



**VICTORIAN RAILWAYS.**

# **INSTRUCTIONS**

**For the Guidance**

**OF**

**DEPOT FOREMEN**

**TRAVELLING FOREMEN**

**FITTERS-IN-CHARGE**

**DRIVERS-IN-CHARGE AND**

**DRIVERS**

**IN CONNECTION WITH THE**

**Care and Management of Loco-  
motives Fitted with  
Superheaters.**



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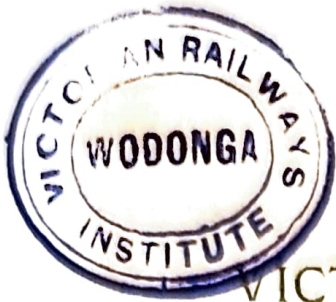
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VICTORIAN RAILWAYS.

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# INSTRUCTIONS

For the Guidance

OF

DEPOT FOREMEN, TRAVELLING  
FOREMEN, FITTERS-IN-CHARGE,  
DRIVERS-IN-CHARGE & DRIVERS

IN CONNECTION WITH THE

Care and Management of  
Locomotives Fitted with  
Superheaters.

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## Superheaters.

1. The following are the types of Superheaters fitted to various classes of locomotives.

These Superheaters are all known as the smoke-tube high temperature type, and are in principle quite similar.

In each system the steam from the regulator first enters through the main steam pipe, a "Header" or "Collector" fixed on the smoke-box at the tube plate, from which it passes to the superheater elements or tubes situated in the large smoke flues, again returning as superheated steam to another section of the "Header" in direct connection with the cylinder steam chest.

- (1) Schmidt type, as fitted to engine No. 882 "DD," having the standard type of mechanical damper attached to the smoke-box for the protection of the superheater element ends when the regulator is closed and the blower is on.
- (2) Schmidt type, without the mechanical smoke-box damper, but having attached to the cylinders an approved combined steam circulating and by-pass relief valve arrangement, which will allow saturated steam to circulate through the header, elements and cylinders whenever the regulator is closed.

- (3) Robinson type, with short loop lengths of superheating elements or tubes in the large smoke flues, and with a draft retarder apparatus in the smoke-box, by which a number of jets of steam are directed into the large smoke tubes for the purpose of retarding the gases, to prevent the burning of the elements when the regulator is closed and the blower is on, and for regulating the superheat when steaming.

The Robinson Superheater differs mainly from the Schmidt in the following features, viz.:—The tubes, forming the elements, are expanded into the bottom of the header without an intermediate joint, and removable front covers are provided on the header, which allow of the elements being expanded into the header or removed with special tools.

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## **Instructions for Driving Superheated Steam Locomotives.**

2. It is most important that the lubrication of Superheated Steam Locomotives be carefully attended to, or otherwise considerable damage will take place.

On engines lubricated by means of two Detroit lubricators with separate piping provided for each delivery point, Drivers must see that each lubricator is worked in accordance with the General Instructions for this type of lubricator.

As two lubricators, instead of one, have to be worked on Superheated Engines, and the necessity for regular supply of oil to the various points is more urgent owing to their higher temperatures,



**special attention must be given each lubricator to see that each feed is working with the required regularity.**

On engines lubricated by means of Wakefield's Patent 8-Feed Mechanical Lubricator, the following instructions must be closely followed and adhered to:—

(A) When the lubricator is first fitted.

(B) When the lubricator has been taken down and refitted.

(C) When the oil has been allowed to fall below the level of the suction valves, thus admitting the air to the pump barrels.

See that each of the oil regulating plugs (G) Fig. I is screwed right home.

Partly fill the oil reservoir (A), leaving the cap-nuts (T) on the cross-heads exposed

Remove the cap-nuts (T) and work the flushing handle (R) Fig. II by hand until oil is seen to appear in the cavities below the cap-nuts. This is necessary to clear the pumps of air.

Replace the nuts, taking care to screw them up tightly.

Fill up the reservoir to the bottom of the strainer (B).

Open the oil test plug (b) Fig. III, on the combined check valve and oil test plug.

Work the flushing handle (R) by hand until the oil is seen at the oil test plug (C).

Close the oil test plug and give the flushing handle nine or ten turns to make sure that the oil delivery pipes are quite full.

