

group then near the center was now on the western limb, and the large spot had separated into a group, composed of one large and several small ones.

From January 26 to February 12, when observations could be made, the sun's disk appeared free from spots. On February 12 a large spot, measuring nearly $\frac{1}{8}$ of the sun's diameter, with very marked penumbra and followed by faculae, was observed. On February 16 this spot was seen to have broken up into a chain of small ones, which measured when last seen, February 20, nearly $\frac{1}{8}$ of the diameter of the sun. Observers should look for the return of this spot about March 9.

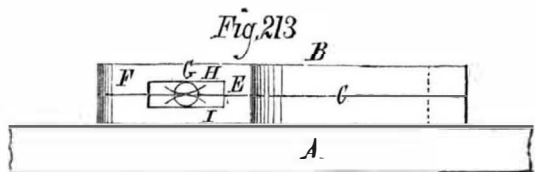
PRACTICAL MECHANISM.

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NUMBER XLIII.

MARKING OUT A CONNECTING ROD.

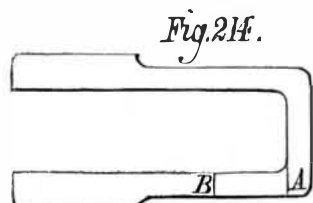
Our next operation is to mark out the keyway, which is performed after the butt end of the rod and the inside and outside of the strap have been planed. We first, with a pair of compass callipers, which are better for the purpose than compasses, mark the center of the strap edgewise, and then, laying it with its broad surface on the marking-off plate, we mark off the keyway as follows: In Fig. 213, A represents



the table, and B the connecting rod strap. C is the center line of the strap, and therefore of the keyway; the end, E, of the keyway should be drawn the necessary distance from the inside crown of the strap, as denoted by the dotted line, because it is that distance upon which the thickness of the brasses depends. Hence the line, E, is the first one to be drawn: then, from the line, E, we mark the length of the keyway, and strike the line, F; the breadth of the keyway we mark by setting the compasses to the radius of a circle whose diameter will be equal to the required breadth of keyway. Then using the center line as a center, we mark the circle, G, and (parallel with its diameter, the center line) the lines, H and I, thus completing the marking of the keyway on the strap. Our next operation is to mark the oil hole of the strap, which should be placed exactly in its proper position, for the following reasons:

A connecting rod whose crosshead end has a strap with a gib and key (or, what is better, two gibs and a key to hold it, the crank pin end having its strap held by bolts, and the key between the bolts and the brass) would maintain its original length, provided the wear on the crosshead brasses were as great as is the wear on the crank pin brasses; but since that on the latter is the greatest, the rod wears longer to half the amount of the difference of the wear between the crosshead and crank pin journals. If both the straps of a rod are held by bolts, the key of one end being between the brasses and the main body of the rod, and the key of the other end between the brasses and the crown of the strap, it would maintain its original length if the wear on both ends was equal; but this not being so, it wears longer, as above stated. The oil hole of a strap, for either a connecting or side rod, should therefore be in the exact center of the space intended to be filled by the brasses. It will thus be central with the joint of the brasses, and from center to center of the oil holes, and will, therefore, represent the proper length of the rod. When, therefore, the brasses of a rod end, whose strap is held by a gib and key, have worn so that the key is let down, the brasses must be lined up to bring the key back to its original position, the back brass being lined up so that its joint face comes even to the center of the oil hole, and the other brass being lined up sufficiently to bring the key back to its original position; then the rod is sure to be of the proper length. But if the strap is held by the bolts (in which case it does not move when the brasses are let together and the key further through), lining the back brass up to the center of the oil hole at once insures the rod being of its correct length, without any reference as to what thickness of liner is put on the other brass, or how far the key may come through. In either case it will be observed that the center of the oil hole, when placed as described, forms a gage to keep the rod its proper length.

To mark off the oil hole, we lay the strap on its side face, as shown in Fig. 214, and, placing a straight edge along the inside crown face of the strap, we mark a line even with it and across the jaw of the strap, as shown at A, in Fig. 214,



and from that we mark with the compasses the line, B, the distance between the two being half the total depth of the brasses, or, what is the same thing, the thickness of the crown brass (when new) from its joint face to its bedding crown. We then, with a square and scriber, carry the line, B, over to the center line of the edges of the strap (C in Fig. 213), and the junction of the two is the center of the oil hole. In centerpunching the center for the oil hole to be drilled, make a deep centerpunch mark to prevent the drill from running to one side and thus deceiving the machinist (who may have to line up the brasses when they become worn) as to thickness of the liner to be placed behind the back brass to keep the rod to its original length.

