Dispensing 1

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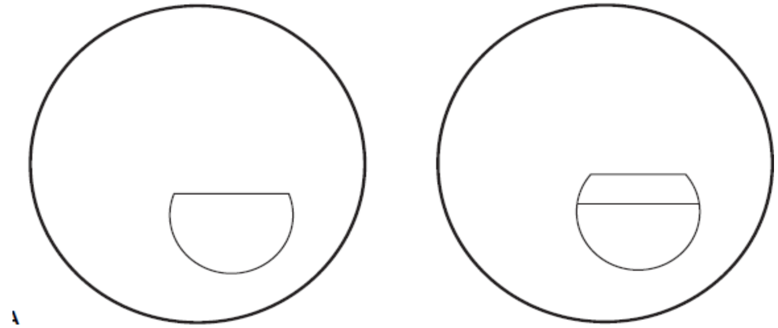
Syllabus

- Ophthalmic lenses
  - Uses of spectacle lenses
  - Measurement of lenses power
    - Neutralisation
    - Lensmeter
      - Uses
      - Laying out lens
- Spectacle frames
  - Spectacle frame parts
  - Spectacle frame dimensions
  - Datum system
  - Box system
- Glazing :
  - Preparing the lens and the frame
    - Uncut lenses
    - Finished lens shape and dimensions
    - Effective lens diameter
    - Laying off and Optical Centration
    - Edge forms and finishes
    - Fix the lens in the frame
- Ophthalmic lenses industry and materials
- Spectacle frames industry and materials
- Prisms:
  - Definition
  - Uses
  - Prismatic effect

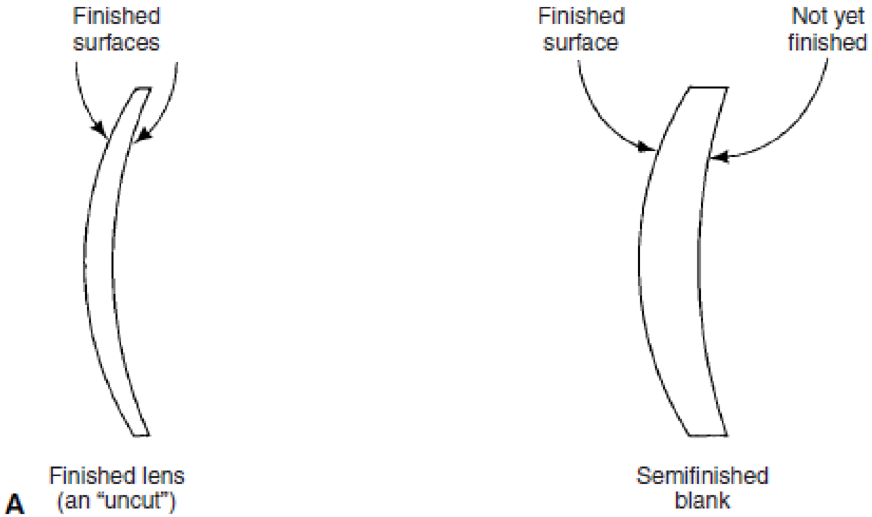
Lens Identification

- Lens category :
  - Single vision lenses
  - Segmented multifocal lenses
  - Progressive addition lenses
  - prism

