M.R.O. 1—77,000—8-6-37.

(1) Number of pages _____

(2) Date of repair _____

(3) Initials of the Referencer _____

MADRAS RECORD OFFICE.

Government of Madras.

Public works DEPARTMENT.

G.O. No. 1988-89 Press Mis.-
496-97

Dated 29-7- 1897

Not to be folded or roughly handled

Proceedings of the Madras Government, Public Works Department.
29th July 1871.

No. 496. Read the following letter from the Acting Consulting Engineer for Railways, to the Secretary to Government, Public Works Department, dated Madras, 11th July 1871, No. 308 :—

I HAVE the honour to submit papers from the Agents of the Railway Companies, on the subject of examining and testing the boilers of locomotive engines with reference to G. O., No. 747, of the 9th March 1870.

Agent, Madras Railway, No. 399, dated 5th July 1871.
Locomotive Superintendent, Great Southern Railway, No. 221, 29th March 1870, and 23rd September 1870.
Locomotive Superintendent, Carnatic Railway, dated 5th August 1870, No. 348-70.

2. There is a general disinclination to having a set of fixed rules, the Locomotive Superintendents considering that much must be left to discretion in weighing the special circumstances of the work done by an engine, the quality of water, etc., and Mr. Bruce, in his letter of the 18th October 1869, to the Secretary to the Great Southern of India Railway, writes regarding the dismantling of an engine at certain fixed times: "you cannot lay down rigid rules of the kind adverted to, without relieving both the drivers and Locomotive Superintendents of the responsibility which fairly rests upon them to exercise care and judgment in the discharge of this part of their duty."

3. The practice on the Madras Railway is thus described :—

I. Each driver examines his safety valves once a month and signs a book to that effect.

II. After every trip, the driver enters in a book whether his engine is in good order or otherwise.

III. When an engine has run over 100,000 miles a careful watch is kept, and the test pump is applied. If there is any suspicion of a defect, the tubes are taken out, the boiler is examined, and any necessary repairs are executed. The engine is then allowed to run again 100,000 miles or more, after which the inside fire-box is taken out, and the boiler and outside case of the fire-box are examined internally, in order that any requisite repairs may be made.

IV. It being generally found on internal examination of boilers that grooving has commenced after a certain time, the parts of the boiler where this takes place are therefore examined, when thought necessary, by means of drilling holes through the plates, and gauging their thickness at the suspected points.

In April 1864 instructions were issued to the Foreman Boiler Smith to the following effect :—

V. All fire-boxes and boilers, tubes, etc., throughout the line are to be inspected once in six* months personally, and with great care by the Foreman Boiler Smith, in addition to the ordinary inspections made by Foremen and workmen.

* Mr. Wright now thinks once a year sufficient.

VI. The results of these inspections are to be entered in a book, and an attested copy to be kept in the Locomotive Superintendent's Office.

VII. The hydraulic test pump is to be taken by the Foreman Boiler Smith on these periodical inspections, and applied whenever it is considered desirable.

4. Mr. Wright considers that the testing of boilers by hydraulic pressure is a valuable means of ascertaining defects, but gives no indication of the commencement of grooving and honey-combing. A thorough internal and external examination of boilers and fire-boxes is preferable to any test; but as the duration of tubes is less than that of the boilers, an engine is not, as a rule, dismantled till the tubes require renewal.

5. The practice on the Great Southern of India Railway, as explained in the two letters from the Locomotive Superintendent, is much the same as on the Madras Railway.

6. The clauses which I have numbered I. to VII. may be considered as a draft of rules to be generally applicable without in any way restricting the Locomotive Superintendent from exercising his judgment, as heretofore, with regard to further precautions and examinations.

7. As to the interval between periodical inspections in Clause V., I would recommend that it should be "not more than one year;" and if on the Great Southern of India Railway there is no travelling Foreman Boiler Smith, the inspections, as per Clauses V., VI. and VII., can be made and recorded by the engines being brought to the head-quarter's shops at Negapatam.

8. The same rules may, if approved by the Government, be brought into effect on the Carnatic Railway, when the line is constructed to Cuddalore.

From the Acting Agent and Manager of the Madras Railway Company, to the Acting Consulting Engineer for Railways, dated Madras, 5th July 1871, No. 399.

With reference to Major Shaw-Stewart's letter No. 126, of the 14th March 1870, I have the honour to forward herewith the copy of a communication* from the Locomotive Superintendent in which he expresses his opinion, in which I concur that it would be practically impossible to frame absolute rules as to the examination and testing of locomotive boilers.