The marking of the keyway in the butt or stub end of the rod is performed in the same manner as that of the keyway in the strap, care being taken to make the edge of the keyway nearest to the end of the rod at the exact proper distance from that end: otherwise the amount of space left, when the strap is in its place, between the end of the rod and the crown of the strap (which regulates the thickness of the brasses), will not be correct, and the oil hole will not stand in its correct position on the strap, unless the key and gib are made to suit the inaccuracy of the position of the keyway in the rod end. For example: Suppose the keyway of the rod to approach too near the rod end; then the strap will, if the gib and key are made of the proper width (when placed together, as shown in Fig. 215) across, as at A, not pass sufficiently along the block end, and there will be too much space allowed for the brasses, and the oil hole will stand too near the crown of the strap. The only method of correcting this defect is to make the width of the key and gib, at A, Fig. 215, wider to the necessary amount, and to cut the keyways, both in the strap and the rod end, wider, by cutting out the metal on the edge of the keyway furthest from the rod end, and the metal on the edge of the keyway in the strap at the end nearest to the crown of the strap. If the keyway of the block end errs in the opposite direction, the keyways must of course be made wider, the metal being cut out in the exact opposite to the above direction. By marking out the two keyways as above described, we have no occasion to take any account of the draw, since that will come right of itself when the brasses are put in their places in the strap, and the strap is put in its place upon the rod end. In marking off the rod end from keyways already cut in the strap, the following plan must be adopted: Place the strap upon the rod end, leaving the space between the rod end and the crown of the strap narrower than is required to receive the brasses (when the latter are new) by an amount equal to the amount of taper there is in the full length of the key, and mark the keyway in the rod end even with the strap, taking no account of the draw required on the keyway, which is provided for in the position in which the strap is placed on the rod end, as will be perceived when we consider that the length of a keyway is always the width of the key and gib, at A, when placed together, as shown in Fig. 216. Hence, by marking off the keyway in the rod end with the keyway in the strap, the latter is in the position in which it will stand when the key and gib are in the position shown in Fig. 216. Supposing then the gib and key to be in their

Fig. 215.



Fig. 216.

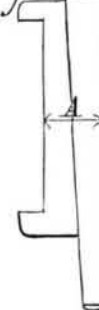
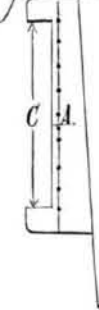


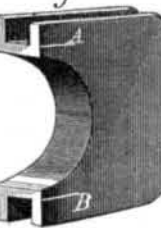
Fig. 217.



places in the rod and strap, and in the position shown in Fig. 216, and that we then lift the key up so that it will stand in the position shown in Fig. 215, and that we then pull the strap as far off the block end of the rod as it will come, the key will then stand in its correct position, and there will be the proper amount of draw in the keyway, both in the strap and on the rod end, and the space between the end of the rod and the crown of the strap will also be correct. To mark off the key and gib, we proceed as follows: After the keyways are filed out, we take a piece of thin sheet iron and fit it to a tight fit in the breadth or thickness of the keyway, and have the thickness of the key and gib planed, using the piece of sheet iron as a gage; we then mark off the key on both edges to the proper width at top and bottom, and hence give it the correct amount of taper. We also have the plain or straight edge (that is, the edge opposite to the jaws) of the jib planed straight; we then place the jib and key in the position shown in Fig. 217, and mark off (from the edge face, B, of the key) the line, A, on the gib, using the compass callipers set to the full width of the keyway in the strap or rod end, taking no account of the draw. Hence the key and gib will, when in the position shown, just fill the keyway. The width between the jaws of the gib, as denoted by C, should be marked a trifle less than is the extreme outside width of the jaws of the strap, so as to allow for the metal taken off in filing up the outsides of the jaws of the strap and off the inside of the jaws of the gib.

