SETTING LOCOMOTIVE SLIDE VALVES.

BY JOSHUA ROSE.

E. G. asks: "How can I set the slide valves of a locomotive when she is on the road?" J. H. S. asks: "What is the method of setting locomotive slide valves from marks on the slide spindle?" And F. O. asks: "How are the valves of inside cylinder locomotives set, since the back ports are out of sight and you cannot measure the lead?"

Our correspondent will find these questions answered in full below.

It is presumed that the lengths of the eccentric rod, reverse rod, and other parts are correct, and they are properly connected and oiled so as to be in working order. The first thing to do is to place the reverse lever in the forward full-gear notch of the quadrants, or sectors, as they are sometimes called. The next procedure is to place the crank on its forward dead center as near as can be ascertained by the eye, and loosening the set screw of the forward eccentric, that is to say, the eccentric which connects with the upper end of the link, move that eccentric round on the shaft until the valve leaves the port at the front end of the cylinder open to the amount of whatever lead it is desired to give the valve. In moving the eccentric round on the shaft, it is necessary to move it in the direction in which it will turn when in operation. This is done in order to take up any lost motion there may be in the eccentric straps, in the eccentric rod eyebolts, or other working parts or joints between the eccentric and the slide valve rod or spindle. If the eccentric was turned backwark instead of forward, all the lost motion would operate to vitiate the set of the valve, because, when the eccentric begins to move, its motion will have no effect in moving the slide valve spindle, until all the lost motion in the various parts is taken up by the eccentric movement. In considering this part of the operation, we must bear in mind that, to set the valve, we must move the wheels of the engine, it being impracticable to move the piston itself. Now, in moving the wheels, we are confronted with the fact that the crank pin is pulling the connecting rod; hence, if there is any lost motion in the brasses at either end of the connecting rod, the piston will not be at the end of its stroke when the crank is on its dead center.

Suppose, for instance, that we have moved the driving wheel forward until the crank stands upright at a right angle to the bore of the cylinder, the resistance to motion of the piston and crosshead has caused the crank pin to bed against the half-brass nearest to the cylinder, all the play or lost motion is then between the other half-brass and the crank pin. When, however, the engine is at work and the piston is driving the crank pin, instead of being driven by it, the lost motion will exist between the crank pin and the half-brass nearest to the cylinder, and the contact will exist between the crank pin and the other brass. The difference in the position of the piston, caused by this lost motion, may be ascertained by moving the piston back and forth until the crank pin contacts with first one and then the other half-brass. It is sometimes attempted to remedy the defect due to this lost motion by moving the crank pin past the dead center and then moving it back to the dead center, so that while on that center the play or lost motion in the connecting rod is taken up. This is all very well so far as the connecting rod and piston is concerned, and will cause them both to stand on their respective dead centers with the lost motion taken up; but, in moving the wheel back to the dead center, we have given full liberty to all the lost motion in the various parts of the valve motion or gear, as already explained, in reference to moving the eccentric upon the shaft. As there are so many more parts in the valve gear, in which lost motion may occur, it is manifestly preferable to take up that play by moving the driving wheel in a continuous direction, rather than to move the latter back to accommodate any play there may be in the connecting rod.

The crank being placed by the eye upon its forward dead center, and the eccentric connected to the top of the link being moved round on the axle (in the direction in which the wheels will run when the engine is going forward) until the steam port at the front end of the cylinder is open to the amount of the lead, we fasten the eccentric to hold in that position. We then throw the reverse lever over into the last notch at the other end of the sector, lifting the link up so that the eccentric connected to the lower end of the link may be approximately adjusted, which is done by moving the eccentric round upon the axle (in the direction in which the axle will revolve when the engine is running backward) until the crank stands upon the same dead center, and the front port is open to the amount of the lead. This being done, we have the eccentrics approximately adjusted and may proceed to the final adjustment, in which the first thing to do is to find the exact dead centers of the crank. It is obvious that a line drawn through the center of the crank pin and the center of the wheel axle, will stand horizontally true and level when the crank is on either of the dead centers, but the presence of the crank pin makes it impracticable to draw such a line. We can therefore draw one which will be parallel to those centers; and to do this we draw a circle upon the end of the wheel axle (and from its center) of the same diameter as that of the crank pin, and then resting a straight-edge upon the bearing of the crank pin (taking care to avoid the round corner upon the pin, if there is one), we place the other end of the straight-edge even with the top of the circle drawn upon the axle; and then, using the straight-edge as a guide, we draw a line across the end of the axle and the wheel face. When this line is level the crank will be upon its dead center. This plan is sometimes employed, but is not a very accurate one, because the length of the line is very short as compared to the circumference of the driving wheel; hence, an error of the thickness of the line becomes one equal to several thicknesses of the line when carried out to the wheel circumference. Furthermore, if the line of the cylinder does not stand horizontally level, as is sometimes the case, the result of the whole proceeding will be inaccurate. Again, the connecting rod end and the coupling rod is in the way, rendering it awkward to both draw and level the line.