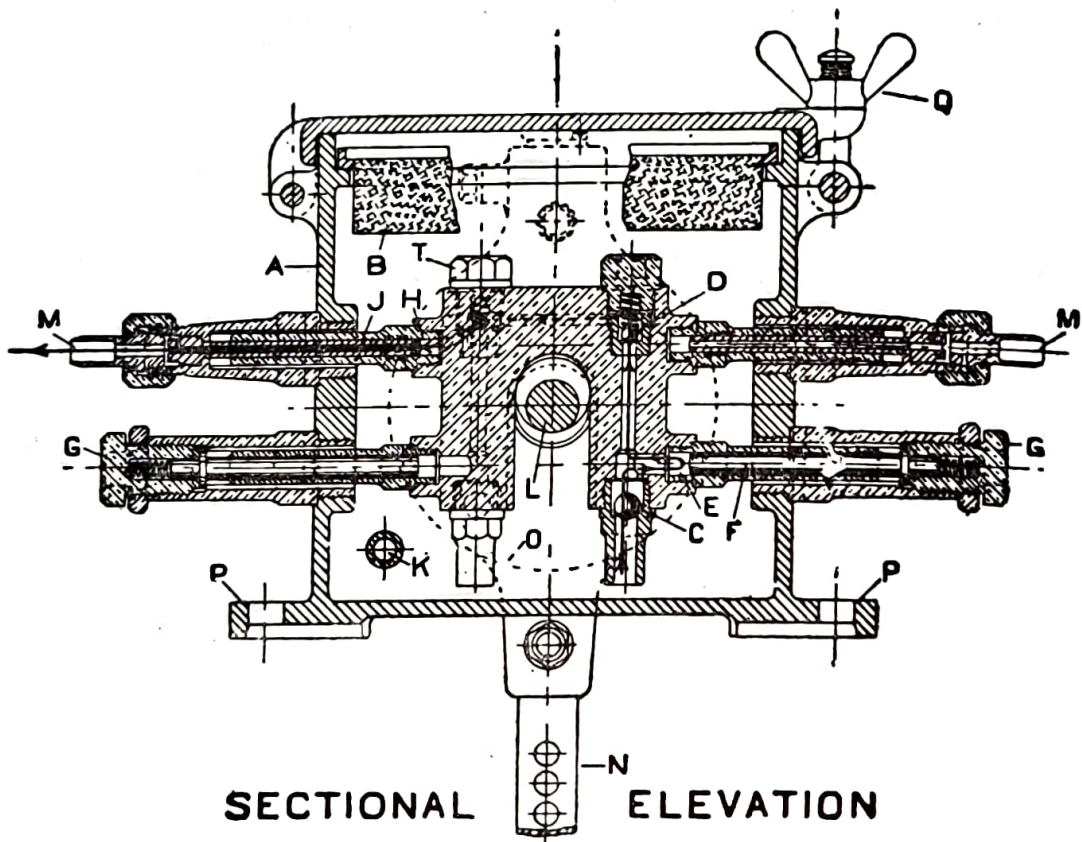
# WAKEFIELD'S PATENT

## No. 1 Pattern

### MECHANICAL LUBRICATOR.

WITH SEPARATE ADJUSTMENT FOR EACH FEED.

Fig. I.



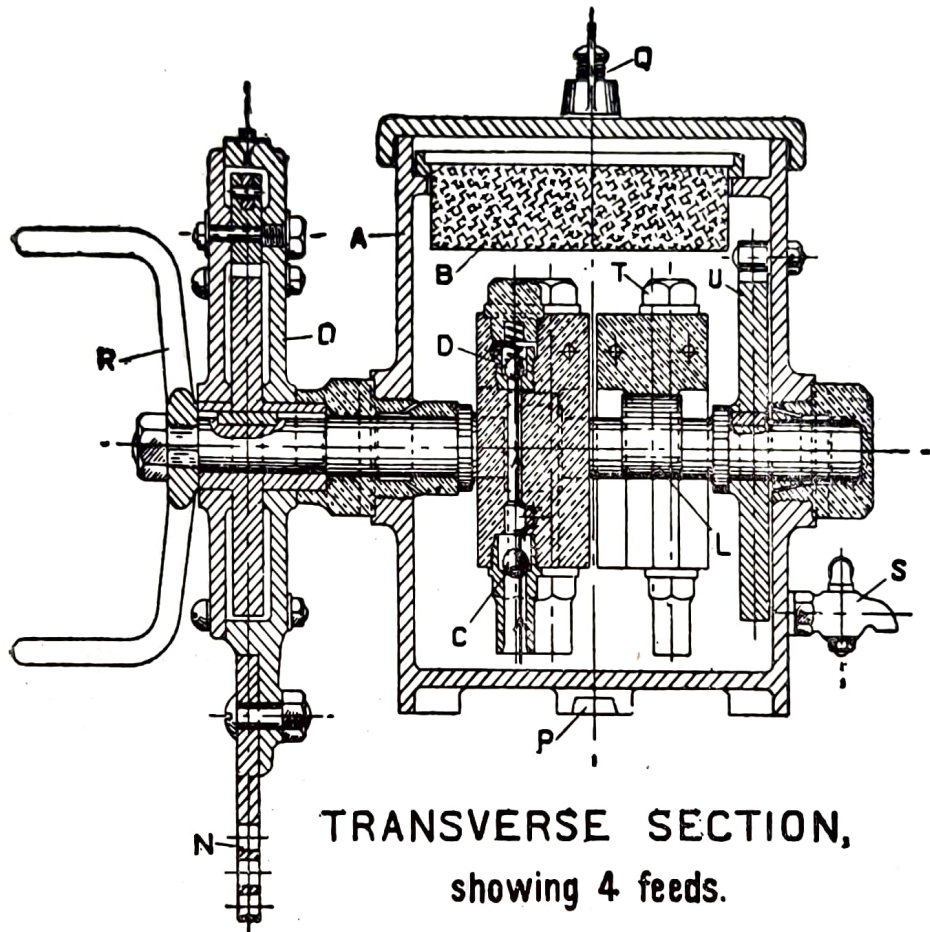
## DESCRIPTION.

- |                               |                                 |
|-------------------------------|---------------------------------|
| A. Oil Reservoir.             | L. Driving Eccentric Shaft.     |
| B. Wire Gauze Strainer.       | M. Oil Deliveries.              |
| C. Suction Valves.            | N. Driving Arm.                 |
| D. Intermediate Valves.       | O. Ratchet Wheel and Gear Case. |
| E. Large Pump Barrels.        | P. Fixing Lugs.                 |
| F. Large Adjustable Plungers. | Q. Fly Bolt to Secure Lid.      |
| G. Oil Regulating Plugs.      | *R. Flushing Handle.            |
| H. Small Pump Barrels.        | *S. Drain Plug.                 |
| J. Small Hollow Plungers.     | T. Cap Nuts.                    |
| K. Oil Warming Pipe.          |                                 |

\*Shown on Diagram, Fig II.



Fig. II.