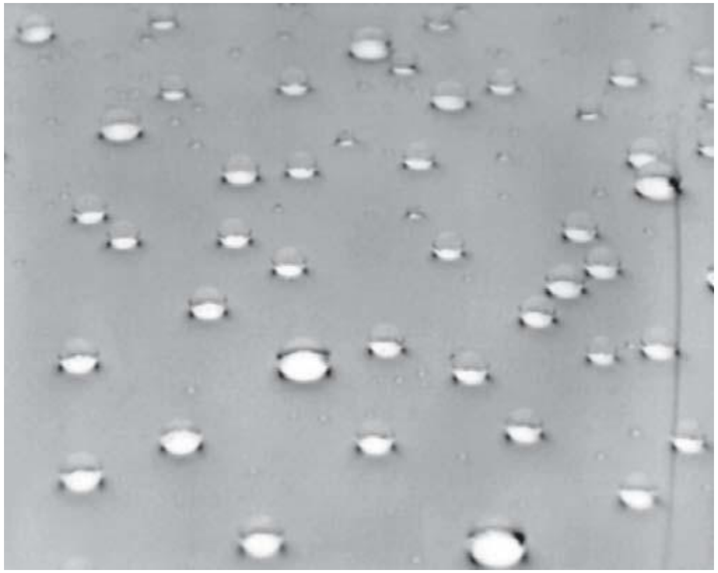


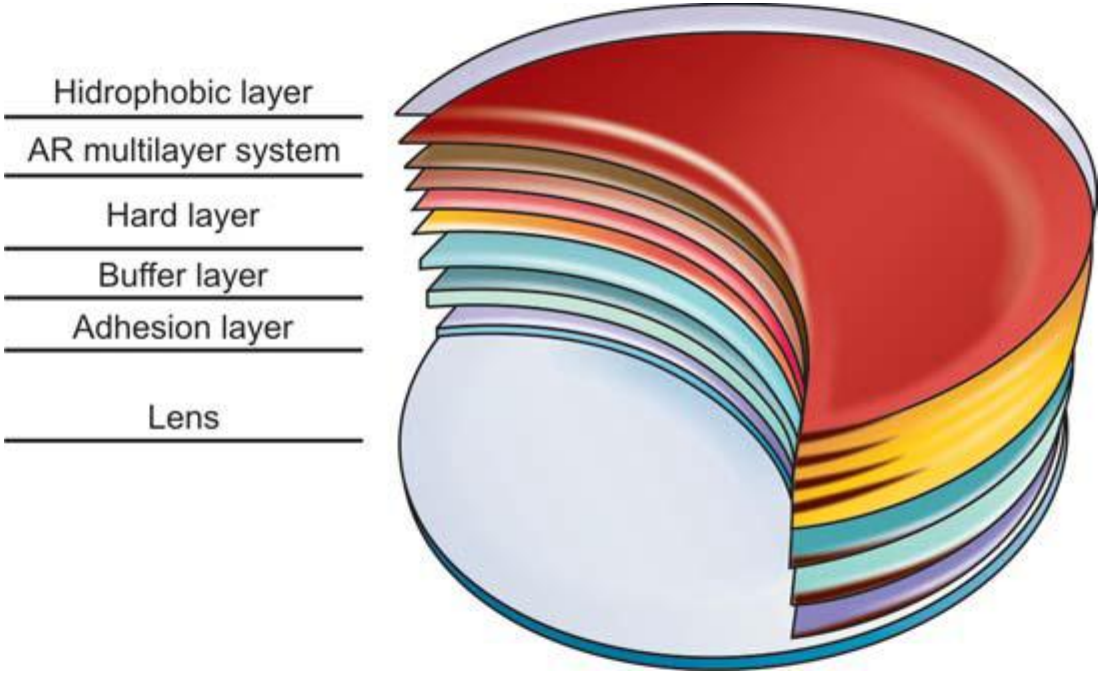
- Lens material :
  - Plastic
    - CR-39,
    - Polycarbonate,
    - High- Index Plastic Lenses
  - Glass Lenses

- Lens readiness
  - finished lenses.
  - Semi-finished
  - uncut lenses
  - stock single vision lenses.