A better and more accurate method to find the dead centers is as follows: Place the reverse lever into the end notch of the sector at the forward end, and then move the driving wheel forward until the guide block is within about a quarter of an inch of the end of its travel, then place a straight-edge against the end of the guide block, and draw, on the outside face of the guide bar, a line even with the end of the guide block. Bend a piece of wire (pointed at both ends) to a right angle, make a center punch mark either in the rail, under the driving wheel, or in some stationary, solid part contiguous to the wheel, or at such distance from it that when one end of the bent wire is placed in the center punch mark, the operator with the other end will be able to draw a line across the rim of the driving wheel. Here, however, arises another consideration, that it is better to set the valves with the wheel axle in its proper position in the pedestal shoes, and in order to do this the wheel should rest upon the rail with its proper proportion of the weight of the engine resting upon it. The springs will then be deflected to their proper amount, and the axle box will have passed its proper distance up the pedestals. It is obvious that if the engine is blocked up so that the driving wheels clear the rails (which is done in order to avoid having the weight of the engine to move while setting the valve), the axle boxes will drop in the pedestal and the valve will be set incorrectly, as the wheels are in a wrong position. To avoid this, and at the same time to avoid having to move the whole engine while setting the valve, the engine is blocked up from the rails, and the axle boxes of the driving wheels are wedged up so as to be lifted up into their proper position. In this case there is no very accurate means of ascertaining what is the exact proper height, save it be by first marking upon the outside faces of the shoes or pedestal a line even with the top of the axle box when the load is upon the wheels, and then, after blocking up the engine from the rails, wedging up the axle boxes till the face again comes even with the line.

Whatever plan is pursued, one end of the piece of wire is rested in the fixed center punch mark, and with the other a line is drawn across the outside face of the wheel rim. The driving wheel is then revolved forward until the guide block returns, having passed to the end of its travel. When its end again stands exactly even with the mark made upon the guide bar, the piece of wire is again brought into requisition, one end being rested in the fixed center punch mark as before, and with the other end another line is drawn across the outside rim of the wheel. It is obvious that by taking a pair of compasses and finding a point exactly equidistant between the two lines thus marked upon the wheel rim, and then marking that point with a center punch mark, the crank will be upon its exact dead center, when one end of the piece of bent wire rests in the fixed center punch mark, the other end rests in the center punch mark upon the wheel rim. To find the other dead center, the wheel must be moved about halfway round and the process repeated with the motion block at the other end of the guide bars.

Thus, whenever the piece of wire will stand with one end resting in the fixed center punch mark and the other end in either of the center punch marks upon the wheel run, the crank is upon a dead center. Having thus placed the crank upon either dead center, we measure the valve lead, and if in temporarily fixing our eccentrics we gave it too much lead, we mark where it stands upon the shaft by means of a line drawn on the axle and carried up on the side face of the eccentric; then move the eccentric back some little distance more than is necessary to make the adjustment, and then move it forward again a little at a time, noting when the valve has the proper amount of lead, and thus fasten the eccentric upon the axle by means of the set screw.

The object of moving the eccentric too far back and then moving it forward is to make the adjustment so that the latter may be made with the lost motion of the valve gear all taken up. The next proceeding is to move the driving wheel halfway round and try the lead at that end of the stroke. If the lead at the two ends is not equal, it shows that either the slide valve spindle or the eccentric rods are not of the proper length and must be rectified; this being done, the crank must be again placed upon first one and then the other dead center, the valve lead being measured at each end. When the lead is equal at each end, the rods are of correct length, and the amount of the lead must be regulated by moving the eccentrics as already directed.

If the link block does not come opposite the end of the eccentric rod when the reverse lever is in the end notch of the sector, the length of the reverse rod is wrong and should be corrected. If the link block comes right, under the above conditions, for the forward but not for the backward eccentric rod, the notches in the sector are not cut in their proper positions, or the link hanger is not of the proper length. In either case the error may be remedied by altering the length of the latter. But, as doing this would alter the amount of the valve lead, it is well, if there is any prospect of such errors, to correct them before setting the valves.