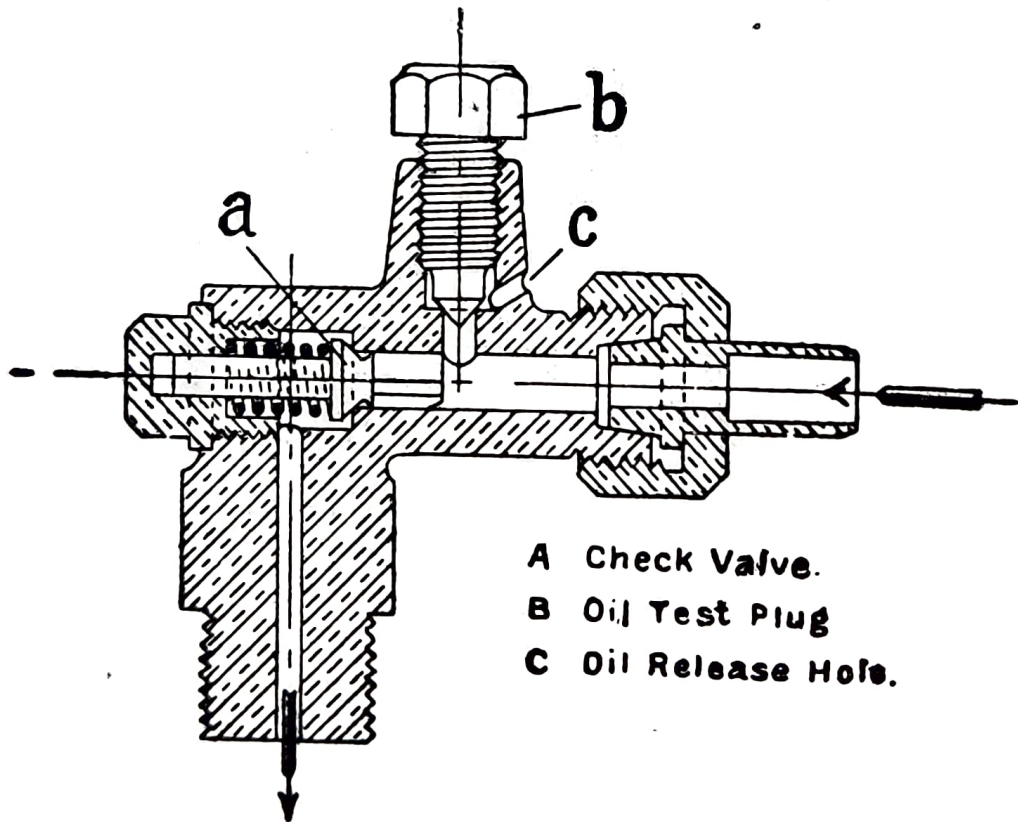
TRANSVERSE SECTION,  
showing 4 feeds.

DESCRIPTION.

- |   |   |
|---|---|
| <p><b>A.</b> Oil Reservoir.<br/> <b>B.</b> Wire Gauze Strainer.<br/> <b>C.</b> Suction Valve.<br/> <b>D.</b> Intermediate Valve.<br/> <b>*E.</b> Large Pump Barrel.<br/> <b>*F.</b> Large Adjustable Plunger.<br/> <b>*G.</b> Oil Regulating Plugs.<br/> <b>*H.</b> Small Pump Barrel.<br/> <b>*J.</b> Small Hollow Plunger.<br/> <b>*K.</b> Oil Warming Pipe.<br/> <b>*L.</b> Driving Eccentric Shaft.</p> | <p><b>*M.</b> Oil Deliveries.<br/> <b>N.</b> Driving Arm.<br/> <b>O.</b> Ratchet or Fiction Drive and Gear Case.<br/> <b>P.</b> Fixing Lugs.<br/> <b>Q.</b> Fly Bolt to Secure Lid.<br/> <b>R.</b> Flushing Handle.<br/> <b>S.</b> Drain Plug.<br/> <b>T.</b> Cap Nuts.<br/> <b>U.</b> Wheel and Pawl for preventing backward movement.</p> |
|---|---|

\* See Fig. I.

Fig. III.  
COMBINED CHECK-VALVE AND OIL-TEST PLUG.





## Regulating the Feed.

As far as possible the Feed should be regulated by adjusting the swing of the driving arm (N) Fig. II. For instance, if it is desired to increase the rate of delivery, the connecting rod should be coupled closer to the centre of the ratchet wheel, and vice versa if it is desired to decrease the delivery. The plugs (G), which enable each Feed to be separately regulated, should only be used when a finer adjustment of the Feed is needed, or when delivery from any of the pumps is required to differ from the others. When these plugs are screwed right home, the pumps are working at full capacity.

The amount of oil delivered for the various positions of the plug (G) is as follows:—

One full turn outwards	reduces the oil delivered by			$\frac{1}{6}$
Two	do.	do.	do.	$\frac{1}{3}$
Three	do.	do.	do.	$\frac{1}{2}$
Four	do.	do.	do.	$\frac{2}{3}$
Five	do.	do.	do.	$\frac{5}{6}$

Each full turn outwards therefore represents a decrease of one-sixth of the full pumping capacity.

The total supply of oil delivered by the 8 pumps of the lubricator on "DD" engines should be regulated so that the engine uses not more than 1 pint for every 60 miles.

Each day, before leaving the shed, the Driver should test the oil pump to see that it is in proper working order, and that all the pipes from the lubricator to the various parts are full of oil. The test cocks, which are provided for this purpose, should be opened, and if oil does not come out, the oil pump must be worked by hand until oil appears at the openings of all these test cocks.

If at any time one of the oil pipes has to be taken down for repairs, or in any other way becomes empty, it should be filled with oil by a syringe before being again coupled up.

**Great care must be taken to prevent, from getting into the oil pump, any waste or other foreign matter which might be drawn past the suction valves and interfere with the proper working of the pump. To obviate this, all oil must be passed through the wire gauze strainer.**

During the journey the Driver should occasionally glance at the lubricator to see that the flushing handle is revolving. If handle is seen to oscillate, without going round, it will indicate that the pawl inside the lubricator box is moving backwards and forwards on the same tooth of the ratchet wheel; the oil pump would then be stationary, and of course there would be no delivery of oil.

This may be caused by the stroke of the driving arm being too short, and can easily be remedied by altering the link connection, to obtain an increased stroke of the driving arm.

If considerable slackness develops in the driving mechanism, the lost motion is liable to cause the lubricator to be thrown out of action in the same way. This trouble can also be overcome by increasing the travel of the driving arm.

If a valve or piston starts groaning owing to the failure of lubrication, the regulator should be closed for a few seconds and oil poured in through the vacuum valve on the steam chest. If further trouble is experienced, the three regulating plugs on the lubricator for valves and cylinders giving

trouble should be screwed right home, so that some of the extra oil may be carried to that particular valve or piston giving trouble.

If the trouble still continues, the superheat damper in the smoke-box should be closed, and the temperature of the steam reduced until the lubricator can be put right.