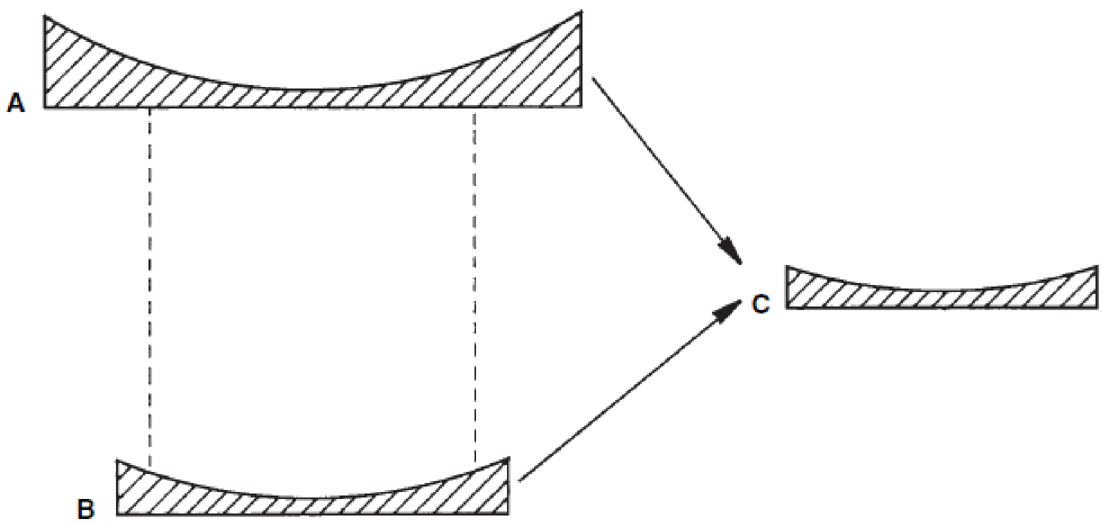


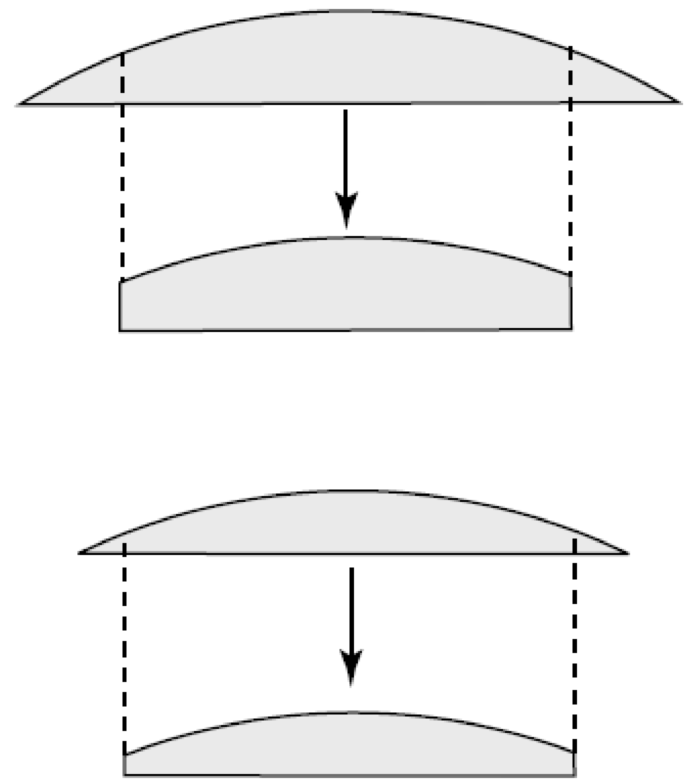
- Coating and tinting
  - Tinting
  - Mirror coating
  - AR coating
  - Hydrophobic coatings
  - Anti-fog coating



