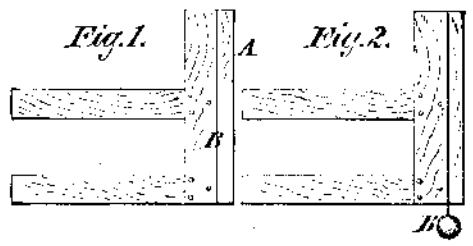
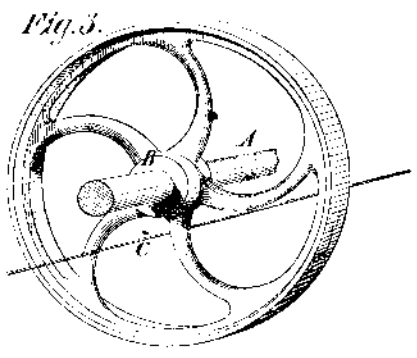
HOW TO ADJUST LINE SHAFTING.

A correspondent asks us for some accurate method of lining shafting, and says that for want of knowledge upon the subject, his shafting runs out of true; and as results, the belts have an unequal tension upon them, the bearing boxes get heated, and the couplings get loose, giving him constant trouble. As we have from time to time received a number of similar communications, we give the following information upon the matter.

There are several methods of lining line shafting, and some of them are found to be decidedly defective in practice. One of the most common of these is that of hanging plumb lines over the shaft, and then streching a line, parallel with the line shaft, but near the floor, and then adjusting the line shaft until the plumb lines are all equidistant from, or have precise and equal contact with, the stretched line, thus accomplishing the horizontal adjustment. This is a crude and troublesome operation for several reasons, among which may be mentioned the fact that it is difficult to measure between such lines when they are long, and that, as the line shaft is moved during adjustment, the plumb lines sway about, involving the necessity of some one to steady them. They are furthermore in the way; and the contact by swaying of a single one with the stretched line interferes with the whole operation. For the vertical adjustment a spirit level alone



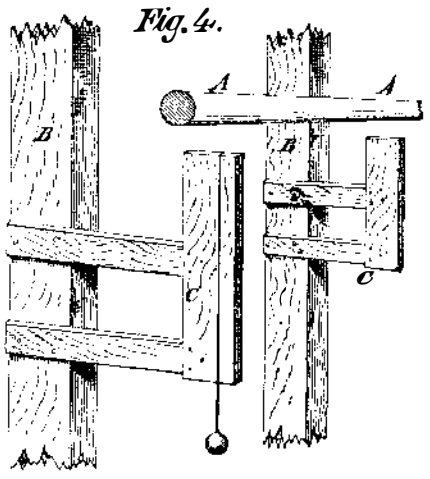
is sometimes employed; and this is objectionable for the reasons, among others, that there is nothing to guide the operator as to whether the part he begins at, and which we will suppose requires to be adjusted, should be lifted at the one end or lowered at the other, in order to make an adjustment suitable to the general line of the shafts. He may it is true first test the whole line of shaft, and make a note of the result arrived at at each testing place, using the notes as a guide to the readiest method of adjustment. It is better, however, in every respect, to adopt the plan here recommended, which is as follows: First prepare a number of rude wooden frames, such as are shown in Fig. 1. They are called targets, and are pieces of wood nailed together, with the outer edge face, A, planed true, and having a line marked parallel with the planed edge and about ¾ inch inside of it. This is intended for use as a guide, in conjunction with the plumb line shown in Fig. 2, attached at B. The next proceeding is to stretch a line parallel with, but vertically below the line of shafting, sufficiently to clear the largest hub upon any of the pulleys on the line of shafting, as shown in Fig. 3, in which A, represents the shafting, B the largest pulley hub, and C the stretched line. In adjusting this line, we have, however, the following considerations: If the whole line of shafting is parallel in diameter, we set the line equidistant from the shafting at each end. If one end of the shafting is of larger diameter, we set the line further from the surface of the shafting, at the small end, to an amount equal to one half of the difference in the two diameters; and since the line is sufficiently far from the shafting to clear the largest hub thereon, it makes, so far as stretching the line is



concerned, no difference of what diameter the middle sections of shafting may be. The line should, however, be set true as indicated by a spirit level.

We may now proceed to erect the targets as follows: The planed edge, A, in Fig. 1, is brought true with the stretched line and is adjusted so that the plumb line, B, in Fig. 2, will stand true with the line or mark, B, in Fig. 1. When so adjusted, the target is nailed to the post carrying the shafting hanger. In performing this nailing, two nails may be slightly inserted so as to sustain the target, and the adjustment being made by tapping the target with the hammer, the nails may be driven home, the operator taking care that driving the nails does not alter the adjustment. In Fig. 4, A A represents the line of shafting, B B, two of the hanger posts, and C C, two of the adjusted targets.