Care must be taken never to allow the oil in the lubricator box to get below the suction valves, otherwise air is drawn into the pump, and no delivery of oil can be obtained even after filling the box, until the air is got rid of.

This may be done by removing the plugs on the top of the cross-heads, and working the flushing handle until the air is worked out, and the pump barrels and passages recharged with oil.

When altering the feed of oil by the regulating plugs, it must be remembered that **the plugs on the right hand side of the lubricator box regulate the oil delivered on the left hand side and vice versa.**

Excessive lubrication of the valves and pistons is to be avoided. If, when using a mechanical lubricator, any incrustation of soot forms on the rim of the blast pipe, it indicates that the lubrication is excessive and must be reduced. When using two Detroit lubricators this incrustation occurs more readily, and before such incrustation hampers the exhaust blow, it must be carefully removed, and care taken to see that no dirt falls into the blast pipe.

**The use for the lubrication of the pistons and valves of superheated steam locomotives, of any oil other than that specially provided for the purpose, is absolutely prohibited.**



Before leaving the shed the Driver of any engine fitted with smoke-box damper must specially check the proper working of the automatic gear operating the damper.

As the superheated steam locomotives have piston valves it is important to prevent any water being carried over into the cylinders.

The following precautions must be observed for this purpose:—

At each start the regulator must be opened slowly.

When leaving the depot, when the cylinders are not yet heated, the drain cocks must be open during the first few revolutions of the wheels, and when leaving with a train, the drain cocks must remain open until 350 deg. Fah. to 400 deg. Fah. is registered on the Pyrometer gauge.

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## Driving.

**3.** Drivers should run with the regulator full open where the working conditions will permit and with the reversing gear giving as short a cut off as is consistent with the proper handling of the train.

It is not advisable, however, to maintain the regulator full open when the cut-off has to be reduced below 20 per cent. in order to give the lower draw bar pull required.

## Handling of Reversing Gear.

4. When the engine is steaming the reversing gear should be operated as described in paragraph 3. When about to shut the regulator, the blower must be turned on full; **and immediately the regulator is shut, the reversing lever must be put into full gear;** the blower should then be adjusted to suit requirements. If any irregularity of the piston valves occurs the lubrication should be increased by means of the flushing handle (mechanical lubricator) or the regulating valves (Detroit lubricator). If the irregularity occurs while the engine is drifting, the regulator should be opened slightly for a few seconds.

engine is drifting, the regulator must be opened for a moment.

Whilst running, the Driver must avoid a high level of water in the boiler. Half a glass is sufficient at any time on a level, so as to allow the steam to rise to the dome as dry as possible.

If in spite of these precautions, any water is carried over into elements and cylinders whilst running, the Driver will be informed by a sudden drop in temperature of the superheated steam, indicated by the pyrometer. In this case the drain cocks must be opened and the opening of the regulator reduced so as to dry the steam by throttling.

The temperature of the superheated steam must not exceed 670 deg. Fah. If this is exceeded, the Driver will, on engines equipped with mechanical damper, reduce for the period required, the opening of the damper of the smoke-chamber by shortening the stroke of the piston of the small cylinder of the automatic gear, and on other engines will reduce the intensity of combustion and draft by operating draft retarder or other means available.

## Combustion and Superheating.

5. The economy in coal and water increases with the degree of superheat. The latter depends as much upon the firing, and moisture of the steam in the dome, as on the handling of the engine.

The firing must, therefore, be carefully done, and too high a water level in the boiler avoided.

A good even fire, well burnt through, should be maintained.

The steam should be maintained at a temperature of 650 Fah. or as near as possible. This can be obtained by keeping a well ignited even body of fuel on the grate, and by adding regularly fresh coal by a few shovelfull at a time, attention being paid to the back corners of the fire-box. Holes in the fire will rapidly reduce the superheat.

Under ordinary working conditions insufficient superheat is caused by too much air being drawn through the fire-box or fire-door, a heavy fire not properly burnt through, too high a water level in the boiler, the superheat tubes not being kept clean, or cold air being drawn into the smoke-box.

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### Ashpan Dampers.

6. These must be worked consistently with having a clean fire; if too much air passes through, the temperature is reduced, cooling the superheater tubes.

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### Fire-box Door.

7. This should generally be kept almost closed, only allowing sufficient air through to help consume the smoke, which is much greater when using Maitland coals than with Powlett coal.



## **Superheater Damper (if used) and Tubes.**

**8.** The Driver must oil the damper cylinder before each trip; also see that the damper in the smoke-box closes immediately that the regulator is closed, and opens when steam is put on. **On no account should the damper be open when the blower is on, or when the engine is standing, or steam off.**

In case of any damage to one of the superheater tubes, the Driver should be able to work home without much difficulty, unless it is a very exceptional case.

If necessary, remove the defective nest of tubes and cover opening with plates provided for the purpose in case of Schmidt type, and remove header cover and plug tubes with plugs provided in case of Robinson type.

The large smoke tubes, and the tubes of the superheater, are to be kept clean, and may be cleaned by compressed air, utilising the specially devised blowing apparatus provided at the depots.

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## **Vacuum Relief Valves.**

**9.** On engines fitted only with the ordinary Vacuum Relief Valves there is, when drifting, a marked tendency to draw ash grit and soot into the cylinders, thus adversely affecting lubrication.

Drivers should, therefore, as far as possible avoid putting on fresh fires immediately before or when drifting.

## **Combined Steam Circulating and By-Pass Relief Valves.**

10. The Combined Steam Circulating and By-Pass Relief Valves, fitted to superheater engines, obviate the use of the automatic damper gear or draft retarder apparatus, which, by hampering the speedy cleaning of the large tubes, cause them in traffic to be frequently neglected, and, in addition, they should overcome the inadequacy of the existing vacuum relief valves to effectively prevent suction of soot and grit into the cylinders.

By this arrangement a jet of saturated steam, when the regulator is closed, passes through the superheater elements, thus preventing overheating of the tubes, and at the same time establishing communication between both ends of cylinders.