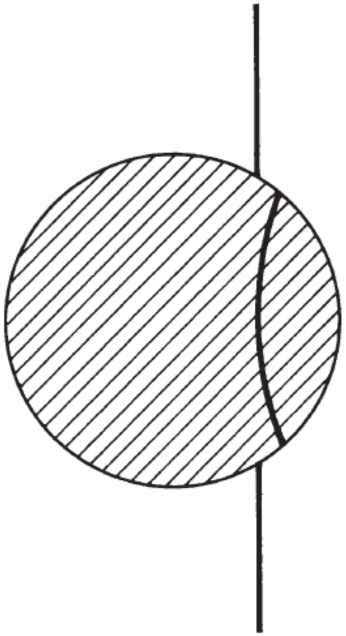


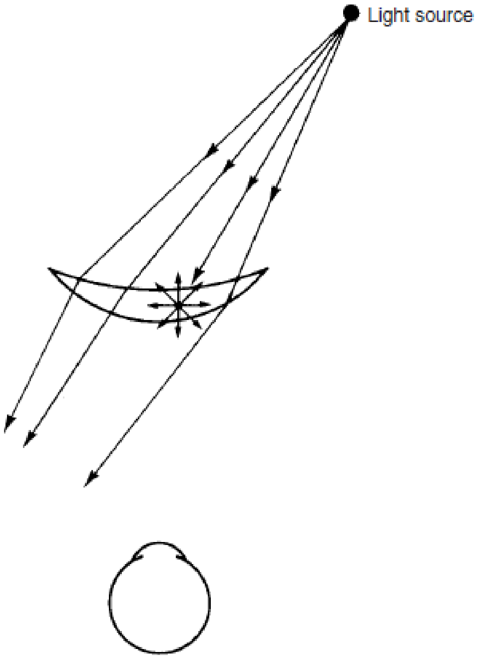
- Diameter

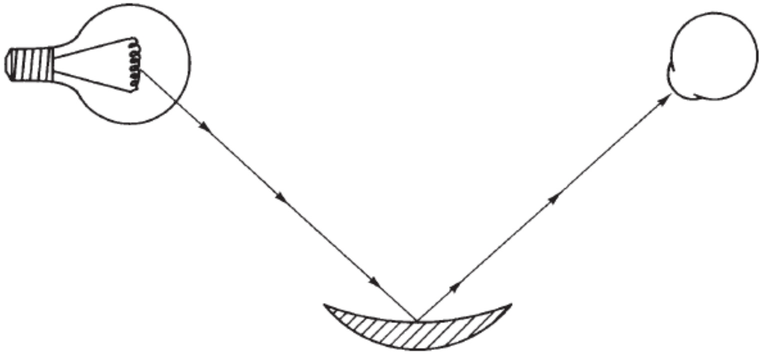




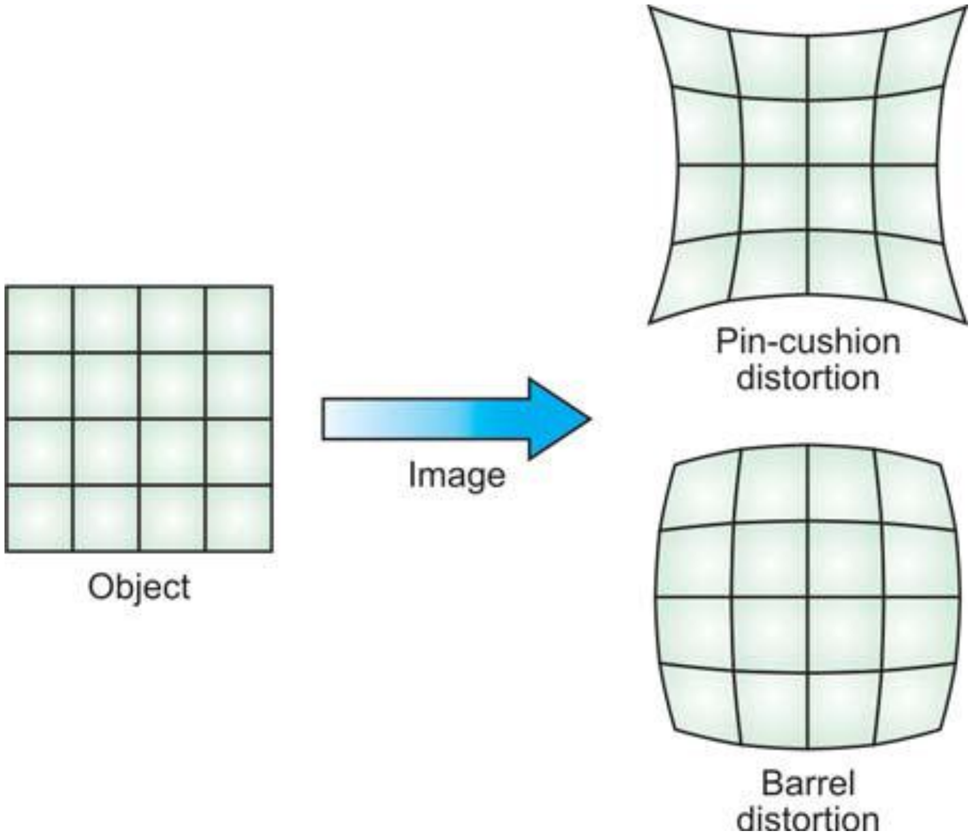
- Lens optical quality inspection
  - Surface inspection
  - Body inspection
  - Lens free from waviness