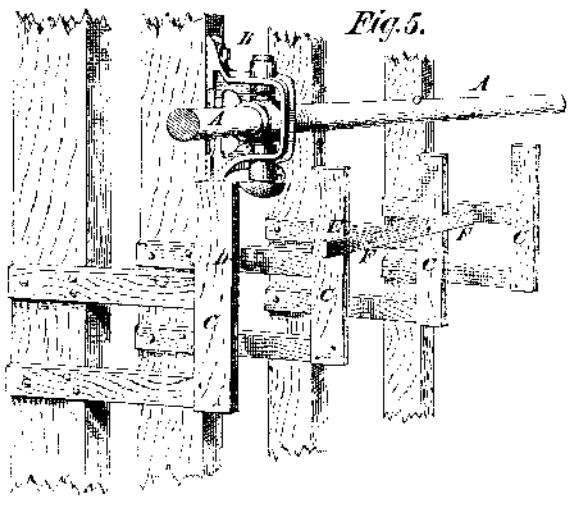
Having adjusted and fixed in the manner above described a target to each of the posts supporting a shafting hanger, we may remove the horizontal stretched line, and take a wooden straight edge long enough to reach from one post to another. Then beginning at one end of the shafting, we place the flat side of the straight edge against the planed edge of two targets at a distance of about 15 inches below the top of shafting; and after leveling the straight edge with a spirit level, we mark (even with the edge of the straight edge) a line on the planed edge of each target; and we then move the straight edge to the next pair of targets, and place edge even with the mark already made on the second target. We then level the straight edge with a spirit level, and mark a line on the third target, combining until we have marked a straight and horizontally level line across all the targets, the operation being shown in Fig. 5, in which A A represents the line of shafting, B B, the hangers, and C C, the targets. D represents the line on the first target, and E, the line on second. F is the straight edge, levelled ready to form a guide whereby the line, D, or target, may be carried forward, level and straight, to target 3, and so on across all the targets. The line thus marked is the standard whereby the shafting is to be adjusted vertically; and for the purpose of this adjustment, we must take a piece of wood or a square such as is shown in Fig. 6, the edges, A and B, being true and at a right angle to each other. The line D, in Fig. 5, marked across the targets being 15 inches below the center line of the shaft at the end from which it was started, we make a mark upon our piece of wood the line C, in Fig. 6, 15 inches from the edge, A (as denoted by the dotted line in Fig. 6); and it is evident that we have only to adjust our shaft for vertical



height so that, the gauge (shown in Fig. 6) being applied as shown in Fig. 7, the shaft will be set exactly true, when the mark, C, on the piece of wood comes exactly fair with the lines, D, marked on the targets.

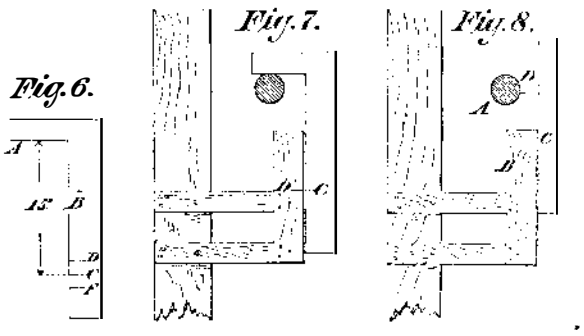
For horizontal adjustment, all we have to do is to place a straight edge along the planed face of the target, and adjust the shaft equidistant from the straight edge, as shown in Fig. 8, in which A is the shaft, B the target, C the straight edge referred to, and D a gauge. If, then, we apply the straight edge and wood gauge at every target, and make the above described adjustment, the whole line of shafting will be set level and true.

There are several points, however, during the latter part of the process at which consideration is required. Thus, after the horizontal line, marked on the targets by the straight edge and used for the vertical adjustment, has been struck on all the targets, the distance from the center of the shafting to that line should be measured at each end of the shafting; and if it is found to be equal, we may proceed with the adjustment; but if, on the other hand, it is not found to be equal, we must determine whether it will be well to lift one end of the shaft and lower the other, or make the whole adjustment at one end by lifting or lowering it as the case may be. In coming to this determination we must bear



in mind what effect it will have on the various belts, in making them too long or too short; and when a decision is reached, we must mark the line, C, in Fig. 6, on the gauge accordingly, and not at the distance represented in our example by the 15 inches.