The steam valve, that controls the flow of steam from the boiler to the circulating pipe and blower, must always be open so that steam will always circulate when regulator is closed, and the blower valve may be operated when necessary.

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### **After Running.**

11. The examination of the mechanism presents no special features. The rods of the valves and pistons are to be examined more particularly to see there is no chance of seizing.

The safety valves on the cylinders and vacuum relief valves on the steam chests must be carefully examined, and the latter valves cleaned when necessary.

The sweeping out of the upper and lower tubes has to be done with great care; as regards the upper tubes containing the superheater elements, this is best effected from the back, from the fire-box, not forgetting (on engines fitted with smoke-box damper) to open to the fullest extent the dampers of the smoke-box chamber by means of the lever placed outside, near the smoke-box.

The attention of all concerned is particularly drawn to the absolute necessity of looking after the very complete cleaning of the superheater elements, or else their utility will be reduced very quickly.

The upper tubes must have any cinders which may have lodged between the super-heater tubes removed; the back tube-plate must be carefully cleaned and any beginning obstructions are to be removed, and the clinker which tends to adhere to the back ends of the superheater is to be carefully removed by means of hooks and taken out at the fire-box end.

Locomotives using superheated steam have, as already stated, to be lubricated very perfectly, but it is advisable from several points of view that the internal lubrication shall not be excessive.

The examination of the valves, pistons, and their rods will determine whether the lubrication has been excessive, and, if it has, Officers-in-Charge should instruct Drivers as to the adjustment of the oil pumps.

### **Failure of Motion Gear.**

12. In the case of having to uncouple the motion on the road, it is necessary to first centre the piston valve and then clamp it in position with the clamps provided for the purpose.

*Jump this out first.*



## Periodical Inspection and Maintenance of Superheated Steam Locomotives.

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### Cleaning the Tubes.

13. The large superheater tubes containing the superheater elements must be blown through every day. A special blower is provided for this purpose. This apparatus is worked from the fire-box and takes its air from the air compressor service available.

The cleaning of the tubes should be done after the fire has been drawn and the steam in the boiler has dropped to 60 or 70 lbs. per square inch. Before starting to blow the tubes through, **the superheater dampers in the smoke-box must (where such are provided) be opened by means of the lever on the outside of the smoke-box and clamped in this position by the thumbscrew. After cleaning the tubes, the thumbscrew must be slackened and the damper allowed to close. On no account must the engine be lit up while the superheater dampers are open.**

It will be the duty of the Foreman, Fitter-in-charge, Driver-in-charge or Driver to see that after each wash-out the return bends of the superheater elements at the fire-box end are carefully examined, and that any deposits that may be adhering to them are removed.

### Superheater Elements.

14. At every general overhaul at the Workshops, the superheater elements must be all taken out and examined with care, and, if necessary, hydraulically tested.

Before being again put into place, the tubes should be coated with a thin layer of hot coal tar.

### **Superheater Dampers.**

**15.** The automatic dampers must be left clean so as to be able to work freely.

### **Smoke-box.**

**16.** It is very important that the smoke-box should be kept tight. Should air be drawn in, the efficiency of the superheater would be reduced.

### **Periodical Examination of Valves, Pistons, Etc., by Fitter.**

**17.** The valves should, during the first three months that an engine fitted with superheater apparatus is in running, be examined once every month; then if everything is all right, the period between the examinations may be extended to two months.

The valve heads and rings must be thoroughly cleaned; any deposits of carbonised oil in the grooves or holes in the rings must be removed.

**The rings** must be free to move vertically without any side play. **The valve heads** must not be allowed to touch **the steam chest liners**; should the valve spindle or guide bushes be worn, they must be renewed so as to bring the valve heads back into their central position.

### **Pistons.**

**18.** The periods between the examinations of the pistons should be the same as for the valves. The heads and rings must be thoroughly cleaned, care being taken to remove any carbonised oil or dirt from the lubricating grooves and holes in the piston rings.

Sharp edges on the rings should be slightly rounded off.

At each examination of pistons, careful observation should be made as to whether or not the piston heads are bearing on the cylinder surfaces, and any wear of tail rod bushes, guide bars and crossheads noted, should be so adjusted, that the centre line of piston throughout the stroke coincides with the centre line of cylinder, and the weight of the piston is thereby kept (a) off the stuffing box gland and packing, (which otherwise will not stand the high temperature it is subjected to), and (b) off the cylinder surfaces.

### **Piston Rod Packing.**

19. The packing rings must be trimmed up, and if necessary clearance filed on the ends.

Packing should be examined at every examination of piston and piston valves.

### **Vacuum Relief Valves.**

20. The vacuum valves on the steam chests and the combined steam circulating and by-pass relief valves on the cylinders must be kept in good working order, and must be carefully examined by a fitter every three months.

### **Pyrometer.**

21. The reading of the **Pyrometer Gauge** must be tested every three months by placing a standard mercury thermometer in the oil well in the steam header or by detaching the Pyrometer terminal from the header and submerging it in a cylinder of heated oil, the temperature of which is taken also



from a standard mercury thermometer, and comparing the reading of the Pyrometer with that registered by the thermometer.

If necessary, the Pyrometer must be adjusted. This is done in the case of vapour tension Pyrometers, similar to that used on engine 882 "DD," by removing the front of the gauge, holding the pointer very gently, and regulating the nut to suit the correct temperature.

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## **Robinson Smoketube Superheater.**

22. The Superheater illustrated by the accompanying chart consists of a header or steam collector "A," superheater pipes or elements "B" connected thereto and located within the boiler flues "C." The flow of gases through these tubes is controlled by a draught retarder "D."

### **Header "A."**

This consists of a casting with openings in the front adapted to be closed by means of a mild steel plate "A1"; this joint is preferably made and closed with boiled oil only. The steam passes from the regulator head into the saturated compartments "E" and thence into the superheater pipes "B." After passing through these pipes the steam returns to the header compartments "F" and from these flows through the steam pipes "G" to the cylinders "H." The passage of the steam is indicated by arrows.

