

thus admitting steam against the front end of the piston and moving the engine backward.

THE LOCOMOTIVE BOILER IN SERVICE.

The frames of the locomotive are regarded as two girders, and are supposed to be strong enough to bear the weight of the boiler and all that is on it without yielding, but this is not entirely correct.

The boiler and frames are secured to each other by the expansion braces at the fire box end, the cylinders at the front end and by belly braces at intermediate points along the barrel of the boiler. The boiler and frames being bound to each other in the manner they are, it is the supposition that this combination is self-sustaining, but such is not the fact, as the boiler itself indicates. Keen observers, who are responsible for the care of boilers, know that the boiler yields by its own weight when it receives heavy shocks. Where the belly braces are riveted to the barrel of the boiler, which has run any length of time, it will be found that around the edge of the rivets, inside the boiler, the sheets are grooved. Grooving is nearly always a result of sheet movement. If these braces are not riveted, but are brought up to the boiler so as to fit around the under side, the working of the engine will show the chafing of the braces on the boiler, indicating the resistance it must offer.

Other signs of destruction are the small cracks that take place in the upper side of the throat sheet. These are generally supposed to be effects caused by some obstruction to the expansion of the boiler.