LOCOMOTIVE MANAGEMENT

INSPECTION, CARE AND MANAGEMENT

The degree of success attained by an enginedriver will depend not only on his ability to handle his locomotive effeciently and economically but also on the care he exercises to ensure that it is kept in good running order. Frequent and thorough inspection of all parts of the locomotive is essential.

In making an inspection, it must be ascertained whether there are any loose joints, bolts or nuts; whether any of the parts are defective through wear and tear and should be renewed; whether any of the parts are missing, and whether the bearings are in such condition as will ensure their running cool during the next trip. By feeling the bearings immediately on arrival at the terminal and before they have had time to cool, their condition in this respect can be determined.

To inspect the locomotive, begin at the back bogie as you come down from the cab. Make a careful examination of the wheels for broken or cracked flanges, cracked spokes or loose tyres. The springs spring hangers, and equalisers and pins should be examined as they sometimes break or the pins work out. The axle box wedges, keep plates, and the axle boxes should be closely examined, as also should the side-rod, connecting-rod, eccentric-rod and motion oil cups to ensure that all are in place. Oil trimmings should also be withdrawn from the syphon-pipes and placed in the oil cups to avoid waste of lubricant. The Westinghouse brake equipment should be examined for possible defects, and if found necessary, the brake travel should be taken up in readiness for the next trip. The draw bar between engine and tender should be checked over to see that it is in good order. ~~The tender~~ wheels, springs, spring hangers and brake rigging should next be carefully examined to ascertain whether they are in good order. The firebox should also be checked for tubes fusible plugs, mis-placed or missing firebars and for leaky stays. The injectors should both be worked to ensure that there are no defects. Steam or air blows or knocks noted while on the road or during examination should be adjusted where possible or booked for attention by the repair staff.

REPORTING DEFECTS

Next in importance to a careful inspection of the locomotive, is the proper booking of any defect requiring attention by the repairs staff. Care should be taken to ensure that all entries are couched in plain and concise language in order that the fitters may be able to locate the defects immediately and effect repairs without loss of time. In many instances, enginedrivers through a lack of complete knowledge of the parts of their locomotive, make entries in the repair journal which entail more time by the repair staff in locating the actual defect, than is taken to make the necessary repair once it has been located. For example, "engine not steaming" is frequently entered in the repair book. With such a vague entry, no one is able to determine where the possible defect, or what the probable cause of the "engine not steaming" may be. If the locomotive is "dead", it is more difficult still as there are no means of even making a test. If the enginedriver, who has been running the locomotive all day, made an entry after carrying out tests and from his own personal observation, made such entries as "tubes blocked","brick arch defective", "superheater elements blowing" or "to be tested," "piston or valve rings to examine " (stating which side), "exhaust to line up" or any other apparent defect, then it is a simple matter for the repair staff to deal with the trouble. Similarly, instead of booking "air compressor not working", book "reversing rod bent", if that is the cause of the compressor failing to work.

The following are several examples of the way to report defects:- "Left hand injector to change. Obstructed steam nozzle." "choke plug, R.H. steam chest, worn too large." "R.H. front cylinder cock to change valve broken." "Line down wedges of R.H.Main driving box." ".L.H. cylinder metallic packing blowing badly." "Brake-pipe connection to distributing valve broken." The above examples should be sufficient to enable the student to fully realise the importance of making specific reference to the type of defect noted and thus enable the fitter to proceed with despatch in the repair of the broken or defective part.

FOAMING AND PRIMING:

FOAMING:

When certain impurities are present in the boiler, they cause the water to foam with the result that suds form on its surface. Foaming may be due to the presence of impurities, such as alkali or soda in excess of grease, or oil, or other substances that result in the formation of suds.

Foaming is always indicated by the rapid falling and rising and frothy appearance of the water in the gauge glass, and generally by water discharging from the funnel. The valves become dry, and jerk and rattle the reverse lever, and in some instances the valves or pistons "groan" and "squeak", showing that the oil has all been washed away from these surfaces and that the parts are dry and cutting.

Foaming affects the correct reading of the gauge glasses and tends to make them indicate too high a level. There is a danger, therefore, that the crown sheet may become overheated, and for this reason it is essential that the truewater level should be ascertained immediately foaming indications appear. To determine the true water level, close regulator slowly; if the water level is high and it remains at the same height when the regulator is closed, it indicates that the boiler has been overfilled rather than that it is foaming. If, however, the water level shows a decided drop when the regulator is closed, the indications are that the boiler is most likely foaming. In this case, open the cylinder cocks, to protect the cylinder covers from possible fracture, place the reverse lever in full gear, then open the regulator "off the face " to keep the train moving, and put on the two injectors if necessary to keep the water level in sight in the gauge glasses. At the first opportunity open the blow-down cock to effect an improvement in the quality of the boiler feed water.