### **Superheater Pipes "B."**

These are of the best solid cold drawn steel, and each element consists of four pieces of tubing suitably connected by special return bends, or torpedo ends, so as to form a continuous channel for the steam. The two ends of each element are expanded directly into the bottom of the header. One end receives the steam from a compartment "E," and the other discharges the superheated steam into a compartment "F." In its passage through the superheater pipes the temperature of the steam is raised about 250 to 300 deg. Fahr. The temperature of the steam after passing through the superheater is 650 to 680 deg. Fahr. The superheater pipes extend back to a distance of about twenty inches from the fire-box tube plate. The superheater pipes can be readily disconnected from the header by means of the simple tools illustrated, and can be as easily replaced without in any way damaging them.

### **Boiler Flues "C."**

These vary in number and diameter according to the size of the boiler, and are usually made from 5 in. to 5½ in. external diameter. The fire-box end of each tube is swayed to a smaller diameter. This reduction provides more metal between the tubes in the tube plate and also increases the water space, thus ensuring less liability of fracture in the tube-plate and free circulation of water at the fire-box end. The flues are expanded into the tube-plate in the same way as the regular boiler tubes, and are usually beaded over.

### **Draught Retarder "D."**

This consists of a number of small steam nozzles disposed in the smoke-box, one nozzle extending a

short distance into the end of each flue tube "C." The nozzles are connected to the pipe which supplies steam to the blower, so that, when the latter is turned on, the jet of steam delivered from each nozzle is sufficient to retard the forward draught induced by the blower. The draught retarder is provided with a fitting "J" on the outer side of the smoke-box, by means of which it can be made inoperative if at any time necessary. In the event of the superheat attaining too high a temperature, or if it should be found necessary to work with a low superheat, the blower valve would be partially opened, thus retarding the flow of gases through the large flues "C," and reducing the superheat.

### **Pressure Release Valve.**

This valve is a differential valve, one side of which is in connection with the steam chest through pipe "K," and the other with the cylinder "H." If the pressure rises in the cylinder (due to priming) a certain predetermined amount above that exerted in the other direction by the live steam the valve opens and relieves the extra pressure. When steam is shut off the valve opens and remains open, and provides a free passage of vapor from one end of the cylinder to the other through the bye-pass pipe "L" owing to compression at one end and vacuum at the other, and in transmission a small amount of cold air is drawn through the holes in the pipe "L," and mixing with the vapor, which is of a very high temperature owing to repeated and rapid compression, reduces the temperature of the mixture, and this prevents the overheating of the cylinder walls, piston rods, and packing, at the same time prevent-



ing excessive initial condensation. The valves therefore operate when drifting and perform the functions of the usual steam chest air valves by-pass ports and cocks, and priming or water relief valves.

### **Schmidt's Smoketube Superheater.**

23. The Superheater, illustrated by the accompanying diagram, consists of a header "A," superheater tubes "B" connected thereto and located within the boiler flues "C." The flow of gases through these flues is controlled by a damper arrangement consisting of a damper "D," damper cylinder "E," steampipe "E1," and counterweight "E2."

#### **Header "A."**

The header receives steam from the regulator head, and due to its internal construction directs the steam through properly arranged channels into the superheater tubes. After passing through the tubes the steam returns to the header as indicated by the arrows, and from these flows to the steam pipes "F" on its way to the cylinder "G."

#### **Superheater Tubes "B."**

These are of seamless steel and each unit consists of four pieces of tubing, so connected by return bands as to form one continuous channel for the steam. The two ends of each unit are expanded in a collar or rectangular flange, and are held steam-tight to the header by one clamp bolt or stud. One unit receives the steam and the other discharges the superheater steam. In its passage through the superheater tubes the temperature of the steam is raised about 250 to 270 deg. Fahr. The temperature of the steam after passing through the superheater

is on the average 650 deg. Fahr. The superheater tubes are arranged in the upper part of the boiler flues by means of supports, so as to offer a minimum of obstruction to the flow of gases through the flues. They extend to a point about two feet from the fire-box tube plate.

### **Boiler Flues "C."**

These vary in number according to the size of the boiler, and are 5 in. x 5½ in. outside diameter as the case requires. The fire-box end of each tube is swayed to a standard diameter. This reduction in diameter at the fire-box end increases the water space, and thus ensures free circulation next to the tube plate. The flues are expanded into the tube plate in the same way as the regular boiler tubes.

### **Damper "D."**

This is automatically operated, and is shown on the drawing on dotted lines the position which it occupies when the regulator is open and the engine working under steam. The damper closes after the regulator is closed and thereby checks the flow of gases through the large flues and around the superheater tubes, and prevents their being burned, as there is, at this time (the regulator being closed) no steam passing through the superheater tubes.

### **Damper Cylinder "E."**

This is actuated by the steam taken from the saturated side of the header through the pipe "E1," and thus supplies the power to operate the damper described above. The counterweight "E2" closes the damper when steam is shut off, and when there is no steam pressure existing in the damper cylinder.



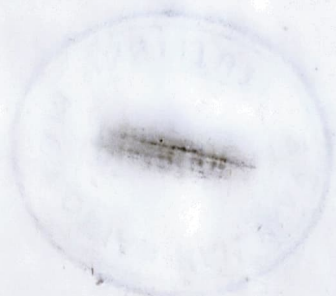




VICTORIAN RAILWAYS.  
CHIEF MECHANICAL ENGINEER'S OFFICE.  
*8th August, 1916.*

**I**NSTRUCTIONS for disconnecting  
the Walschaert Valve Gear in  
case of failure of the mechanism,  
with reference to the moving parts  
as illustrated on the accompanying  
diagram (Litho. 51/16).

(To be gummed in at page 26 of the pamphlet  
containing the "Instructions in regard to the  
Care and Management of Locomotives fitted  
with Superheaters.")



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## In case of Breakdown or Failure of the Motion on "A2" Engines fitted with the Walschaert Valve Gear.

Never disconnect between the Valve Spindle and the Valve Spindle Guide Block. When the Valve is to be centred, disconnect the Radius Rod and, if necessary, the Combination Link, and tie them up securely as directed below.