* No. 185, dated 1st July 1871.

2. Mr. Wright, however, fully explains the practice on the Madras Railway and the general regulations in force for the prevention of accidents by the bursting of boilers, and this, I hope, will be sufficient for the purpose required.

3. I have the honour to return, as requested, the printed correspondence which accompanied Major Shaw-Stewart's letter.

From W. B. WRIGHT, Esq., Locomotive Superintendent, to the Acting Agent and Manager of the Madras Railway, dated Perambore Works, 1st July 1870, No. 185.

Referring to the correspondence noted in the margin, I have now the pleasure to submit my views with regard to the testing of locomotive boilers.

Letter from Agent and Manager, No. 893, 15th March 1870.
" from Consulting Engineer, " 126, 14th do. "
" Order of Government, " 747, 9th do "
Letter from Agent and Manager, " 1,120, 6th April "
" to Agent and Manager, " 100, 7th do. "
" from Agent and Manager, " 4,174, 10th Nov. "
" from Board, No. 460, 30th Sept 1870, para. 14, "
" from Agent and Manager, No. 256, 21st Jan. 1871.

2. I am of opinion that it would be practically impossible to frame absolute rules as to the examination and testing of locomotive boilers, as so many points have to be taken into consideration in weighing the different and varying circumstances under which engines necessarily must work.

3. The practice on this line is for each driver to examine his safety valves once a month, and to sign a book to that effect. This examination is recorded in a return sent in to my office once a month by each Locomotive Foreman, from which the office register is compiled.

4. After every trip the driver, on returning to his station, reports in a book kept for the purpose, if his engine is all right or otherwise, and on his watchfulness and that of his Foreman chiefly depends the discovery of any sign of defect in the boiler, fire-box, or tubes.

5. The general practice regarding the examination and testing of boilers on this line is as follows.

6. That as soon as one of each class or type of engines has run over 100,000 miles she is carefully watched and the test-pump applied. If there is the slightest suspicion of any defect the tubes are taken out and the boiler thoroughly examined; any repairs that may be necessary are executed, and the engine is allowed to run a second 100,000 miles or more according to circumstances, when the tubes are again removed, the inside fire-box taken out, and the boiler and outside casing of fire-box thoroughly examined internally, and, if necessary, repaired.

7. The state in which the boiler and fire-box thus examined is found is taken as a guide to the state of other engines of the same class, due consideration being given to other circumstances, such as the work done, quality of water, etc., etc., in each case.

8. Taking these preliminary examinations and tests as bases for our guidance, the engines have run from 103,000 to 164,000 miles before the tubes have been removed and a thorough internal examination of the boiler has been made, the average mileage of each engine before such examination being 134,000 miles.

9. On the 22nd April 1864 I issued the following written instructions to the Foreman Boiler Smith:—

"It is my intention to have a periodical inspection of all fire-boxes and boilers, tubes, etc., "throughout the line once in every six months, in addition to the ordinary inspections which are "made by the Foremen and workmen of out-stations.

"These periodical inspections must be conducted with great care and must be made by you "personally.

"You must enter the results of the inspection of each boiler in a book which will be supplied "to you for that purpose, and your observations must be copied out into a book which must be "kept in my office and attested by you.

"You will examine all stationary engine boilers at out-stations during your periodical "inspections, but you will continue to examine the Perambore and Royapooram stationary boilers "once a month.

"You can leave Madras for this purpose on Monday next, 25th instant, visiting successively, "Tripatore, Salem, Coimbatore, Palghaut, and Beypore stations.

"On your return to Madras I will arrange for your examining the engines working on the "North-West Line."

10. On such inspections the Foreman Boiler Smith takes with him one of the hydraulic test-pumps and applies it in all cases where it may be considered desirable.

11. As I think that one such general inspection in the year is sufficient, I propose that it shall hereafter be made annually instead of every six months.

12. The test-pump is always employed to test the boilers after repairs. The plan of filling the boilers quite full of water and then heating the water up to the required pressure referred to by Mr. Bruce* and approved of by some of the Locomotive Superintendents of Indian Railways, is, in my opinion, preferable to the cold-water test; but the chief objection to it is that the inside fire-box cannot under such circumstances be properly examined.

* *Vide* enclosure to Circular No. 3, from Government of India, Public Works Department, dated 17th February 1870, referred to in order of Madras Government, No. 747, of 9th March 1870.

