

impossible to blow it out under steam pressure without danger. Attempting to do this frequently sets up a water-hammer action within the pipes, and from this cause several explosions have occurred. The only safe plan is not to let the lodgment occur, or to shut off the steam before opening the drain taps.

SHORTNESS OF WATER.—If the boiler is found to be short of water throw open the fire doors, lower the dampers, ease the safety valves, and set the engine going, at rest, so as to reduce the pressure. If the boiler is one of a series, shut down the junction valve. If there is reason to conclude that the water has not sunk below the level of the furnace crowns, and they show no signs of distress, turn on the feed and either draw the fires quickly, beginning at the front, or smother them with ashes or anything ready to hand. If there is reason to conclude that the water has sunk below the level of the furnace crowns, withdraw, and leave the safety valves blowing. Warn the passers by from the front.

EASING THE SAFETY VALVES.—If either the construction of the boiler or the character of the feed water is such as to render the boiler liable to prime, the safety valve should be eased gently.

TURNING ON THE FEED.—From experiments association has conducted, it appears that this is the best thing to do in nearly every case, especially where the feed is introduced behind the firebridge, as it would tend to restore the water level, and at the same time to cool and reinvigorate the furnace plates. While, however, the experiments showed that showering cold water onto red-hot furnace crowns would not, as has been generally supposed, lead to a sudden and violent generation of steam which the safety valves could not control and the shell could not resist, it is thought that if the furnace crowns were very hot and just on the point of giving away, the generation of a few additional pounds of steam might turn the scale and lead to a collapse. Thus it might be wise to turn on the feed in some cases and not in others, according to the extent to which the furnace crowns were overheated, and this it is difficult to ascertain. Under these circumstances a hard and fast rule, applicable to all cases, cannot be laid down, and therefore, having regard to the safety of the fireman, the advice to turn on the feed, as a general rule is confined to those cases where the water has not sunk below the level of the furnace ground.

DRAWING THE FIRES.—This ought not to be attempted if the furnace crowns have begun to bulge out of shape. It is an extremely responsible task to give any recommendation with regard to the treatment of a boiler when short of water and working under steam pressure, that shall be applicable to every case under every variety of circumstance. A boiler attendant has no right to neglect his water supply and allow it to run short; nor has he a right to charge the fires without making sure that the furnace crowns are covered. Should he neglect these simple precautions it is impossible to put matters right without some risk being run. A boiler with hot fires and with furnace crowns short of water is a dangerous instrument to deal with, and the attendant who has done the wrong must bear the risk. The best advice the association can give the boiler attendants on this subject is, do not let shortness of water occur. Keep a sharp look-out on the water-gauge.

USE OF ANTI-INCORUSTATION COMPOSITIONS.—Do not use any of these without the consent of the association. If used, never introduce them in heavy charges

at the manhole or safety valve, but in small daily quantities along with the feed-water.

Many furnace crowns have been overheated and bulged out of shape through the use of anti-incrustation compositions, and in some cases explosions have resulted.

EMPTYING THE BOILER.—Do not empty the boiler under steam pressure, but cool it down with the water in; then open the blow-out tap and let the water pour out. To quicken the cooling the damper may be left open, and the steam blown off through the safety valves. Do not, on any account, dash cold water on the hot plates. But in case of an emergency pour cold water in before the hot water is let out, and mix the two together so as to cool the boiler down generally, and not locally.

If a boiler is blown-off under steam pressure the plates and brickwork are left hot. The hot plates harden the scale, and the hot brickwork hurts the boiler. Cold water dashed on to hot plates will cause severe straining by local contraction, sometimes sufficient to fracture the seams.

CLEANING OUT THE BOILER.—Clean out the boiler at least every two months, and oftener if the water is sedimentary. Remove all the scale and sediment as well as the flue dust and soot. Show the scale and sediment to the manager. Pass through the flues, and see not only that all the soot and flue dust has been removed, but that the plates have been well brushed. Also see whether the flues are damp or dry, and if damp find out the cause. Further, see through the thoroughfares in the glass water gauges and in the blow-out elbow pipe, as well as the thoroughfares and the perforations in the internal feed dispersion pipe and the scum pipe are free. Take the feed pipe and scum troughs out of the boiler if necessary to clean them thoroughly. Take the taps, if not asbestos packed, and the feed valve to pieces, examine, clean and grease them, and, if necessary, grind them in with a little sand. Examine the fusible plugs.