Clips for securing the Valves central are provided on all engines fitted with this gear, and if the one marked "F" be placed on the front end of Spindle up against the Lubricating Ring and the Valve moved so that the end of Spindle is exactly at the edge of clip, the Valve will be central; then secure clip in this position and put the other clip on the back end of Spindle up against the Lubricating Ring and secure it.

When Valves are centred as above, test by allowing a little steam in the steam chests with the cocks open. If correct, no steam will come out of the Cylinder Release Cocks.

If the Connecting Rod has to be taken down, the Eccentric Arm must not be taken off, but left on to keep the Clamps, which take the place of Connecting Rod big end, on the Crank Pin.

### Broken Valve Spindle.

Disconnect the Radius Rod from the Reversing Arm and Combination Lever and tie up the front end to the Motion Bracket. Take down the Eccentric Rod. Place the Link Block in the centre of the Link and pack **under and over** it, or the Radius Rod with wood packing, which



should be securely wedged or tied in place. Centre the Valve as described above. Disconnect the Combination Link from the Crosshead Arm and tie up Combination Lever and Link close to the cylinder so that it will clear the Crosshead. Take out the Relief Valves from both ends of the cylinder. The engine may then be run with one side.

### Broken Radius Rod.

(1) If broken near the Link:—Take down all pieces of the broken rod, disconnecting them from the Combination Lever, Link Block, and Reversing Arm. Centre the valve and secure it as described above. Disconnect the Combination Link from the Crosshead and tie up the Combination Lever and Link close to the cylinder to be clear of Crosshead. Take out the Relief Valves and run the engine with one side.

(2) If broken near the Combination Lever:—Disconnect the Rod from the Reversing Arm and tie up the front end to the Motion Bracket. Take down the Eccentric Rod. Place the Link Block in the centre of the Link and pack it there securely. Centre the Valve and secure it as described above. Disconnect Combination Link and tie up Combination Lever and Link to the Cylinder clear of the Crosshead. Take out the Relief Valves and run the engine with one side.

### Broken Reversing Arm or Pin.

Detach all broken pieces. Place a block in the **Link under the Link Block** so that the front section of the Radius Rod will be held in the same

①

position in the Link as the one on the other side when the Reversing Gear is at the "Cut Off" that will be worked with, and put a block on top of the Link Block to prevent it from slipping and tie them securely in place. The engine must not be notched up or let out after the positions of the Radius Rods have been matched.

**Broken Lower End of Combination Lever,  
Combination Link, or Crosshead Arm.**

Disconnect Radius Rod from Reversing Arm and Combination Lever and tie up the front end. Take down the Eccentric Rod. Centre the Link Block in the Link and pack it there. Centre the Valve and secure it. Take down Combination Link and secure Combination Lever to the cylinder so that it will clear Crosshead. Take out the Relief Valves and run the engine with one side.

*Take  
down*

(2)

**Broken Eccentric Rod, Pin or Arm or  
Link Foot.**

Take down the Eccentric Rod. Disconnect the Radius Rod from the Reversing Arm. Centre the Link Block in the Link and pack it there securely. Do not remove Eccentric Arm from the Crank Pin.

With the gear fixed in this way the disabled side will do a certain amount of work owing to the motion given to the Valve through the Combination Lever, but care must be taken when making a stop, as should be done when running with one side only, that the crank on the undamaged side is in a good position for starting again.

## Broken Connecting Rod, Piston Rod or Crosshead.

③ Disconnect the Radius Rod from the Reversing Arm and Combination Lever and tie up the front end. Take down the Eccentric Rod. Centre the Link Block in the Link and pack it there securely. Disconnect the Combination Link from the Crosshead Arm. Centre the Valve and secure it. Tie up the Combination Lever and Link to the Cylinder. Take down the Connecting Rod. If the Piston Rod is not broken pull the Crosshead to the back end and block it there. If the Piston Rod is broken remove broken parts and secure Crosshead. Take out the Relief Valves when necessary, and run the engine with one side.