The method of adjustment thus pursued possesses the advantage that it shows how much the whole line of shafting is out of true before any adjustment is made and that without entailing any great trouble in ascertaining it; so that, in making the adjustment, the operator acts intelligently and does not commence at one end utterly ignorant of where the adjustment is going to lead him to when he arrives at the other. Then, again, it is a very correct method, nor does it make any difference if the shafting has sections of different diameters or not; for in that case, we have but to measure the diameter of the shafting, and mark the adjusting line, represented in our example by C, in Fig. 6, accordingly, and when the adjustment is completed, the center line of the whole length of the line of shafting will be true and level. This is not necessarily the case, if the diameter of the shafting varies and a spirit level if used directly upon the shafting itself. In further explanation, however, it may be well to illustrate the method of applying the gauge shown in Fig. 6, and the straight edge, C, and gauge, D, shown in Fig. 8, in cases where there are in the same line sections of shafting of different diameters. Suppose, then, that the line of shafting in our example has a mid section of 2¼ inches diameter, and is 2 inches at one, and 2½ inches in diameter at the other end. All we have to do is mark on the guage, shown in Fig. 6, two extra lines, denoted in Fig. 6 by D and E. If the line, C, was at the proper distance from A, for the section of 2¼ diameter, then the line, D, will be at the proper distance for the section of 2 inches, and E at the proper distance for the section of 2⅓ inches diameter: the distance between C and D,



and also between C and E, being ⅛ inch, in other words, half the amount of the difference in diameters. In like manner for the horizontal adjustment, the gauge piece shown at D in Fig. 8, would require when measuring the 2¼ inches section, to be ⅛ inch shorter than for the 2 inches section, while for the 2⅓ inches section would require to be ⅛ inch shorter than that used for the 2¼ inches section, the difference again being one half the amount of the variation in the respective diameters. Thus the whole process is simple, easy of accomplishment, and very accurate.

If the line of shafting is suspended from the posts of a ceiling instead of from uprights, the method of procedure is the same, the forms of the targets being varied to suit the conditions. The process only requires that the faced edges of the targets shall all stand plumb and true with the stretched line. It will be noted that the plumb lines (shown on the target in Fig. 2, at B) are provided simply as guides whereby to set the targets, and are put at about ¾ inch inside of the planed edge so as to be out of the way of the stretched line. It is of no consequence how long the stretched line is since its sag does not in any manner disturb the correct adjustment

Bewitched Engineers.

It is luckily not often that we learn of such an exhibition of silly superstition as the performance of one Latimer has lately evoked from the Civil Engineers' Club of the Northwest, in Chicago. Latimer is not an every-day seventh son of a seventh son, born under an eclipse, who restores lost articles and predicts marriages (with photograph of future spouse), and who invites you to send one dollar and a lock of your hair—ladies half price. He is a specialist in the business, and devotes himself exclusively to the divining rod branch. The club recently had a collective interview with him. After working himself into a proper clairvoyant state, he lucidly explained that "from every substance in nature, there are thrown out emanations at an angle of 45°, and that according to the affinity between such emanations and a substance on the rod, so will the latter be more or less influenced." With a perspicuity unusual in oracular utterances, he added that "the moving force is magnetism;" and that when he insulates himself, there is no movement in the rod.

So vastly was the club impressed with the superhuman information it had received (doubtless free, in consideration of the advertising of the *séance* in the club's organ, the Chicago *Engineering News*, whence we quote *verbatim*) that the members "became so absorbed in the fascinating occupation of wandering gravely about the room with forked twigs in their hands, sometimes advancing, and sometimes retreating; but always with eyes closely fixed on the mysterious rod which each clutched with all the strength of his fingers, that a formal adjournment was forgotten, and the meeting finally broke up as train time approached. A committee, however, was appointed to arrange for a series of complete tests by which the most skeptical might be convinced that a new and valuable scientific fact awaited only investigation to become recognized and utilized."

There is evidently a good opening for sane civil engineers in Chicago.

A Toad-Eating Fly.

Nature, among those occasional odd freaks wherein she seems to overturn her own laws, often reverses in the strangest manner the conditions of destroyer and prey. Toads, it is well known, live on insects, and for this reason are valuable aids to gardeners and farmers in protecting their crops. Lately there has been discovered an insect which lives on toads, and which afflicts those reptiles in a way that suggests the concentrated revenge of the whole insect class. It deposits its eggs on the eyes of the toads; and the *larvæ*, in the form of minute white worms, devour not only these organs, but the nose end jaws of the unfortunate batrachian. Curiously enough, the toads do not seem to suffer, but continue their usual habits apparently undisturbed. The name *lucilia bufonivora* has been given the fly.