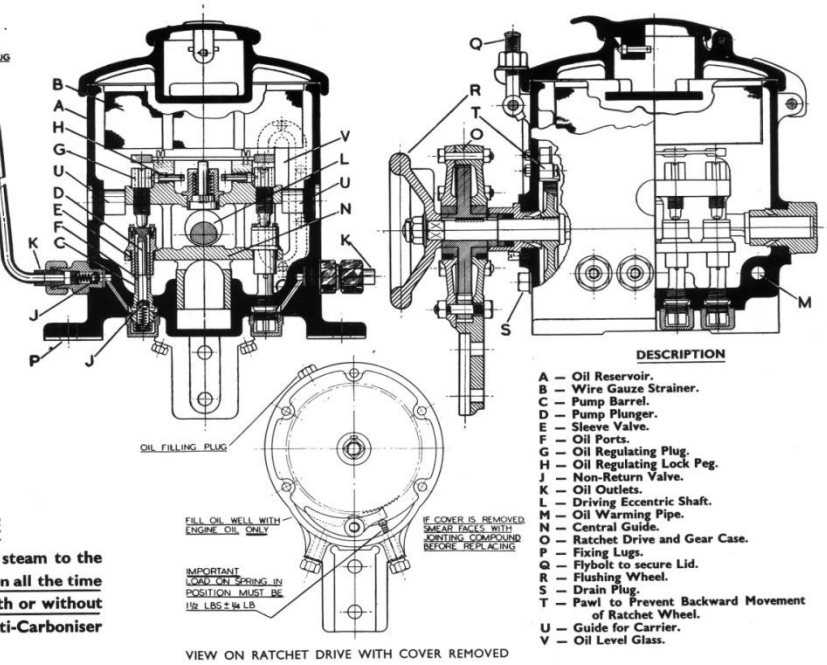
The seating 'L' must not be screwed too tightly into position and should only be nipped up hard on the last few threads. If distortion occurs, it cannot be corrected in position.

After seatings have been renewed, the Anti-Carboniser must always be subjected to back-pressure test. This is important, as faulty fitting will then become apparent immediately.

Tapered valves are stainless steel, and seatings manganese bronze. Ball valves must be best quality stainless steel, and seatings BS. 249.

SPECIAL NOTE

It is absolutely essential that the steam to the Anti-Carboniser should be kept on all the time the engine is running, whether with or without steam. If this is not done, the Anti-Carboniser is inoperative.



VIEW ON RATCHET DRIVE WITH COVER REMOVED

DESCRIPTION

A — Oil Reservoir.
B — Wire Gauze Strainer.
C — Pump Barrel.
D — Pump Plunger.
E — Sleeve Valve.
F — Oil Ports.
G — Oil Regulating Plug.
H — Oil Regulating Lock Peg.
J — Non-Return Valve.
K — Oil Outlets.
L — Driving Eccentric Shaft.
M — Oil Warming Pipe.
N — Central Guide.
O — Ratchet Drive and Gear Case.
P — Fixing Lugs.
Q — Flybolt to secure Lid.
R — Flushing Wheel.
S — Drain Plug.
T — Pawl to Prevent Backward Movement of Ratchet Wheel.
U — Guide for Carrier.
V — Oil Level Glass.

HOW THE ANTI-CARBONISER WORKS

Oil from the Wakefield Mechanical Lubricator enters the Anti-Carboniser at the individual inlets "A", is forced past the tapered check valves "B" and through the passages "C".

Steam enters the Anti-Carboniser at a common inlet "D" and branches along the passage "E" to pass through the ball check valves "G"; these serve to prevent the steam and oil from traversing passage "E" in a reverse direction.

It will be seen that the point of contact of the oil and steam is in the small space or cavity "H". The oil and steam together then pass through the baffles "J" and so to the outlets "F".

The object of the baffles is to mix more thoroughly the oil and steam which would not, of course, mix so well were they merely to pass through a plain hole.

HOW THE LUBRICATOR WORKS

Rotation of the eccentric shaft "L" in its bearings imparts a reciprocating motion to the central guide "N"; this motion is transmitted to the pump assemblies by the oil regulating plugs "G" on the downward, or forcing, stroke, and by the sleeve valve "E" on the upward, or recharging, stroke.

When the pump plungers "D" and sleeve valves "E" are at the top of their stroke, oil flows into the pump barrels "C" through the oil ports "F".

On the downwards stroke, as soon as the oil ports are sealed, by both the plungers and the sleeve valves, the oil thus trapped in the barrels is forced away under pressure through the non-return valves "J" to the outlets "K".

Adjustment of the amount of oil delivered by each pump unit is achieved by means of the regulating plugs "G". With these screwed right down, the pumps are working at their full capacity; one complete turn of the plugs upwards reduces the amount of oil pumped by one-fifth, as follows:—

Plug "G" screwed right down	-	= full feed:	0.023 cubic inches
" " " one turn up	-	= 4/5ths :	0.0184 " "
" " " two turns up	-	= 3/5ths :	0.0138 " "
" " " three turns up	-	= 2/5ths :	0.0092 " "
" " " four turns up	-	= 1/5th :	0.0046 " "
" " " five turns up	-	= feed cut off.	