- Lens power :
  - Plus or minus
  - Cylinder.



Measurement of lens power

- Checking the lens power of spectacle
- Determining the specification of an unknown lenses

Methods :

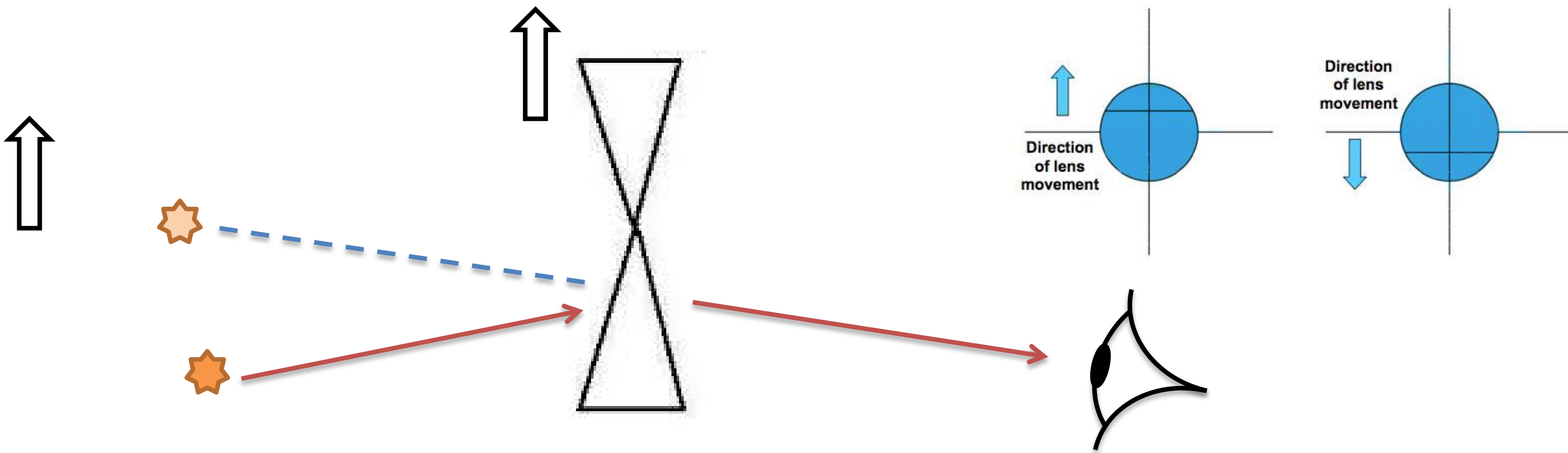
1. Neutralization
2. Lens (Geneva) clock
3. Focimeter

