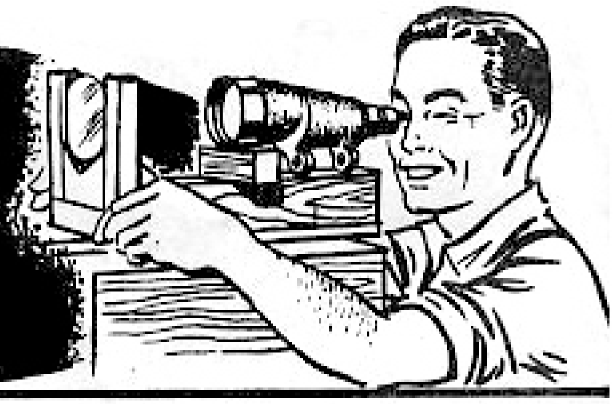


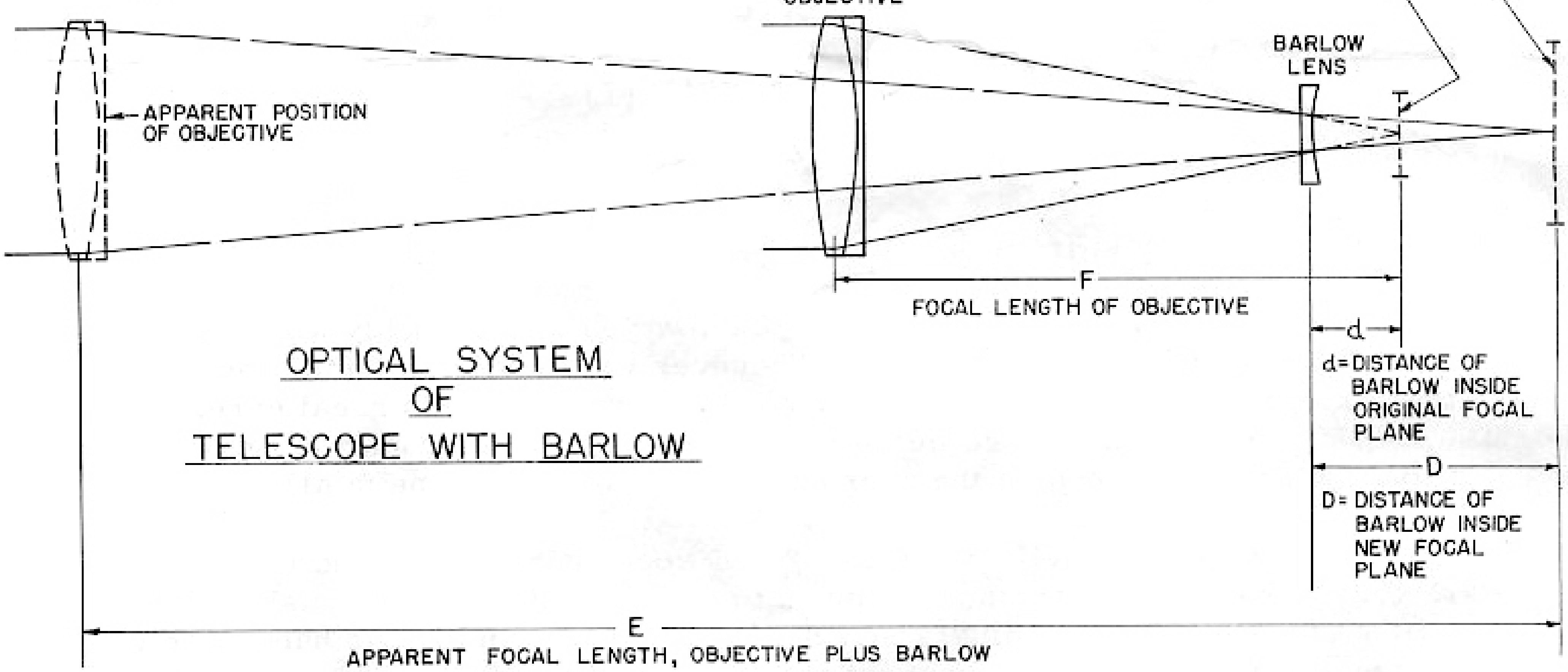
HELPFUL HINTS, DIRECTIONS AND SUGGESTIONS

EDMUND SCIENTIFIC COMPANY, BARRINGTON, NEW JERSEY

GOODWIN ACHROMATIC BARLOW
NO. 60,122

In the early nineteenth century, Peter Barlow, English physicist and mathematician, discovered that a negative lens placed just inside the focal plane of a telescope could double or triple the magnification. Since then Barlow lenses have been widely used to increase the magnification and therefore the resolving power of both refracting and reflecting telescopes. Another feature that adds to the popularity of the Barlow is its effect of increasing eye relief. Figure 1 shows the optical principles involved in the use of the Barlow.