All taps, whether asbestos packed, or metal to metal, should be followed in working, especially when new. The gland should be screwed down as found necessary so as to keep the plug down to its work, otherwise, it may rise, let the water pass, and become scored.

PREPARATION FOR ENTIRE EXAMINATION.—Cool the boiler and carefully clean it out as explained above, and also dry it well internally. When the inspector comes, show him both scale and sediment as well as the old cap of the fusible plug, and tell him of any defects that manifested themselves in working, and of any repairs or alterations that have been made since the last examination.

Unless a boiler is suitably prepared, a satisfactory entire examination cannot be made. Inspectors are sent at considerable expense to make entire examinations, and it is a great disappointment when their visits are wasted for want of preparation.

PRECAUTIONS AS TO ENTERING BOILER.—Before getting inside the boiler, if it is one of a series, take off the junction valve handwheel, and if the blow-out tap is connected to a common waste pipe, make sure that the tap is shut and the key in safe keeping.

From the neglect of these precautions, men working inside boilers have been fatally scalded.

FUSIBLE PLUGS.—Keep these free from soot on the fire side and from incrustation on the water side. Change the fusible metal once every year, at the time of preparing for the association annual entire examination.

If fusible plugs are allowed to become incrustated, or if the metal be worked too long, they become useless, and many furnace crowns have been rent from shortness of water, even though fitted with fusible plugs.

GENERAL KEEPING OF BOILER.—Polish up the brass and other bright work in the fittings. Sweep up the flooring plate frequently. Keep ashes and water out of the hearth pit below the flooring plates. Keep the space on the top of the boiler free, and brush it down once or twice a week. Take a pleasure in keeping the boiler and the boiler house clean and bright, and in preventing smoke. — The Safety Valve.

WASTE IN CONVERTING A LOG INTO LUMBER.

IN the hardwood sections the most experienced estimators, says the Southern Lumberman, almost invariably over-estimate the amount of lumber the standing timber will make. It is not done with fraudulent intent, but simply because neither the estimators, the purchasers, or the manufacturers realize what a small per cent of the actual contents of a hardwood tree is convertible into merchantable lumber. In the pine forests the loss is less than in the hardwoods, because the pine trees are generally more nearly straight and of more uniform diameter at both ends of logs of the usual lengths. After a tree is cut into saw log lengths the amount of lumber that can be got from it can be very closely ascertained by the use of what is known as the Doyle rule as given in Scribner's log book. This rule is in almost universal use where the logs to be measured can be seen all over, but does not apply generally to logs to be measured in water, as a raft. About the only thing that the lumber trade is in full accord on is this Doyle rule. About twenty years ago the publishers of Scribner's log book substituted it for the one the author had brought into wide use years before, and is now considered the standard. If we take the actual contents of a log and compare with the result given in Doyle's rule we will find the loss ranges from 20 to 65 per cent., the loss being greater in the smaller logs. We get the actual contents by taking the mean diameter of the log, finding its cubical contents in feet and multiply by twelve to reduce the cubic feet to board measure.

The following table will illustrate this more fully:

DIAMETER OF LOG. 10 FT. LONG.	Real Contents of Log in feet ft. ft. or 1- tenth cubic foot, al- lowing no waste.		
	Contents in feet ft. ft. as per Scribner or Doyle's rule.	Waste as per ct. of real contents deduc- ed by Doyle.	
10 inches	65	23	65
12 "	127	62	51
14 "	167	90	46
16 "	211	122	42
18 "	261	160	39
20 "	316	250	34
24 "	588	422	28
30 "	847	640	25
40 "	1,046	810	23
50 "	1,635	1,322	20

Thus it appears that while in a log 50 inches in diameter 80 per cent. may be converted into salable boards, this ratio drops to 35 as the diameter decreases to 10 inches; a good argument against cutting young and small timber.

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