Neutralization

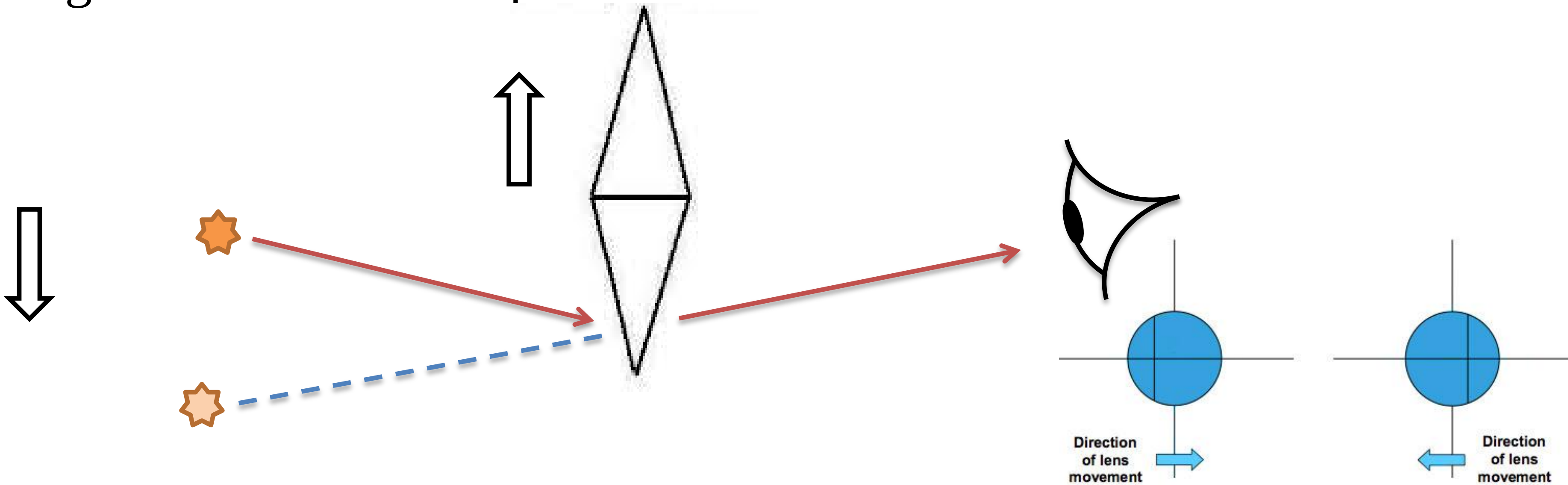
- Lens with unknown power combined with known lens power >> zero power

- Known lens power neutralizing the unknown lens

With movement in minus lenses



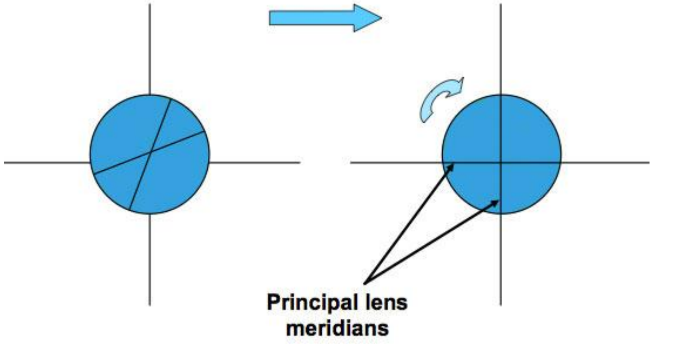
Against movement in plus lenses



Neutralizing unknown spherical power lenses

1. Cross target
2. Mark the optical center
3. Determine the image movement (with or against)
4. Positive or negative
5. Using lenses of opposite powers to neutralize until get no movement .
6. The lenses must be held in contact
7. In high powers , use an aperture to restrict the view .
8. Bracketing technique

Neutralizing unknown cylinrical or sphero-cylinrical power lenses



1. Identify the lens by the rotation test.

1. Mark the optical center

2. Determine the image rotation (with or against)

3. Positive or negative

4. Using lenses of opposite powers to neutralize each meridian by spherical lenses .

5. Or use spherical lens to neutralize one meridian , leave it in place and use cylinder lens to neutralize the other meridian.