FIG.- I

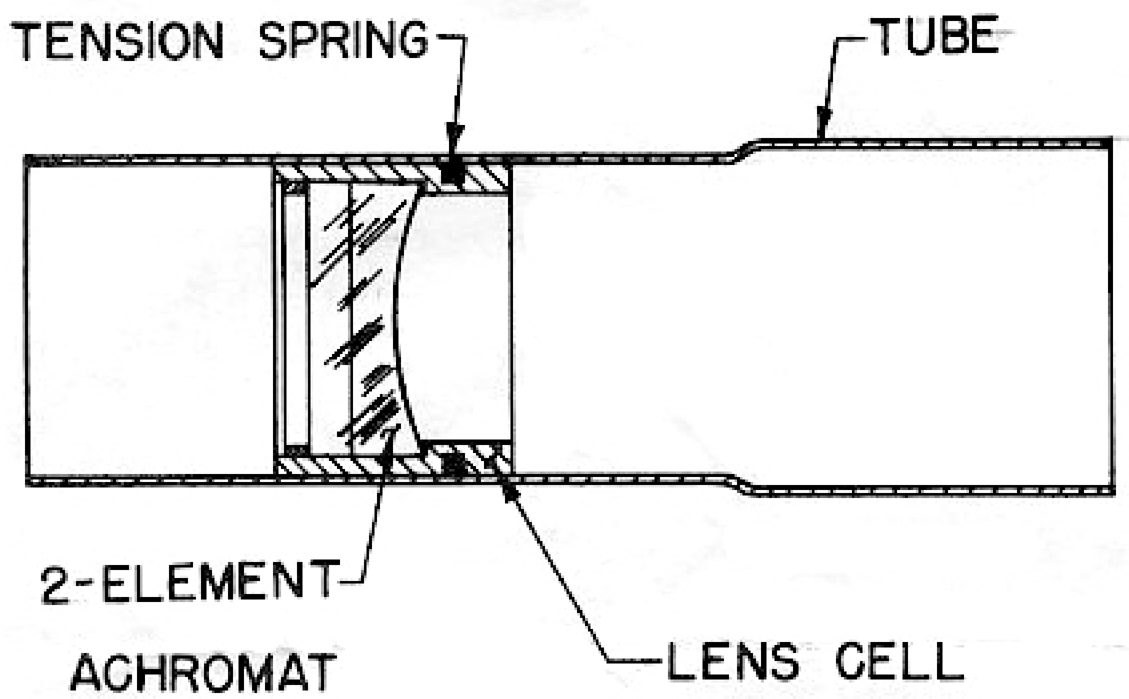


OPTICAL SYSTEM OF TELESCOPE WITH BARLOW

The standard Barlow, however, has the disadvantage of all simple lenses of introducing aberrations which reduce the quality of the image. This can be overcome by using a well designed achromat in place of the simple lens. For years the fine achromatic Barlow developed by F. L. Goodwin has been recognized for outstanding quality. The Goodwin Barlow, however, has not been available since Mr. Goodwin's death a few years ago, but we are now able to bring it to you again, made in exact accordance with the original precise specifications.

Our Goodwin Barlow consists of a cemented (two-element) achromat especially made for this use. It has an effective focal length of 44mm. (1.73" or approximately 1-3/4"). The coated achromat is mounted in a cell which is held by spring tension inside a 4" long blackened adapter tube for standard (1-1/4" o.d.) eyepieces. The position of the achromat inside the tube is easily changed to fit the characteristics of individual telescopes. Figure 2 shows the construction.

② THE GOODWIN BARLOW



Removing the Achromat from the Tube

When you first receive your Goodwin Barlow you will probably want to remove it from the tube and examine it. Whenever you do this, whether for initial inspection or later on for periodical cleaning, do so with great care. The special formula glass used in the flint element of the achromat is exceptionally brittle. Dropping the achromat on the floor could be fatal.

To remove the lens cell, use the piece of wood supplied with the Goodwin Barlow as a pusher. If you should happen to misplace this wooden pusher, an excellent substitute is an ordinary sewing thread spool. Hold your hand over the wider end (the eyepiece end) of the tube and slowly push the lens cell from the other end of the tube until it drops out into your hand.

Cleaning the Achromat

Ordinarily the only cleaning the lens will require is the removal of loose surface dust. This can best be done by gentle dusting with a soft camel hair brush or by blowing off the dust with a rubber ear syringe which can be bought at any drug store. At long intervals more thorough cleaning may be necessary.

When this is true, remove the lens cell carefully as directed above. Remove the surface dust by brushing or blowing. Take good quality lens tissue and moisten it slightly with lens cleaning fluid. Wipe the exposed surfaces of the lens gently. It is best always to try to avoid touching the lens surfaces with the fingers.