C. C. WAKEFIELD & CO. LTD. LONDON

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Created by: Andrew Hardy

Authorised by:Pete Salmon

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Description

The Wakefield mechanical lubricator consists of four main assemblies. These are:

1. the reservoir
2. The pumps
3. The gear case
4. The drive

The reservoir is used for locating each individual pump assembly, which may be between two and sixteen in number. The gear case assembly is located at the drive end of the reservoir.

The reservoir is of cast iron construction with one mounting lug cast integrally in its base. A hinged lid, secured by a wing nut, gives direct access into the lubricator for filling and checking the oil level. A facility for warming the oil is available when required, and takes the form of either a passage, cast integral through the base, or a pipe situated within the reservoir. Screwed connections are provided at each end for the steam supply and drain.

Within the reservoir is the drive mechanism for the pumps, the pump assemblies, and the wire gauze strainer.

The drive assembly comprises the driving eccentric shaft, internal ratchet wheel, driving frame and eccentric bearing, and the flushing wheel. The eccentric shaft – located in bearings screwed into each end of the reservoir – has one eccentric situated centrally on the shaft. A central spigot within the reservoir locates, and allows vertical motion of, the driving frame. The eccentric on the drive shaft is located within, and bears against, the eccentric bearing of the drive frame. Rotation of the drive shaft therefore imparts a vertical reciprocating motion to the driving frame.

The internal ratchet wheel allows rotation of the driving eccentric shaft in one direction only, a sprung pawl preventing backlash. The flushing wheel is mounted on the eccentric drive shaft external to the reservoir.

Each single-acting pump is a two-piece assembly. The upper portion consists of the pump plunger surrounded by a sleeve valve. This assembly is located within the driving frame and is free to move vertically within the constraints imposed by the regulating plug. This regulating plug is screwed into the driving frame above the plunger and is adjustable to allow for regulating the feed of the pump. The head of the plug has four vertical slots to permit quarter-turn adjustments, a spring loaded locking peg locating in one of the slots maintains the required setting.

The lower portion, the pump barrel, is screwed into the base of the reservoir and incorporates the delivery check valve. This check valve is a spring loaded steel ball housed within the base of the barrel and is secured by a spring seat.

The complete pump assembly is arranged such that the reciprocating motion of the plunger is derived from the movement of the driving frame. The plunger reciprocates within the pump barrel with the sleeve valve sliding on and surrounding the barrel.

The gear case assembly converts the drive to the lubricator from a rocking motion into a rotary motion. The assembly comprises:

1. A gear case with lid
2. A ratchet wheel
3. A sprung pawl
4. A driving arm

Mounted upon, and keyed to the driving eccentric shaft is the ratchet wheel containing 100 teeth. This wheel incorporates a collar upon which is located the gear case. The collar also performs the function of a gland follower by bearing against the ring and packing that forms the drive shaft oil seal. The gear case lid encloses and seals the ratchet wheel, preventing the ingress of dirt. Within the top of the gear case is the driving pawl. The pawl is located on, and pivots about, a bolt screwed through the gear case. A spring loaded eye pin bears against the top of the pawl to ensure that it engages with the ratchet wheel.

Partial rotation of the gear case is achieved from the driving arm. At its upper end the arm is fixed to the gear case whilst at its lower end the arm is linked to a part of the engine that gives a constant motion.

Operation

Movement of the engine provides a pendulum type motion to the driving arm of the lubricator. This movement gives a partial rotation of the gear case such that in one direction the driving pawl rotates the ratchet wheel, whilst in the other direction the internal pawl acts upon the internal ratchet wheel and stops any return motion. The ratchet wheel and hence the driving eccentric shaft, rotates slowly but positively in one direction only. The rotation of the eccentric on the drive shaft provides a vertical reciprocating motion to the drive frame which subsequently operates each pump plunger simultaneously.

The plunger reciprocates within the pump body. As the plunger rises on its suction stroke a partial vacuum is created. The sleeve valve uncovers the oil ports and allows the oil to be drawn into the pump from the reservoir. When the plunger is on its return stroke the sleeve valve covers the oil ports and forces the oil out of the pump barrel under pressure, through the non-return valve, and down the delivery pipe to the oiling point.

Filling

Drivers must use the correct grade of oil as specified by the engineering department. Oil should be poured through the sieve until the lubricator is full (define full). The flushing wheel should then be turned to prime the oil passageways with oil prior to starting the days operation.

Maintenance

The only maintenance required by running shed staff, other than to check the oil level, is as follows:

1. Check for water contamination, by slackening the reservoir drain plug, and draining any water present.
2. Check the operation of the gear case assembly. This can be achieved by disconnection the driving arm from the rest of the drive linkage, and racking the driving arm through an angle similar to that provided during running. All motion of the gear case should transmit drive to the shaft. Any lost motion may indicate a broken pawl spring, a worn pawl, or worn ratchet teeth.
3. Check the drive linkage and make sure all pins and connections are tight. Renew any pins that are excessively worn, because lost motion at these points will reduce the output of the lubricator.