6. Determine the axis by the protractor.

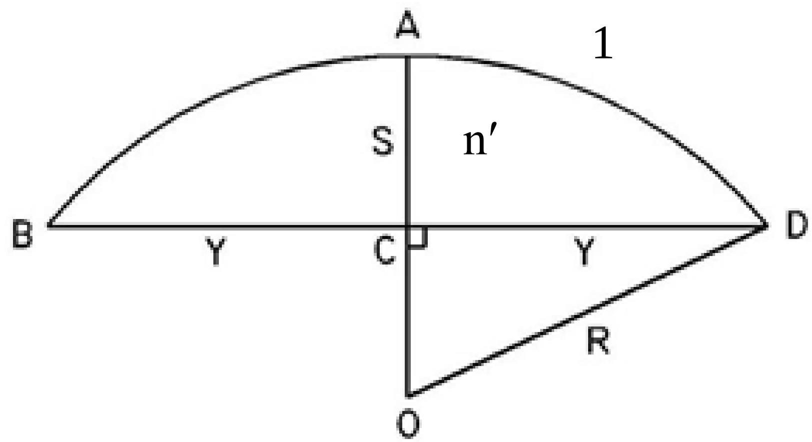
Geneva clock

$F = (n' - n) / r$

By knowing r and n′ we can calculate the surface power in air (n=1)

$r = y^2 / 2s$

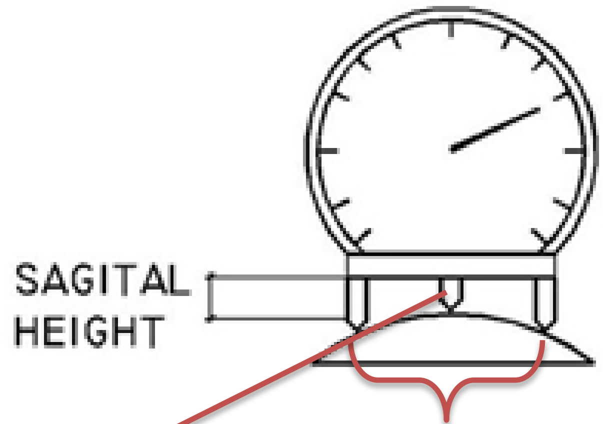
By knowing s and d we can calculate r and thus the surface power F



$r = y^2 / 2s$

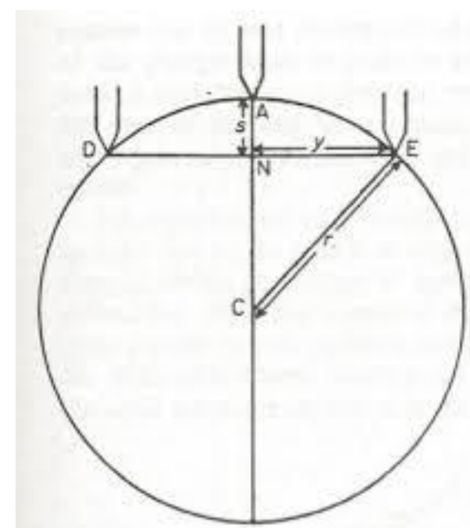
$n = 1.53$

$F = 0.53/ r$



Two fixed legs will give fixed diameter >> fixed y^2

movable leg will determine the sag by the difference in height between it and the other two fixed legs



Geneva clock is a mechanical dial indicator that is used to measure dioptric power of a lens. Assuming the lens is made of a material with particular refractive index .