13. To render the conditions of the fire-box and boiler as nearly as possible similar to those under which the engine would work, the boiler might be filled quite full, the fire lighted, and the test-pressure attained, care being taken that the temperature never rises to that point which would generate steam.

14. After an examination of the boiler and outside casing of fire-box, the fire might be drawn, and, as soon as the temperature is sufficiently reduced to admit of a man going into the fire-box,

the test-pump might be applied and the examination of the inside box then made. I have ordered a trial of this system.

15. The testing of boilers by hydraulic pressure is, I consider, a most valuable means of ascertaining defects. Its application at once indicates the position of broken stays in the water-spaces of the fire-boxes, as the copper commences to bulge out under the pressure, and thin or defective tubes collapse; but as regards boilers and outside casings of fire-boxes, although the hydraulic test may indicate that a pressure considerably greater than the working pressure may be borne, it affords no means of ascertaining incipient internal defects, such as grooving, honey-combing, etc., defects which, though probably slight at the time of testing, may rapidly develope into sources of danger.

16. A thorough internal and external examination of boilers and fire-boxes is preferable to any test, but the fact that experience shows that in general practice boilers and fire-boxes are much longer lived than the tubes, renders a Locomotive Superintendent unwilling, as a rule, to dismantle an engine for the purpose of examination until the tubes require removal.

17. Grooving or furrowing of plates is perhaps the greatest source of danger to guard against; most of our boilers being constructed with lop-rivetted seams, it is generally found, on internal examination, that after a certain time this evil has commenced, but, as this action is understood, the parts of the boilers where it takes place are examined, when thought necessary, by means of drilling holes through the plates, and gauging their thickness at the suspected points.

18. I trust that this report, taken in conjunction with Mr. Collinson's letter No. 76, dated 23rd April 1869, to your address, and my letter, dated London, 6th September 1870, to the Secretary of this Company, may be found to furnish all the information required on the subject of the practice of testing and examining boilers on this line.

From the Locomotive and Carriage Superintendent, to W. S. BETTS, Esq., Great Southern of India Railway, dated Negapatam, 29th March 1870, No. 221.

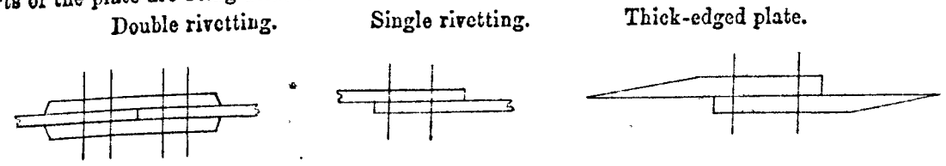
YOUR No. 1,297 and Consulting Engineer's No. 125 with printed form returned. The rules in force upon this line, in view of securing a thorough examination of boilers, are as follow:—

2. Every engine when in the shop for repair is overhauled and examined by the Locomotive Foreman, he tapping the seaming all round to ascertain the condition of the boiler plate, and if the slightest suspicion is held of the goodness of the metal, a hole is drilled in the plate to ascertain its exact thickness. When an engine's three lower rows of tubes require any renewal at any time during her working the remainder are removed and the boiler examined. When an engine comes in for new tubes she is thoroughly examined inside and out. Engines having undergone repair are tested by hydraulic test before the logging is replaced, up to 50 per cent. in all cases, but in suspicious cases to more than that. Every engine is examined by the Locomotive Foreman daily before leaving the shed for her train, the correct working of her safety valves and their pressure being ascertained. Drivers report daily in the running-shed book any defects, to which the Foreman sees before they leave the shed again. Engines under five years' service I consider new; after that they require more careful watching.

3. Engines Nos. 1 to 9 have been running nine years, their original working pressure was 120 lbs. per square inch; they are now working at 90 lbs. per square inch. Nos. 10 and 11 engines (ballast) have been working four years, original pressure 100 lbs. per square inch; now working at 80 lbs. per square inch. Engines Nos. 12, 13, 14, and 15 have been working three and four years; working pressure 120 lbs. per square inch. Engines Nos. 16 and 17 have been working eighteen months; pressure 120.