PRIMING

When fine particles of water are carried by the steam from the boiler into the cylinders, the boiler is said to PRIME.

Priming may be caused by;

(1) Insufficient steam space as a result of the water being carried too high
(2) The water foaming
(3) A sudden release of pressure, due to the regulator being opened too quickly or the safety valves blowing off.
(4) Poor circulation of the water in the boiler.

The water next to the heating surface is always the hottest, therefore steam is first generated near the heating surface. This steam forms bubbles, which are prevented from expanding as they rise by the resistance offered by the water. As the bubbles approach the surface, the water exerts less and less resistance to the expansion of these steam bubbles, until, finally, the resistance becomes less than the expansive force, and the bubbles explode and throw small particles of water up into the steam space. When the regulator is open, the steam rushing into the dome tends to carry this water spray with it, just as the wind tends to pick up dust off the ground. The more spray thrown up from the body of the water, or the greater the flow of steam to the dome, the greater will be the tendency to prime. If the water level in the boiler is high, the steam will have a shorter space to raise the spray consequently, the priming will be more apt to increase.

INDICATION OF PRIMING:

The fact that a boiler is priming is indicated by the peculiar flat sound of the exhaust, by water discharging from the funnel, and by the violent boiling of the water in the gauge glasses.

Steam is colourless, invisible gas. The white vapour noticed coming from the exhaust is not steam, but fine water particles formed by steam condensing. Steam occupies the space above the water in the water gauge glass, but since it is invisible, the space appears empty. If the boiler is priming, the space above the water level will appear cloudy, due to the water particles it contains.

EFFECTS OF PRIMING

Priming produces a number of bad effects:-

(1) It washes the oil from the valves and cylinders, thereby causing the reverse lever to work hard and the valves and cylinders to cut.
(2) Power is lost, as it requires additional force to overcome the greater frictional resistance
(3) Wet steam has less expansive power than dry steam, and does not flow so freely. This causes a reduction of initial pressure and increases the back pressure, both of which result in a waste of power.
(4) It endangers the cylinder heads, as water is incompressible.
(5) The hot water carried away with the steam does no useful work, the heat it contains is wasted and being cooler, it condenses the steam with which it comes into contact.

Priming, therefore, is wasteful and should be prevented if possible as it affects the coal and oil consumption very materially and is a potential cause of damage to the cylinder ends and motion gear, particularly so if the locomotive slips whilst the boiler is priming.

As soon as priming is noticed, the cylinder cocks should be opened the regulator eased or closed, the water level reduced and if the safety valves are lifting through excess pressure, the firebox doore should be eased to assist in reducing the boiler steam pressure.

A locomotive which is priming when passing through stations is likely to cause much inconvenience to passengers standing in the vicinity as they are likely to have their clothes damaged by the emission of sooty water ejected from the funnel. The Department in consequence, apart altogether from the loss of the goodwill of the passengers, may also be presented with claims for damage done to clothing etc.

POUNDS:

A pound, as the term is used in connection with the locomotive, is not easily defined, but all experienced enginedrivers recognise it as a very disagreeable jerk, combined with an annoying sound, quite common to the locomotive on the road.

What are generally called pounds are really both knocks and pounds, and the distinction is somewhat indefinite. However, as an aid in distinguishing the difference, it can be stated that a knock is heard while a pound is both heard and felt.

The neglect of a pound or knock may be the cause of much trouble, even to the extent of causing a locomotive failure. For this reason, the enginedriver, should make every endeavour to locate and report the fault so that either he himself or the repair staff, on his return to the depot can take the necessary steps to have the trouble rectified.

An experienced enginedriver can very often locate a pound or a knock, by its own peculiar sound, but even so, his diagnosis may sometimes be at fault. One of the most misleading or deceiving knocks is that caused by a loose piston head. This knock is apt to start suddenly, and is of such a nature as to lead one to believe that there must be an inch of lost motion somewhere, whilst in reality the amount may be the thickness of a tissue paper. This knock is often mistaken for that resulting from a loose wedge, big end brass or crosshead as the noise is similar to that of a crosshead being loose on the piston-rod when passing both centres.

CAUSES OF POUNDING

There are numerous causes of pounds and knocks in a locomotive among the more common of which are improperly adjusted wedges, lost motion between the crosshead and guides and loose or worn driving box brasses.

