whether the front end of the main rod really requires as much oil as the front end of the side rod or the back end of the side rod. There is not the friction on the front end of the main rod there is on the side rod, because the pin does not make a complete revolution. Of course, the main rod generally is heavier than the side rod, but it does not have that oscillating motion that will create friction that we have on the side rod."

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*Setting Valves on a Shay Locomotive.**

In setting the valves of a Shay locomotive the principal point is to obtain the correct central positions of the crank for the different cylinders; after they are found the setting of the valves is the same as on other engines.

To find the central position of the crank for No. 1 cylinder (cylinder nearest cab), roll the crank until the crosshead for No. 1 cylinder is within a short distance of the end of the stroke at the top, say ¾ of an inch, make a mark on the crosshead and guide of No. 1 cylinder while in this position, also on the

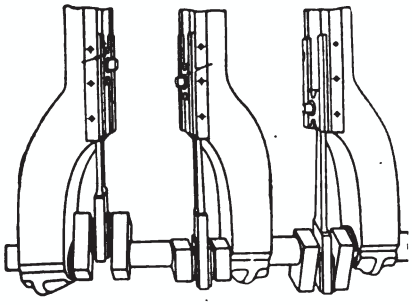

Fig. 1

crosshead and guide of one of the other cylinders that has the crosshead the highest, which will be No. 2, if the pin of No. 1 is back of the center. (See Fig. 1.)

Now, roll the crank till the crosshead of No. 1 passes up to the end of the stroke and returns to the mark; make a mark on the crosshead and slide of No. 3 cylinder. (See Fig. 2.) There are now two marks that are an equal distance from the center of No. 1 cylinder and to roll the crank over until the marks on the crossheads of Nos. 2 and 3 are the same distance from the marks on their respective guides, will place the crank on the top center for No. 1 cylinder. (See Fig. 3). The lower center may be found

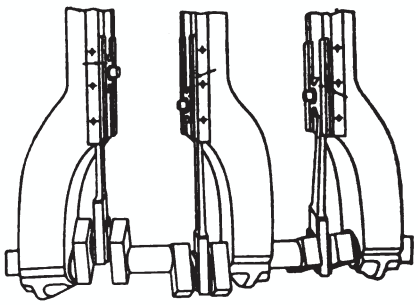

Fig. 2

by rolling the crank a half turn, which will bring the marks on the crossheads for Nos. 2 and 3 cylinders an equal distance from the marks on the guides, but the distance will be greater between the

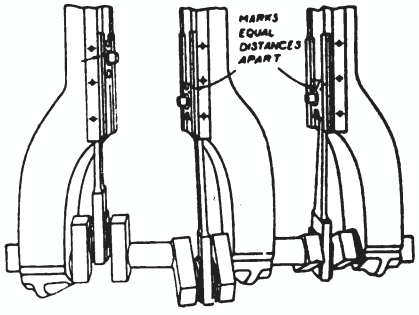

Fig. 3

marks than when the crank was on the top center. (See Fig. 4.)

The centers for the other cylinders are found by the same operation, using Nos. 1 and 2 to get the center for No. 2, and Nos. 1 and 2 for the center for the No. 3.

To set the valves, place the crank on the upper center for No. 1 cylinder, move the reverse lever to the extreme positions, forward and back and adjust the eccentric rods until the port openings in these positions are equal and should be about 1-32 inch.

Roll the crank to the lower center and if the port openings are the same with the reverse lever in the extreme positions as they were when the crank was on the upper center, the valves are properly set. If it is found that the port opening is greater or less on the lower cen-

*Courtesy of The Locomotive World.

ter than on the upper center, the openings may be equalized by shortening or lengthening the eccentric rods. If there is no lead after the movements are equalized, it would be well to dress the edges of the valve to give the proper amount of lead.

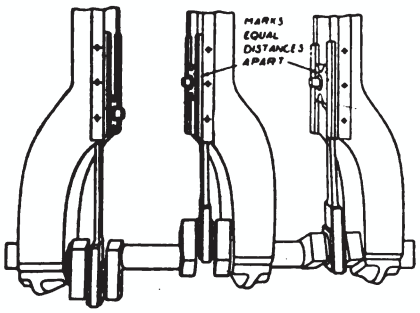

Fig. 4

The valves for the other cylinders are set in a like manner. A valve tram is furnished with each locomotive that just fits in the center punch marks on the valve stems and steam chests—when the crank is on the center and the eccentric rods are properly adjusted. In using the tram it is not necessary to remove the steam chest covers to set the valves.

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Boiling Point.

The boiling point of a body may be defined as the temperature above which a body passes into the state of a gas, not only on the surface, but in the body of the liquid; this temperature is, therefore, different for different pressures, and is accordingly a relative magnitude.

The term boiling especially refers to the rapid production of vapor in the mass of the liquid itself. At the ordinary atmospheric pressure ebullition-like fusion takes place at a definite temperature.

When a liquid, water for example, is heated at the lowest part of a vessel the first bubbles are due to the disengagement of air, which had been previously absorbed. Small bubbles of vapor then begin to rise from the heated parts of the sides, but as they pass through the upper layers, the temperature of which is lower, they condense before reaching the surface. The formation and successive condensation of these first bubbles occasion the singing noticed in liquids before they begin to boil. Lastly, large bubbles rise and burst on the surface, and this constitutes the phenomenon of ebullition.—Engineering Review.

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*Locomotive Tenders in Derailments.**

Whoever heard of an engineer speaking in glowing terms of a tank? Its virtues, if any, go unnoticed; it bobs its rough and eneven way through life, backward and forward, up and down and sideways, until it wobbles off the track and receives the maledictions of those whose path it happens to cross. It is the Ishmaelite of the mechanical department. It is quite distasteful to me to say anything bitter or harsh. As the years go by I feel that I am growing more liberal and less inclined to criticise and it is painful to hurl abuse at an inanimate object like a tank—a thing that can't strike back, but if it expects me to cease talking about it, it must change its ways.

It is quite singular that the engine should receive practically the undivided attention of the mechanical department. It has undergone all the transformations looking to its betterment that could be conceived of by its builders and handlers. It has been the object of countless experiments. Everything that could be done to make it a perfect running machine has been adopted. Those responsible for its existence and condition have labored with hand and heart and brain to shape it into a thing of beauty, symmetrical, clean-cut and pleasing to the eye. The gulf that yawns between the Spanish broncho and the Kentucky thoroughbred isn't any wider than the chasm that separates the old-fashioned, diamond-stacked, wood-burning, screeching locomotives of a quarter century ago and the beautiful modeled engine of today.

It is unfortunate that I am not in a position to give the exact number of derailments attributed to tanks leaving the rails first, but the time given me has been too short in which to prepare the figures. You may rest assured that such a statement would be alarming. Three derailments have occurred within a short time on the Gulf and El Paso divisions of the Rock Island system, the tender quitting

*From a paper by Claim Agent W. P. Williams Chicago, Rock Island & Gulf Ry., read before a meeting of claim agents and adjusters of the Chicago, Rock Island & Pacific Ry. at Kansas City, May 16, 1908.—Reproduced from The Railway and Engineering Review.