4. Mr. Bruce concurs in my views regarding the treatment of boilers and in deprecating an enforced removal of tubes unless under suspicion. If the Government give an order to carry this out I shall of course proceed to do it, as it would relieve me of the onus of greatly increased working expenditure which, as it is opposed to the best English practice, I consider unnecessary. All our engines are in a thoroughly trustworthy condition. The reduction of pressure of Nos. 1 to 9 is only a precautionary measure, the boilers and boxes being to all appearance, after careful examination, nearly as sound as when new. I am fixing a locked safety-valve to all our engines.

5. Regarding the concluding paragraphs of Colonel Hyde's letter. Double rivetting is resorted to only in view of increased strength for very high pressure, the proportion of strength of a double rivetted joint to a single rivetted one being as 9 to 7 of the strength of the solid plate. Double rivetting does not, in my opinion, ensure safety against corrosion, as boilers rarely or never go at the joints; but on either side where the sediment encrusts, the inside ring of a double rivetted shell gives two holes for lodgment, instead of *one*, in the single rivetted plate; hence two parts of the plate are being attacked at the same time.



6. The thickened plates to which I referred in my former letter are so constructed to anticipate a weakening of the plate at the point where corrosion always thins it. The heavy goods engines of the London, North-Western, and Great Northern working up to a pressure of 150 lbs are double-rivetted to ensure strength at the joints. In this country 120 per square inch is the maximum working pressure I fancy, in which case the single joint is quite strong enough. I am, as I have already said, putting lock-valves on our engines.

7. I have never seen a recording steam gauge; if such a thing be made it would be in a measure a check against loading the valve levers, as some drivers are apt to do if pressed by an excessive load. I have never had a case of this kind brought to my notice here. It would, of course, be severely dealt with. If the Traffic Departments of Railways would not endeavour to put on loads for traffic sake beyond the economical safe tractive power of the engines, drivers would have no excuse or cause for straining their engines.

From the same officer, dated Negapatam, 23rd September 1870.

Testing Boilers.

YOUR No. 9,549-3,491.—We have no actual code of rules upon this subject. The whole matter is so simple, and the Foremen intuitively understand the conditions so well that there is no need for rules for their guidance. The following are the general conditions and known rules upon which the treatment of locomotive boilers are based:—

1. When an engine comes in for repair she is invariably overhauled and tested by hydraulic pressure.

2. Entries are made in the shed book of the engines condition, both boiler and gear. If any doubt exists of a boiler plate it is drilled through to ascertain its exact condition.

3. Drivers noting any leakage, etc., report at once to their Foreman, who stops the engine and examines her.

4. Engines in a doubtful state (of which I am glad to say there are none) would be very carefully watched and on the first opportunity taken into the shops and made good.

I may mention that some of our engines (Nos. 1 to 9) have been at work ten years. I have myself examined some of them with the tubes out, and the plates are nearly as good as they were when put together. I am quite alive to the need of care and supervision in this matter as much for the preservation of life and limb as of Company's property, and all precautions are taken to detect imperfections and insure security. A faulty plate is beyond any control, and excepting this I am of opinion that our engines' boilers are in as thorough a state of soundness as they can be.

From the Locomotive Superintendent of the Carnatic Railway, to the Secretaries and Agents of the Carnatic Railway Company, dated Arconum, 5th August 1870, No. 348-70.

THE following is the system I intend to adopt for the examination of locomotives and testing the boilers:—

I. The safety valves to be examined and spring balances adjusted once a month, when the fire-boxes, tubes, and boiler fittings will be carefully inspected, and anything found defective put right.

II. As the mileage performed by our engines is so small, I do not think it advisable to test the boilers more than once in eighteen months or two years, and this would consist of the outside being well cleaned and examined, and the boiler filled with water which will be heated to 40 or 50 lbs. per square inch above the usual working pressure, or with a force pump.

2. I do not consider an external inspection sufficient; to make the examination complete the locomotives should be thoroughly overhauled inside as well; but this operation would necessitate the tubes being removed, and be attended with great expense; as our engines, however, have scarcely run 40,000 miles each, and the tubes appear perfectly sound, there is no necessity for it at present; when the tubes are burnt or begin to show indications of wear and tear and have to be renewed, the time will then have arrived for an internal inspection of the boilers.

No. 497. ORDER THEREON, 29th July 1871, No. 1,988.

RAILWAY, No. 56.