Returning the Achromat to the Tube

Examine closely the achromat in its cell. Note that the surface of the lens near one end of the cell is virtually flat while the other surface is strongly concave. Be sure to insert the lens so that the flat surface is toward the narrow end of the tube and the concave surface toward the wider end (see Figure 2). Insert the lens cell from the wide end of the tube. Gently drop it in so that it comes to rest with the tension spring in contact with the collar where the tube decreases in diameter. Using the wooden pusher, press gently and evenly on the cell. The tapered walls of the tube will compress the spring sufficiently to allow the cell to enter the narrower section.

Testing the Goodwin Barlow

First make certain that the telescope is properly collimated. Remember that you are about to increase magnification and that inaccuracies of adjustment will be magnified just as much as anything else.

Choose a night when seeing is good. Check for turbulence by observing critical objects through your telescope without the Barlow. If conditions are poor, wait for a night when seeing is good.

Using the wooden pusher, slide the lens cell down the tube until it is flush with the narrow end. Remove your eyepiece from the holder and in its place insert the Goodwin Barlow tube. Then, in the flared end of the Barlow tube, insert your longest focal length eyepiece. Do not use an eyepiece with focal length less than 1/2".

Focus your telescope on some critical object and test various positions of the Barlow in its tube to find the one that gives you optimum performance. The greater the distance between the Barlow and the eyepiece, the greater will be the magnification. There will, however, be an optimum position beyond which star images will loose crispness and definition. This position depends on specific optical characteristics of the individual telescope. Trying to stretch magnification beyond this point is completely meaningless and is something that would be done by only the rankest of amateurs.

When you have determined the optimum position for your Goodwin Barlow, you may wish to compute the optical characteristics of your telescope with the Barlow in position. To do so, consult Figure 1 and use the formulas given on the top of Page 4.

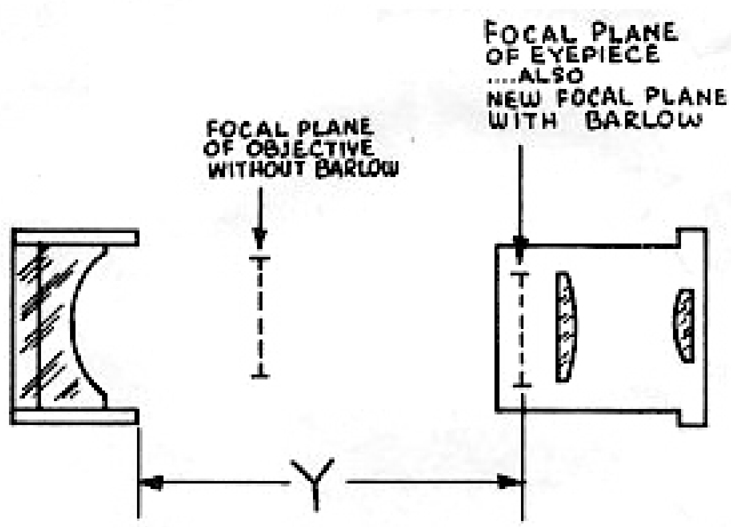
Formulas for Computing Optical Characteristics

F - focal length of objective
f - focal length of the Barlow lens (44mm.)
E - apparent focal length, objective plus Barlow
M - magnification factor of the Barlow
d - distance of Barlow inside original focal plane
D - distance of Barlow inside new focal plane

$$E = \frac{F\,f}{f - d} \qquad M = \frac{E}{F} = \frac{f}{f - d} \qquad D = f\,(M - 1)$$

For a quick check of the magnification factor for your Goodwin Barlow at the optimum position you have chosen, measure the distance between the end of the lens cell and the image plane of your eyepiece. (In the Edmund No. 5223, 28mm. Kellner eyepiece, for example, the image plane of the eyepiece is 7/8" back from the small end of the eyepiece tube.) Consult the following diagram and chart to find the magnification:

(3)



Approximate Y Distance	Approximate Magnification
0"	1.25 X
1/16"	1.5 X
7/8"	1.75 X
1-5/16"	2.0 X
1-3/4"	2.25 X
2-3/16"	2.5 X
2-5/8"	2.75 X
3-1/16"	3.0 X

Using the Goodwin Barlow with Other Eyepieces

When you have found the optimum position for use of the Goodwin Barlow with your long focal length eyepiece, you will find that this position will give good results with other eyepieces as well. Although there might be a slight difference in optimum position for different eyepieces, this is usually so small as to be insignificant.

When properly used, the Goodwin Barlow will give you superb results. Do not, however, expect it or any other supplementary lens to extend your telescope beyond the limitations that are inherent in its optical characteristics.