Other trouble often resulting in a knock or pound are crosshead loose on piston-rod, improper cottering or rod brasses, broken frames, broken or hot driving boxes and improper length of connecting rods. A pound with the steam shut off might indicate a broken strap bolt, "flat" on the tyre, or compression trouble in the cylinder, although the last mentioned defect would cause a knock rather than a pound. Insufficient or faulty lubrication will also often result in a pound.

LOCATION AND REMEDY OF POUNDS AND KNOCKS.

With the use of a little care and judgment, pounds and knocks may be readily located. Some of the usual methods are as follows:-

To test for pounds in the driving boxes, wedges or rod brasses, place the main crank pin on the suspected side on the top quarter. Open the regulator slightly to give steam to the cylinders. The pound, will be readily observed if it is in the driving boxes, wedges or brasses on that side.

If it is not found, test the other side of the locomotive. Of course, in this test, it is necessary to apply the brake and to have the fireman in the cab to operate the reverse lever backwards and forwards, while the enginedriver stands alongside the locomotive to observe the action of the various parts and to locate the pound.

If it is found that the axle has too much play in the boxes or that the trouble is in the driving box or brasses, endeavour should be made to adjust the faulty part at once, while the defect should be reported on arrival at the depot.

In the same manner excessive lost motion between the crosshead and guides may be located. This applies to the guides at the sides as well as the upper and lower guide bars. The same is true of a piston-rod not central between the guide bars, and in this case these parts should be booked to be lined. The driving box wedges, too, should be reported when they have been set up as far as possible, and it is found that the boxes are still loose between the wedges and the hornstays.

To locate a pound in the connecting-rod brass, place the locomotive on the top or bottom quarter on the side to be tested, so as to have the crank between two rigid points, where any lost motion will show before the box moves. Set the brakes, work the lever backwards and forwards; then by watching the brasses, it can easily be discerned if there is any slackness in that quarter.

Side-rod brasses should be booked to be "closed" when they are cottered brass to brass and are pounding on the crank-pin. They should be booked to be "lined" when the cotter has been driven its full length and the brasses do not close together or are too loose in the strap, lengthwise of the rod, in other words, when the cotter

is driven as far as possible and the brasses are working in the strap.

Before commencing to cotter up side-rod, centre coupling and big end brasses, the axle box wedges should be first adjusted. The locomotive should then be placed on the front or back of dead centre and the rod-cutters, slackened back. The centre coupling should be adjusted first, after which all the remaining cotters and the connecting rod wedge should be taken up until the brasses are just free on the pins. The locomotive should then be moved half a revolution to ensure that the crank pins are not oval and thus causing the brasses to be too tight on one centre.

Set screws must be tightened on completion to securely lock the cotters in position.

LOCATING POUNDS: HELPFUL HINTS:

A connecting rod too long or too short pounds most when drifting, with the regulator closed, because the weight of the piston will take up the slack in the connecting rod and its connections and thus cause the piston to strike the head of the cylinder, (front or back according to whether the rod is too long or too short.) To protect the cylinder heads, open the regulator so that steam admitted due to lead will cushion the stroke of the piston and thus take up its lost motion.

A loose piston head or piston rod in the crosshead pounds hardest when working steam as the pins pass the centre. It might be said with regard to the standing test for locating aloose piston head, that as the lever is worked back and forth in the quadrant, the pound will be most noticeable when the lever reaches the front quarter, and will be lighter as it reaches the back quarter. When running under steam, however, the position would be reversed.

A loose cylinder bushing may be located only while the locomotive is in motion and working steam. The pound occurs at each end of the stroke, just before the crank pin passes the centre and generally before it reaches the eighth. This is because the piston rings are expended by the steam against the walls of the bushing and the friction thus created moves the bushing until it strikes the cylinder head.

THE RAGONNET LOCOMOTIVE POWER REVERSE GEAR:

Now that a power reverse gear has become recognised as necessity not only on heavy locomotives, but on lighter power, such as our "C" class locomotives, it will be of interest and instruction to students to devote this portion of the lesson to some consideration of the particular type of air reverse gear installed on our locomotives.

The attention of students is also drawn to the fact that the Instruction Car is now fitted with a model of the Ragonnet Power Reverse Gear which the Brake Inspectors would be pleased to demonstrate and explain to any member seeking information on this locomotive auxiliary.

The Handbook of Instructions on page 49 also details the procedure to be adopted in the event of the power reversing gear failing.

These instructions should be read, therefore, in conjunction with the following description.

THE RAGONNET GEAR.