ON a consideration of these papers the Government are of opinion that the precautions which are adopted on the Railways in this Presidency for the examination and testing of boilers of locomotive engines are sufficient to ensure their being maintained in efficient working order, and with a view to give effect to the orders of the Government of India of the 17th February 1870, No. 3, His Excellency the Governor in Council resolves to approve of the rules based on existing practice, as embodied in paragraph 3 of the Consulting Engineer's letter with the modifications suggested in paragraph 6, which will then be communicated to the several Railway Companies, with an intimation that the Government are of opinion that the construction of a simple code of rules based on existing practice cannot be considered objectionable, and with the understanding that the rules will not divest Locomotive Superintendents of the responsibility which rests with them to exercise as heretofore their discretion in all cases which the rules may not sufficiently provide for. The officers of each Company will then be requested either to accept the rules as now drafted or to modify them, and bring them into force immediately.

2. These rules will only apply to the Carnatic Railway after its extension to Cuddalore has been completed.

(True Extract.)

(Signed) A. deC. SCOTT, Captain, R.E.,
Under Secretary to Government.

No. 498. DOCKET No. 1,989, dated 29th July 1871.

COPY of the above forwarded to the Government of India, with reference to their letter, dated 17th February 1870, No. 3.

(True Extract.)

Captain, R.E.,
Under Secretary to Government.

Exd. E. C. Shunker.

CONSULTING ENGINEER'S OFFICE.

Railway Department.

No. 308.

From Major H. L. Prendergast RE
Acting Consulting Engineer for Railways,

To Colonel S. Carpendale RE
Secretary to Government,
Public Works Department,
Fort Saint George.

Sir,

I have the honour to submit papers from the Agents of the Railway Companies, on the subject of examining and testing the boilers of locomotive engines with reference to G.O. No. 747 of the 9th March 1870.

Agent. Madras 399. 5th July 1871.
Loco. Supdt. G.S. 221. 29th March 1870.
& dated 23rd Sept. 1870
Supdt. Carnatic 5th August 1870.

2. There is a general disinclination to having a set of fixed rules

rules; the Locomotive Superintendents considering that much must be left to discretion in weighing the special circumstances of the work done by an engine, the quality of water &c.; and Mr. Bruce in his letter of the 18th October 1869, to the Secretary to the Great Southern of India Railway, writes, regarding the dismantling of an engine at certain fixed times, "You cannot lay down rigid rules of the kind adverted to, without relieving both the drivers, and Locomotive Superintendents of the responsibility which fairly rests upon them to exercise care and judgment, in the discharge of this part of their duty."

The practice on the Madras Railway is thus described.

I. Each driver examines his safety valves once a month, and signs a book to that effect.

II. After every trip, the Driver enters in a book whether his Engine is in good order or otherwise.

III. When an Engine has run over 100000 miles a careful watch is kept, and the test pump is applied. If there is any suspicion of a defect, the tubes are taken out, the

the boilers is examined, and any necessary repairs are executed. The Engine is then allowed to run again 100,000 miles or more, after which the inside firebox is taken out, and the boilers and outside case of the firebox are examined internally, in order that any requisite repairs may be made.

IV. It being generally found on internal examination of boilers, that grooving has commenced after a certain time; the parts of the boiler where this takes place, are therefore examined when thought

thought necessary, by means of drilling holes through the plates and guaging their thickness at the suspected points.

V. In April 1864 instructions were issued to the Foreman Boiler Smith to the following effect.

All fireboxes and Boilers Tubes &c. throughout the line, are to be inspected once in 6 months, personally, and with great care, by the Foreman boiler smith, in addition to the ordinary inspections made by Foremen and workmen.

VI. The

* All rights now think ours & yours sufficient.

VI. The results of these inspections are to be entered in a book, and an attested copy to be kept in the Locomotive Superintendents office.

VII. The hydraulic test pump is to be taken by the Foreman Boiler Smith on these periodical inspections, and applied, whenever it is considered desirable.

4. Mr. Wright considers that the testing of boilers by hydraulic pressure is a valuable means of ascertaining defects, but gives no indication of the commencement of grooving and honey combing. A thorough internal and external examination of boilers and fireboxes is preferable to any test; but as the duration of tubes is less than that of the boilers, an engine is not as a rule dismantled, till the tubes require renewal.

5. The practice on the Great Southern of India Railway, as explained in the 2 letters from the Locomotive Superintendent, is much the same as on the Madras Railway.

6. The clauses which I have numbered I to VII, may be considered as

as a draft of rules, to be generally applicable, without in any way restricting the Locomotive Superintendent, from exercising his judgment, as heretofore, with regard to further precautions and examinations.

