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n with ly help ections sted to place his rod with its face as nearly as possible perpendicular to the line of sight, and the vertical wire is brought in line with the axis of the rod by dividing the black points opposite the long white target stripes into two parts of equal area.

As already stated, at a point about 3.17 feet or 1.17 yard above the foot of the rod, a second circular level l' mounted on parellel plates by means of three hexagon headed adjusting screws X with spiral springs, is inserted in the rod, viz., in an opening \mathcal{N} of rectangular section with sides and top flaired out towards the rear, so as to enable the rodman to clearly distinguish the bubble and plumb his rod without having to stoop.

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A circular level in every respect similar to level l' might be inserted in the rod at a point about 1 and $\frac{2}{3}$ feet above 0, as a substitute for the level 1 on the side of the shoe, in which case any precise water level required would have to be determined by means of a separate pointing apparatus or hook gauge. A circular level encased in the rod is not so liable to be deranged, than one projecting on one side; but when in the former position it is, on the whole, not so easy for the rodman to see it distinctly and compare it with the upper level. Moreover, if the two spherical levels were both inserted in the rod, we could not set it up plumb without removing every time the struts from their sockets in the rear, which is not always indispensable nor yet desirable, as for instance, when we are taking levels of the ground where it is sufficient for all purposes to read within the nearest half tenth or so of the true elevation and where a slight variation in position is of little or no consequence.

With a view of assisting the rodman in holding his rod steadily in a truly vertical position, he is provided with a double knife-shaped wooden handle D, which he can pass transversely through a slit cut in the centre of the rod at a height of about 4 feet above 0, partly in the rear or connecting bar B_2 and partly in the front bar B_1 .

When not in use the double or knife handle is housed lengthwise in a corresponding recess cut in the rear half of bar B_1 , near the foot of the rod, viz:—with the flat side sunk flush with the face of the bar. The recess is undercut at the lower end so as to prevent the rounded point of the knife from leaving it, when the handle end is secured in place, and permit of the latter being tilted up by pressing down the point with the thumb, when we wish to remove the knife from its recess. The upper or handle end, is prevented from falling out of the rod by means of a short spring bolt **b**, inserted in the side of bar B_1 with its head left flush with the wood, and which passes through an eye serewed in the end of the handle, viz.—when the spring is released after being pulled out to clear the way for the eye.

The rodman is moreover, provided for the same purpose, with a steel shod and brass tipped hardwood strut U armed with a pruning knife for cutting away branches that obstruct the view in the line of sight, which he can plant in a vertical plane directed upon the tacheometer, and thus effectually stop all oscillations of the rod to and from the latter, which are the most important to avoid.

When, with the object of securing the very highest degree of accuracy that can be attained in the determination of rod intervals and corresponding elevations and distances with the tacheometer, we are prepared to devote to the field operations $3\frac{1}{2}$