W. M. SHANNON,  
CHIEF MECHANICAL ENGINEER.

4715.8.16

*to be done*

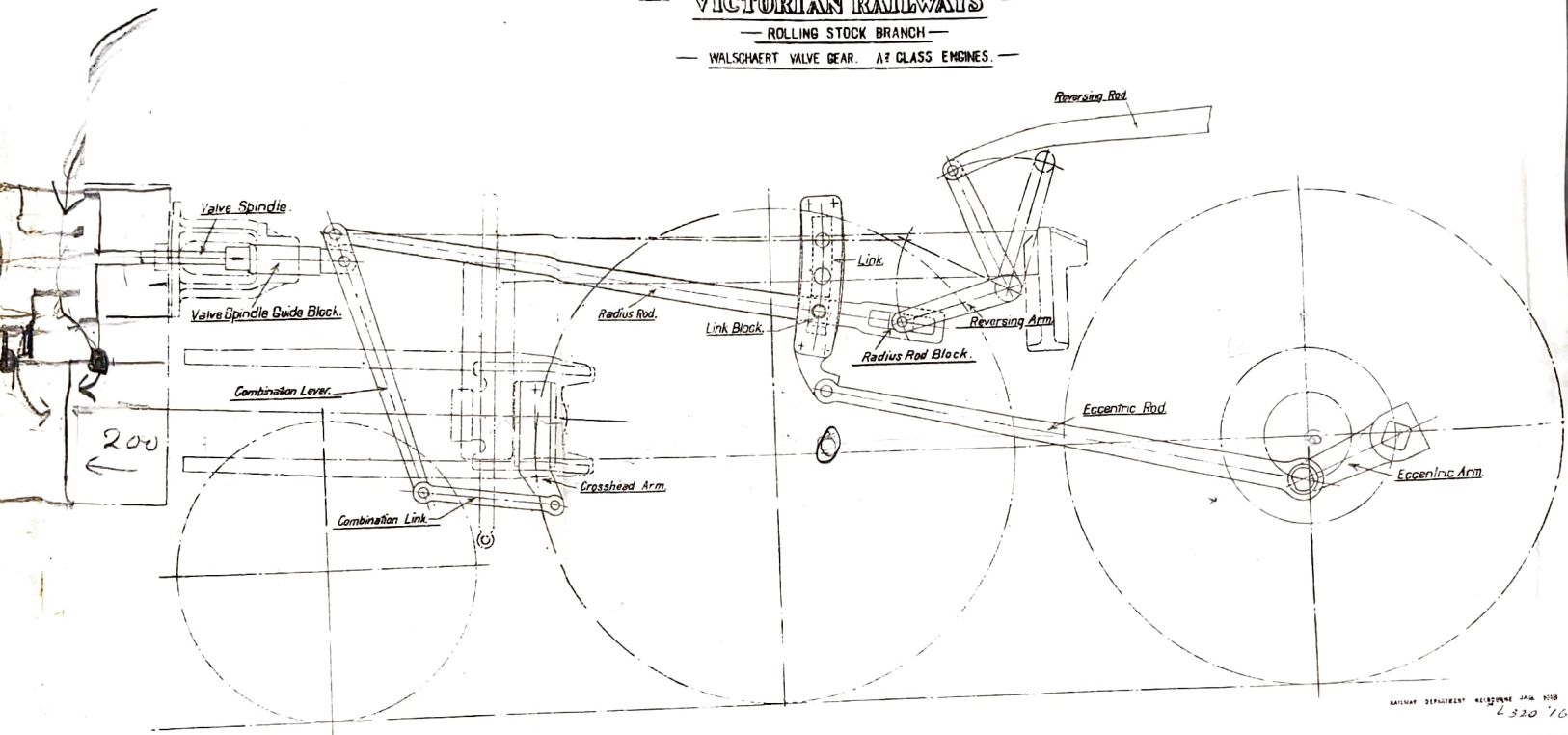
*Speed  
25 M.P.H*



VICTORIAN RAILWAYS

ROLLING STOCK BRANCH

WALSCHAERT VALVE GEAR. A7 CLASS ENGINES.

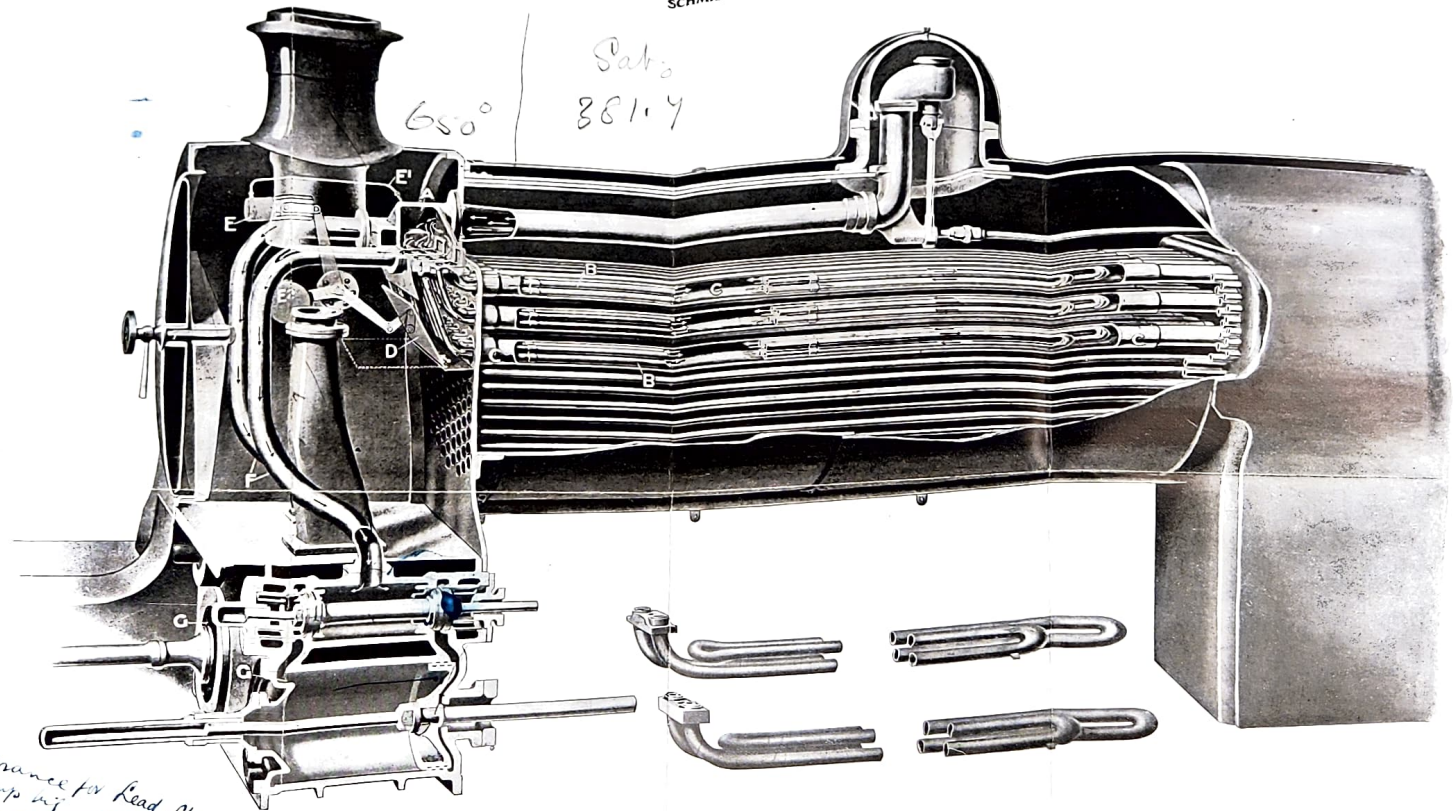


# LOCOMOTIVE SMOKETUBE SUPERHEATER

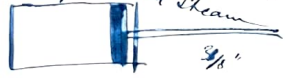
SCHMIDT'S PATENT.

Pat. 381,174

65°



Clearance for Lead Steam  
+ tubes up to 1/2"  
center  
ends



1/4"

# ROBINSON LOCOMOTIVE SMOKETUBE SUPERHEATER