As to the interval between periodical inspections in Clause V, I would recommend that it should be not more than 1 year; and if on the Great Southern of India Railway, there is no travelling Foreman Boiler Smith, the inspections as per clauses V, VI and VII, can be made and recorded by the Engines being

brought

brought to the Head Quarters shops at Negapatam.

The same rules may, if approved by the Government, be brought into effect on the Carnatic Railway, when the line is constructed to Cuddalore.

I have the honour to be

Sir

Your most obedient servant

Madras
11th July 1871

Lieut Col Major RE
Ag. Cons. Engr for Railways.

No. 399

9.5.2.6

MADRAS RAILWAY.

AGENT AND MANAGER'S OFFICE.

Madras, 5th July 1871.

From

Beresford Anderson Esqre
Ag. Agent and Manager. M. R. Co.

To

Major H. L. Prendergast C.R.E.
Ag. Consulting Engineer for Railways.

Sir,

No. 185-87
1st July 71

With reference to Major Shaw Stewart's letter No 126 of the 14th March 1870, I have the honor to forward herewith the copy of a communication from the Locomotive Superintendent in which he expresses his opinion, in which I concur, that it would be practically impossible to frame absolute Rules as to the examination and testing of Locomotive Boilers.

2. Mr Wright however fully explains the practice on the Madras Railway and the general Regulations in force for the prevention of accidents by the bursting of boilers, and this I hope will be sufficient for the purpose required.

3. I have the honor to return as requested the printed correspondence which accompanied Major Shaw Stewart's letter.

I have the honor to be
Sir
Your most obedient Servant
Beresford Anderson
Ag. Agent & Manager.

Rec'd at Simla 22nd July 1871

No. 1871
Railway Department.

From

The Consulting Engineer for Railways,

No. 3349 C.R.E.

To

The Secretary to Government,
P. W. Department,
Fort St. George.

Dated 14th July 1871
Received 17th July 1871

No. 399-
Rails: S. I.
Submitting
Replies from the Agents
the Railway Companies
to the enquiries
regarding the practice
of testing the Boilers of
Locomotive Engines.

Simla 17th July 1871

21387

MADRAS RAILWAY.

From

The Agent and Manager.

To

The Consulting Engineer

for Railways.

Dated 5th July 1871
Rec'd 6th " "

No. 399.

Forwarding Copy of a Report from the Locomotive Superintendent on the subject of the Performance and Working of Engines

Mardeen Railway
Loco. Superintendents Office
Perambone works 1st July 1871

No 185.

To

The Acting Agent and Manager,

Dear Sir,

Referring to the correspondence noted in the margin, I have now the pleasure to submit my views with regard to the testing of Locomotive Boilers.

Letter from Agent & Manager	893	15th March	1870
" from Consulting Engineer	126	14th — do —	"
Order of Government	747	9th — do —	"
Letter from agent & Manager	1120	6th April	— "
" to agent & Manager	100	7th — do	— "
" from agent & Manager	4174	10th Nov	— "
" from Board	460	30th Septr	— "
" from agent & Manager	256	June 14	
		21st January	1871

2. I am of opinion that it would be practically impossible to frame absolute rules as to the Examination and testing of Locomotive Boilers, as so many points have to be taken into consideration in weighing the different and varying circumstances under which Engines necessarily must work.

3. The practice on this line is for each Driver to examine his safety valves once a month, and to sign a book to that effect. This examination is recorded in a Return sent in to my Office once a month by each Locomotive Foreman, from which the Office Register is compiled.

4. After every trip the Driver, on returning to his station, reports in a book kept for the purpose, if his Engine is all right or otherwise, and on his watchfulness and that of his Foreman chiefly depends the discovery of any sign of defect in the Boiler

Firebox, or tubes.

5. The general practice regarding the examination and testing of Boilers on this Line is as follows.

6. That as soon as one of each class or type of Engines has run over 100000 miles, she is carefully watched and the test-pump applied. If there is the slightest suspicion of any defect the Tubes are taken out and the Boiler thoroughly examined; any repairs that may be necessary are executed, and the Engine is allowed to run a second 100000 miles or more according to circumstances, when the Tubes are again removed, the inside Firebox taken out, and the Boiler and outside casing of Firebox thoroughly examined internally, and if necessary repaired.

7. The state in which the Boiler and Firebox thus examined is found is taken as a guide to the state of other Engines of the same Class, due consideration being given to other circumstances - such as the work done, quality of water &c &c in each case.