When the rod is fitted up and ready to mark off the brasses, to bore them out by, we proceed as follows: We take the top brass and mark on its outside face two lines level with the faces which fit against the inside jaws of the strap, as shown in Fig. 218, A and B being the lines referred to. We then key up the brasses in their places in the rod and fasten a center piece in the brasses at each end of the rod. Upon these centerpieces we first mark a line parallel with and central between the lines, A B, and then a line across the joint of the brasses if the joint faces meet, and in the center of the space between them if they do not meet, and in either case to the center of the oil hole, if the rods have been correctly made; and the distance between the junction

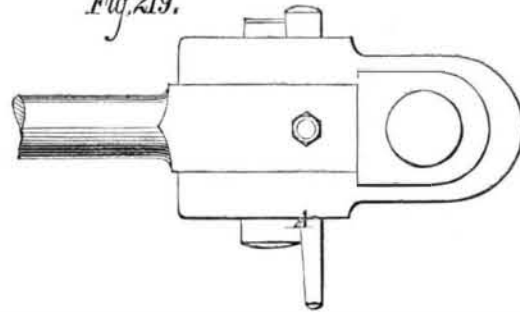
Fig. 218.



of the lines so obtained will, from one to the other, be the length of the rod. The rod should, however, always be tested with a pair of trammels set to the necessary distance between the brasses from center to center of their bores, care being taken to stand the rod, while trying the trammels, in the position in which it works, for all rods deflect by their weight, the amount of such deflection depending upon the position in which the rod is suspended. The trammels also deflect, it is true, but their deflection is allowed for in setting them, whereas the deflection of the rod will not be accounted for unless it is trammed when standing or lying in the position in which it works.

We now come to ascertaining what thickness of liner it is necessary to insert on the back of each brass, when such is necessary on account of the wear of the brasses and on account of the key having passed through the keyway so that its head is level with the top of the jib, and hence requires to be set back. Beginning with the back or bottom brass, which beds against the crown of the strap, we find that the brass at each end of the rod furthest from its key will, no matter what the construction of the rod may be, require lining up so that the center of its bore is even with the center of the oil hole in the strap, that is, providing the oil hole has been marked off as directed. The thickness of liner

Fig. 219.



necessary to place behind the brass nearest to the key should be ascertained as follows: The brass furthest from the key having been lined up, we put the rod end, together with the brasses and keys, in position, and key the rod up properly, when, as shown in Fig. 219, the key will pass too far through the rod end. Then we mark across the face of the key a line, A, even with the edge face of the strap; we then put the key back to its proper position, and mark another line B, even with the edge face of the strap; and taking the key

out, we shall find the two marks shown in Fig. 220, A being the first and B the second line struck upon the face of the key; and the difference between the width of the key at A and its width at B will be the thickness of the liner necessary to be placed behind the brass nearest to the key. To ascertain the precise amount of this difference (because a very small error as to this amount causes a great deal of extra labor), we set a pair of outside callipers to the width at A; and then passing the calliper points down to B,

we keep one of the points even with the line, B, and insert a wedge until it just fills the space between the other point and the side of the key, as shown in Fig. 221, C being the wedge, which should be chalked along its surface so that, when inserted (as shown) until it touches against the calliper point, the latter will leave a mark on the wedge, denoting exactly how far the wedge entered and hence the exact required thickness of liner.

Bicycle vs. Horse.

A ten mile race, between a fast horse named Happy Jack and a velocipede rider named Stanton, recently took place at Lillie Bridge, England, for \$250. For the first three miles the horse kept level with the bicyclist. The ground was rather sticky—owing to late rains—for both, and Stanton seemed laboring, but this is his peculiar way of riding. Stanton was the favorite at as much as 3 to 1, for the start allowed him was generally considered too much. For three miles the horse went easily; where he lost at the corners he made up in the straight. This style he kept up until the sixth mile, when his stride began to falter, not being ridden so well as on the last occasion, combined with the effect of the extra weight he was carrying. Stanton from this point gradually went ahead, and in the next mile he had gained fifty yards. The horse was now beaten, and after going another lap was pulled up at eight miles. Stanton went on and finished the distance, ten miles less 764 yards, in 34 minutes 34 seconds, being at an average velocity of nearly eighteen miles an hour. He rode a 58 inch machine made by Keen, weighing 40 lbs. He seemed to have a good deal more in him had it been required.

A correspondent says: For kitchen and pantry floors there is nothing better than a coat of hard paint; the cracks should be filled with putty before it is applied, and the paint allowed to dry at least two weeks before using. Then it is easily kept clean by washing (not scrubbing) with milk and water; soap should never be allowed to touch it. "Red lead and yellow ochre I prefer for coloring; the former makes a hard paint that wears well."