

TRUMENTS.

as he may desire, and
the hands. But the
to take hold of than
cannot turn his eyes
uckles being struck
f them without look-
the motion hesitating

Clark, applied in the
sector does not take
gears into a complete
a pair of brass or steel
By this arrangement
ution while the sector
all unavoidable irreg-
ed in the ratio of the
el. Whatever advan-
ments, I think that in
by the irregularities
with the variations of
operating to vary the
elasticity, the effect of
ver on the eye-piece is
the Vienna instrument.
f the connection in the
turning screw and the
ected by those who lay
that by a simple press-
na telescope the point-
everal seconds so as to

ess of motion when no
and so far I have found
. The Vienna telescope
ime of my examination,
hly as I wished to; but
f the field I found that
t irregular movement in
ted as between one and

two seconds of arc. This movement had no regular period, and therefore did not seem to be connected with any defect in the figure or motion of the screw. Its irregular period, if I may use the term, varied from the smallest appreciable amount to two or three seconds of time. Its most probable cause seemed to be the variable friction of the motion in right ascension and especially of the friction rollers by which the polar axis is supported at its lower end. A similar irregularity is noticeable in the Washington telescope, but when the conditions are favorable it is less than that noticed at Vienna. On the other hand, the effect of wind is much greater in the case of the Washington telescope.

Arrangement of sector.—In Mr. Grubb's large telescope, an attempt is made to give greater stability to the screw by having the ends of its axis to fit into firm supports in the massive base of the telescope, thus rendering it incapable of any motion except that of turning. The screw cannot therefore be unlocked from the sector as in the instruments by other makers. When the sector reaches the end of its motion, it has to be turned back by giving a rapid backward motion to the screw itself, for which special apparatus is provided. From what I have already said, I am of opinion that this arrangement offers no advantage to compensate for the trouble which it causes the observer.

Slow motion.—The slow motion in right ascension in the Vienna telescope is endless, instead of being confined between narrow limits as that at Washington. This is a decided improvement, saving the observer much loss of time from the motion running out, which it is sure to do from time to time.

Illumination.—The apparatus for illuminating the field of the micrometer was not in perfect order at the time of my visit, so that I cannot report upon it in this connection. It is in its general character similar to the system adopted by the Messrs. Repsold, of which I shall speak hereafter. The illumination of the divisions of the setting circles leaves nothing to be desired.

Minor points.—In the preceding remarks, I have indicated what may be considered fundamental points affecting the use of the Vienna telescope. There are, however, a number of minor points, which are of almost equal importance, so far as the practical use of the telescope is concerned. As the instrument now stands, the drawback which struck me most was the absence of any rough setting either in right ascension or declination, and the impossibility of seeing, even approximately, the