8. Taking these preliminary examinations and tests as a basis for our guidance, the Engines have run from 108000 to 164000 miles before the Tubes have been removed and a thorough internal examination of the Boiler has been made, the average mileage of each Engine before such examination being 134000 miles.

On the 22nd April 1864 I issued the following written instructions to the Foreman Boiler Smiths.

"It is my intention to have a periodical inspection of all Fireboxes and "Boilers, Tubes, &c throughout the Line "once in every six months, in addition to the "ordinary inspections which are made by the "Foremen and Workmen of out-stations.

"These periodical inspections must "be conducted with great care and must "be made by you personally.

"You must enter the results of the "inspection of each Boiler in a Book which "will be supplied to you for that purpose, "and your observations must be copied "out into a Book which must be kept "in my Office and attested by you.

"You will examine all Stationary "Engine Boilers at out-stations during "your periodical inspections but you "will continue to examine the Perambers "and Repairmen Stationary Boilers "once a month.

"You can leave Madras for "this purpose on Monday next, 25th "Instant, visiting successively, "Tripatore, Salem, Coimbatore, Palghaut "and Beypore Stations.

"On your return to Madras "I will arrange for your examining "the Engines working on the North West "Line."

10. On such inspections the Foreman

Boiler Smith takes with him one of the hydraulic test-pumps and applies it in all cases where it may be considered desirable.

11. As I think that one such general inspection in the year is sufficient, I propose that it shall hereafter be made annually instead of six-monthly.

12. The test-pump is always employed to test the Boilers after repairs. The plan of filling the Boiler quite full of water and then heating the water up to the required pressure referred to, Mr. Bruce and approved of by some of the Locomotive Superintendents of Indian Railways is, in my opinion, preferable to the cold-water test, but the chief objection to it is that the inside Firebox cannot under such circumstances be properly examined.

13. To render the conditions of the Firebox and Boiler as nearly as possible similar to those under which the Engine would work, the Boiler might be filled quite full, the fire lighted, and the test-pressure attained, care being taken that the temperature never rises to that point which would generate steam.

14. After an examination of the Boiler and outside casing of Firebox, the fire might be drawn, and, as soon as the temperature is sufficiently reduced to admit of a man going into the Firebox, the test-pump might be applied and the examination of the inside box then made. I have ordered a trial of this system.

Side-enclosure to Circular No 3 from Govt of India P.W.D. dated 17 Feb 1870 referred to in Order of Madras Government No. 747 of 9th March 1870.

15. The testing of Boilers by hydraulic pressure is, I consider, a most valuable means of ascertaining defects. Its application at once indicates the position of broken stays in the water-spaces of the Fireboxes, or the copper commences to bulge out under the pressure and thin or defective tubes collapse, but as regards Boilers and outside casings of Fireboxes, although the hydraulic test may indicate that a pressure considerably greater than the working pressure may be borne, it affords no means of ascertaining incipient internal defects, such as grooving, honeycombing &c., defects which though probably slight at the time of testing may rapidly develop into sources of danger.

16. A thorough internal and external examination of Boilers and Fireboxes is preferable to any test, but the fact that experience shows that in general practice Boilers and Fireboxes are much longer lived than the tubes, renders a Locomotive Superintendent unwilling, as a rule, to dismantle an Engine for the purpose of examination until the tubes require removal.

17. Grooving or furrowing of plates is perhaps the greatest source

Great Southern of India Railway
Locomotive and Carr Supt.s Office
Negapatam September 23rd 1870.

F. S. Bells Esqr
My Dear Sir,

Your No 9569 / 3491 Testing Boilers

We have no actual code of Rules upon this subject. The whole matter is so simple and the Foreman intuitively understands the conditions so well that there is no need for rules for their guidance. The following are the General conditions and known rules upon which the treatment of Locomotive Boilers are based.

1 When an Engine comes in for repair she is invariably overhauled and tested by hydraulic pressure.

2 Entries are made in the check books of the Engines condition both boiler and gear. If any doubt exists of a boilers plate it is drilled through to ascertain its exact condition.

3 Drivers noting any leakage to report advance to their Foreman who stops the Engine and examines her.

4 Engines in a doubtful state (of which I am glad to say there are none) would be very carefully watched and on the first opportunity taken into the shops and made good.