Instead of measuring the lead of the valve with a rule, or by a wedge, the following plan is very often adopted: After the valve and spindle are in position, the valve is placed with the proper amount of lead upon the front port. A center punch mark is then made upon the face of the steam chest. A piece of quarter inch iron wire is then bent at right angles and each end filed to a point. One end of this wire is placed in the fixed center punch mark in the steam chest, and with the other a mark is made upon the slide spindle. Upon this latter mark a center punch mark is also made sufficiently deep to be very plainly visible when the burr raised by center punching is filed off, which is necessary to prevent this burr from cutting the packing. It follows that whenever the bent piece of wire will rest with one end in the center punch mark in the steam chest, and the other end in the center punch mark in the slide spindle, the valve is in its proper position when the crank is on the corresponding dead center. This plan is a very old one and possesses the advantage that the valve may be set without seeing it, that is to say, with the steam chest cover on. If the length of the piece of wire measured direct from point to point is known, the valve may be set when the engine is upon the road without taking off the steam chest cover. The center punch mark upon the steam chest should, however, always be placed in about the same spot, so as to avoid mistakes in case of there being other similar marks upon the chest. It should always be made deep, so as not to get filled up with paint and be difficult to find. In course of time the mark upon the slide valve spindle is apt to disappear from the wear of the spindle, hence the center punch with which it is made should have a long conical point. To mark the position of the eccentric upon the axle, it is an excellent plan, after the eccentrics are finally adjusted, to take a chisel with the cutting end ground to the form of a fiddle drill, one cutting edge being at a right angle to the other. The chisel must be held so that while one edge rests upon the axle, the other edge will bear against the radial face of the eccentric. A sharp blow with a hammer upon the chisel-head will make a clean indented cut upon the axle and the eccentric, the two cuts exactly meeting at their junction and denoting the position of the eccentrics. In setting the valves of inside cylinder locomotives, the back ports being out of sight, the amount of lead is ascertained by making a wooden wedge about three inches long, a thirty-second of an inch thick at one end and three eighths of an inch thick at the other end. The faces of this wedge are chalked, and the lead is measured by inserting it between the edge of the valve and the edge of the port until its thickness just fills the space, and then moving it edgeways so that the valve and port edges will just mark it. By measuring the thickness of the wedge at the mark, the amount of lead is ascertained. After the valves are set, it is still desirable to mark the position by center punch marks upon the outside of the steam chests and upon the valve spindles, as already described.

If an eccentric should slip when the engine is upon the road, and there are no marks whereby to readjust them, it may be done approximately as follows: Put the reverse lever in the end notch of the forward gear, then place the crank as nearly on a dead center as the eye will direct, and open both the cylinder cocks, then disconnect the slide valve spindle from the rocker arm, and move the valve spindle until the opening of the port corresponding to the dead center on which the crank stands will be shown by steam blowing through the cylinder cock, the throttle valve being opened a trifle. The position of the valve being thus determined, the eccentric must be moved upon the shaft until the valve spindle will connect with the rocker arm without being moved at all. The throttle valve should be very slightly opened, otherwise so much steam will be admitted into the cylinder that it will pass through any leak in the piston and blow through both cylinder cocks before there is time to ascertain which cock gives first exit to the steam.

New Steamer.

A new steamer for the Mallory line, between New York and Texas, was lately launched from the yard of Roach & Co., Chester, Pa., 2,200 tons burden. Principal dimensions as follows: Length over all, 239 feet 7 inches; beam (moulded), 34 feet; depth from the base to the spar deck beams, 18 feet 2½ inches; depth of hold, 16 feet 5½ inches; diameter of propeller (Hirsch's patent—four blades), 11 feet 6 inches. She is to be provided with compound engines, having cylinders 24 and 44 inches in diameter, with a stroke of 44 inches, and two return tubular boilers 10 feet long, 10 feet 3 inches wide, and 8 feet 6 inches high. Aft are compartments capable of holding 80 tons of water, for the purpose of depressing the stern before and after crossing the bar at Corpus Christi. Her low draught is 7¼ feet; speed, 14 knots.

A Tin-Can Telephone.

In Professor Bell's telephone a plate of sheet iron is made to vibrate by means of the electrical current, something after the manner of the skin of a drumhead. In a recent improvement by Mr. G. B. Havens, Louisville, Ky., the electrical wires are wrapped around a common tin fruit can. By means of tin cans at each end, sounds, it is said, were sent over 92 miles of wire, and included several pieces of music.

MR. HOTCHKISS, an American inventor, whose improved revolving cannon we illustrated some time since, has received intimation that his system has been approved by the French Government, and that they have decided to adopt his cannon.