The Ragonnet reverse gear is of the "floating lever" type, in which the valve is actuated by a rocker, on the outer arm of which hangs the floating lever. The upper end of the floating lever is attached to the reverse lever, while the lower end is connected to and moves with the cross head.

When the handle of the reverse lever is moved forward, the lower pin of the floating lever acts as a fulcrum and the valve is displaced toward the right. The back port thus being opened to pressure and the front port to exhaust, the piston commences its forward movement. If the reverse lever is then notched, the top pin of the floating lever is anchored, and it, in turn, becomes a fulcrum point. The continued movement of the piston then causes the valve to move to the left and thus again closes the ports.

Now, with the lever notched in this position, we will assume that the pull of the valve gear tends to drag the crosshead forward. A slight forward movement causes the valve to be still further displaced towards the left and opens the first admission port to the front end of the cylinder, increasing the pressure on this side of the piston. If the difference of pressure is still insufficient, the valve gear, a further movement exhausts all air from the other side of the piston. A movement of 3/16" of an inch from true central position of the crosshead will thus instantly bring to bear the full pressure of the reverse cylinder, which, with the main reservoir pressure of 95 lb. per. square inch, is sufficient to hold the largest locomotive with dry valves.

On account of the exhaust lap being double the outside lap, ordinary stresses are taken care of without releasing air from the cylinders. This has led to an erroneous conception of the cushioning type of gear. It is sometimes thought that a reverse gear resists the movement of the valve gear by reason of a high balanced pressure on both sides of the piston. Nothing could, however, be further from the fact. The pressure can balance only when there is absolutely no strain on the reverse gear.

It will be readily understood that even though the pressure on each side of the piston is of the same magnitude, the gear would exert no holding power. By way of example suppose five men were trying to push an automobile forward and the same number were exerting the same force to push it in the opposite direction ; an additional man could start it in the direction he might choose to exert his pressure.

The function of the floating lever is to effect an automatic variation of pressures on opposite sides of the piston sufficient to exactly balance the forces acting to displace the piston.

Under normal conditions, the Ragonnet reverse gear, which is located under the running board on the right hand side of the locomotive is operated by air from the main reservoir. In an emergency, the gear may be operated by steam. All that is necessary in this case is to blind the broken air-delivery pipe, uncouple the nipple on the reversing cylinder and then couple up the steam delivery pipe.

If the piston on the air-reversing cylinder seizes, the gear reach-rod, should be removed and the die-block moved with a lever to the required position; and block in position at the crank on the weighbar shaft. If necessary, pressure in the reverse-cylinder may be released by opening the cylinder drain-cocks.

IN SERVICE:

Drain-cocks should be opened and all moisture drained from the cylinders before the locomotive leaves the depot.

All pins and connections are to be freely lubricated at frequent intervals to provide smooth operation.

In the event of the piston sticking at the extremity of the stroke the gland nuts should be slackened back and the gland tapped lightly, when the piston will free itself.

LOCOMOTIVE CORRESPONDENCE COURSE - FIREMEN AND ENGINEDRIVERS

LESSON No. 4 - LIST OF QUESTIONS

1. Describe the operation of the Ragonnet Power Reserve Gear

2. What air pressure operates the power gear on locomotives fitted with the A.6.E.T. brake equipment.

3. If it is necessary to move the locomotive a few yards and no air or steam is available, what procedure would you adopt?

4. If the piston in the air reversing cylinder seizes, what should be done so that the locomotive may be operated?

5. What causes priming, and how would you deal with a locomotive that commenced to prime?

6. What bad effects does priming have on a locomotive?

7. What are some of the causes of pounding on a locomotive?

8. Describe the test you would make to locate the position of any pound or knock on your locomotives?

9. Describe the method of working a Switch-locked Siding on a Double Line.

10. If on a double line, all signals have failed, or all signals and communication have failed and arrangements have not previously been made by the District Traffic Manager, how many trains proceed in Automatic Signalling areas?

11. What are Arrival Signals, where are they found, and how may they be passed at "Stop"?

12. What is the object of the Electric Train Tablet System?

13. What is the enginedrivers' duty in connection with the custody and transference of tablets?

14. Describe Catch, Safety and Trap points and Points Indicators.

15. Give a description of the Walscheart Valve motion.

16. Describe a piston valve.

17. What are springs for and how are they secured to the engine frame ?

18. Why are side-rods necessary on a locomotive ?

19. What is meant when we speak of the tractive effort of a locomotive ?

20. What is the purpose of the eccentric-rod and to what is it coupled on a locomotive fitted with Walscheart motion ?

21. What is a snifting valve and where located ?

22. Give a brief description of a locomotive boiler.