I may mention that some of our Engines Nos 1 to 9 have been at work 10 years I have my self examined some of them with the tubes out and the plates are nearly as good as they were when put together. I am quite alive to the need of Care and supervision in this matter as much for the preservation of life and limb as of

Company's

of danger to guard against; most of our Boilers being constructed with Lap-riveted seams, it is generally found, on internal examination, that after a certain time this ends has commenced, but, as this action is understood, the parts of the Boilers where it takes place are examined when thought necessary by means of drilling holes through the plates and gauging their thickness at the suspected points.

18. I trust that this Report taken in conjunction with Mr Collinson's letter No 76 dated 28 April 1869 to your address, and my letter dated London 6th September 1870, to the Secretary of this Company may be found to furnish all the information required on the subject of the practice of testing and examining Boilers on this Line.

Yours faithfully,
(Sd) W. Barlow Wright
Loco. Superintendent.

True Copy //

Bousfield Anderson
Acting Agent & Manager.

Company's

Company's property, and all precautions are taken to detect imperfections and insure security. A faulty plate is beyond any control, and even expressing this Law of opinion that our Engines boilers are in as thorough a state of soundness as they can be.

Yours truly
Geo. Forrest & Co. Engineers.

True copy.
Russell Shearer
Clerk

P. Dr. 33 8/71

Carnatic Railway Company
Arconum 5th August 1870.

Sec. 8/8/70

Messrs. Arbuthnot & Co.
Secretaries and Agents
Madras.

Dear Sirs

The following is the system I intend to adopt for the examination of Locomotives and testing the Boilers.

I The safety valves to be examined and spring balances adjusted once a month; when the Fire boxes, tubes and boiler fittings will be carefully inspected and any thing found defective put right.

II As the Mileage performed by our Engines is so small, I do not think it advisable to test the Boilers more than once in 18 months or 2 years, and this would consist of the outside being well cleaned and examined, and the boiler filled with water which will be heated to 40 or 50 lbs per □" above the usual working pressure, or with the force pumps.

I do not consider an external inspection sufficient to make the examination complete the Locomotives should be thoroughly overhauled inside as well; but this operation would necessitate the tubes being removed, and be attended with great expence; as our Engines however have scarcely seen 40,000 miles each and the tubes appear perfectly sound, there is no necessity for it at present; when the tubes are burnt or begin to show indications of wear and tear, and have to be renewed, the time will then have arrived for an internal inspection of the Boilers.

Yours faithfully
(Signed) A. Leasteir
Supt.

(True Copy)
Russell Shearer
Secretaries and Agents

P W Dept

No 1988.

Proceedings of the Madras Government
Under date the 29th July 1871
Read the following

From the Consulting Engineer
for Railways, No 308 dated 11th July 1871

On a consideration
of these papers the Govt
are of opinion that the
precautions which are
adopted on the Railways
in this Presidency for
the examination and
testing of Boilers of loco-
motive Engines are suf-
ficient to
ensure their being main-
tained in efficient work-
ing order and with a
view to give effect to
the orders of the Govt

Govt. India of the 17th Feby. 1870
No. 3 His Excellency the
Governor in Council
receives the approval of the
rules based on existing
practice as embodied in
para 3 of the Comptroller
Inspectors letter with the
modifications suggested
in Para 6 which will
then be communicated
to the several Railway
Companies with an intimation that the Govt.
are of opinion that the
construction of a simple
code of rules based on
existing practice cannot
be considered objectionable
and with the understanding

that the rules will make
direct Inspecting Superintendents of the respective
Lines which have with them
be exercise as heretofore
their discretion in all
cases which the rules may
not sufficiently provide
for. The Officers of each
Company will then be
requested either to ac-
cept the rules as proposed or to modify them
and bring them into force
immediately.

These rules will
only apply to the Sonthe
Railway after its extension
to Cuddalore has been
completed.

25

H. Rivers Thomas Esqrs &c
Despr. 31st 1870

Docket No 1989 of 29 July/11

Copy of the above forwarded to the Govt of India with Reference to their letter dated 17 Feby/10, No 3.

Copies

617 2nd/11 CR. 19

C/2349

Govt of India Works.

PUBLIC WORKS.

Re Cdg Consulting Engr for Railways and The Secretary to the Govt of India

29 July 1988-1989.

Nos. 496-497 & 498

Rec. Replying to letter No [illegible] from the Engineer for submitting papers in connection with the examination of Boilers of Locomotive Engines

Forwarding Copy of Letter No [illegible] from the Engineer for Railways submitting papers in connection with the examination and testing of Locomotive Engines