

The value of f , concluded from observations of the opposing collimators, is
 $0''.75$.

In the beginning of 1867 the object glass was taken out and cleaned. Conceiving a change in the elasticity of its bearings possible, a careful determination of f' was made on September 9, 1867. The circumstance taken advantage of to secure equality of temperature was a cold rain. Two thermometers were fastened to the stairway below the line from the object glass of the telescope to each collimator, and two more were suspended just under the roof. The upper pair indicated a higher temperature of $1^{\circ}.2$ before the observations, and $2^{\circ}.2$ afterward. The separate readings uncorrected for circle flexure were:

South coll.	North coll.
$R' = 90^{\circ}$	$R' = 270^{\circ}$
14''.69	15''.13
15. 10	15. 18
14. 97	15. 25
15. 43	15. 57
15. 51	

The readings were commenced on the south collimator. On looking into it to set it on the north one, preparatory to its second reading, the mean of wires were seen to differ quite sensibly from coincidence with the wire of the other collimator. The first reading is therefore regarded as doubtful. The result of these readings is

$$f' = +0''.78.$$

During the autumn of 1866 the levelled collimators were regularly observed at night with the shutters open, so that the mean result ought to be free from refraction. The result, from observations made by Messrs. Hall and Rogers and myself, was:

Mean excess of reading for S. collimator,	1''.86;
Uncorrected flexure coefficient - - - -	0 .93;
Correction for difference of latitude - -	-0 .12;
difference of pivots - - - -	-0 .23;
circle of flexure - - - -	-0 .37;
Resulting coefficient - - - -	+0 .21.

There is a discrepancy of more than half a second between the flexure coefficients found by the two methods. The error is probably in that determined from the levelled collimators, the conical character of their shoulders rendering their results uncertain.

The discrepancy is so great that I think it best to try also the method of comparison of direct and reflection observations.

(66) *Vertical Flexure*.—Thus far, the coefficient of $\cos Z$ has been found only by the method already set forth, namely, by comparison of the nadir reading obtained from observations of the collimators, and that obtained directly by coincidence of the wires with their images reflected from mercury. The observations were so conducted as to completely eliminate every constant error of the collimator itself, the following being the usual order:

- (1) Nadir;
- (2) Collimator B (north);
- (3) Collimator A (south);
- (4) Collimator B (south);
- (5) Collimator A (north);
- (6) Nadir.