The clock will measure the power of each surface

If the power given by rotating the clock remains unchanged , the surface is spherical.

If the power given by rotating the clock shows change , the surface is either cylindrical or toroidal. >>> we should determine the maximum and minimum powers

Finally , the powers of each surface can be added to give the approximate optical power of the whole lens.

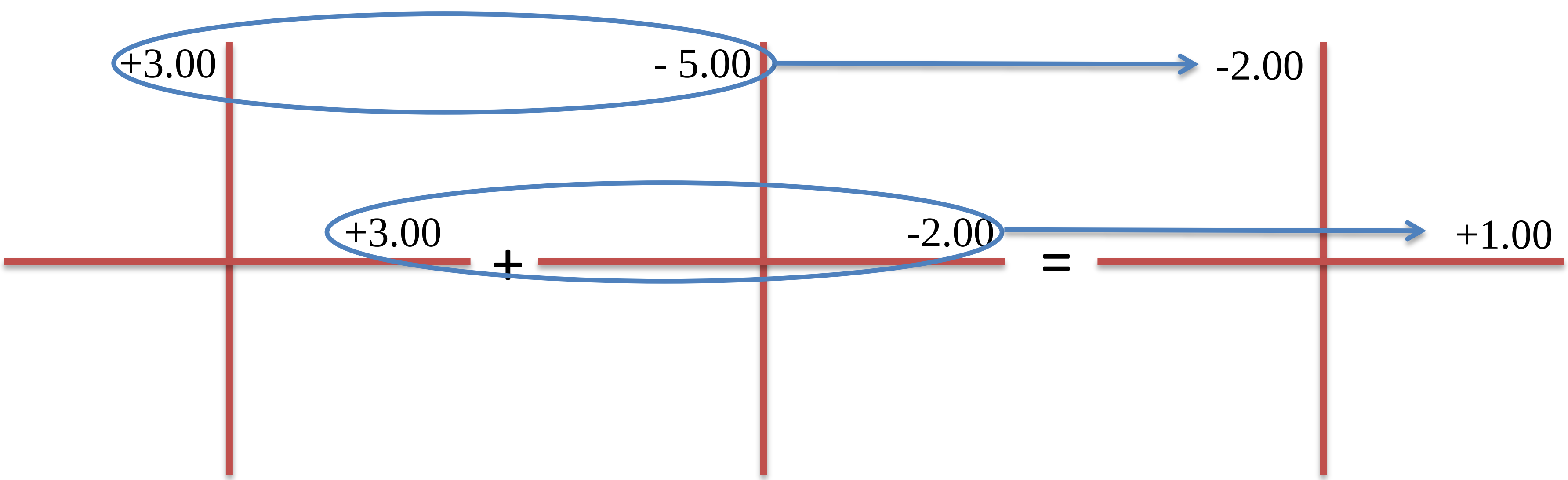
Example :

Front surface power measured by lens clock gives + 3.00 Ds for all meridians

Back surface power shows maximum power -5.00 D @ 90 and minimum power -2.00 D @180

What is the power of the lens ??

Answer :



+1.00 Ds / -3.00Dc × 180

Correcting for refractive index

If a lens with a refractive index of 1.7 for example is measured with a lens clock calibrated with a refractive index of 1.523, the power must be corrected.

Example :

In lens made of material of refractive index 1.7 , surface power is measured by clock lens calibrated with $n' = 1.523$ is -3.0 Ds , what is the correct power of this surface ??

Answer :

First we calculate r which gives -3.00 Ds when $n' = 1.523$

$r = n'-1 / F$ >> $r = 0.523 / -3.00$ >> $r = -0.174$ m

Then, the power recalculated using the refractive index of the lens (1.7)

$F = n'-1 / r$ >> $F = 0.7 / -0.174$ >> $F = -4.00$ Ds

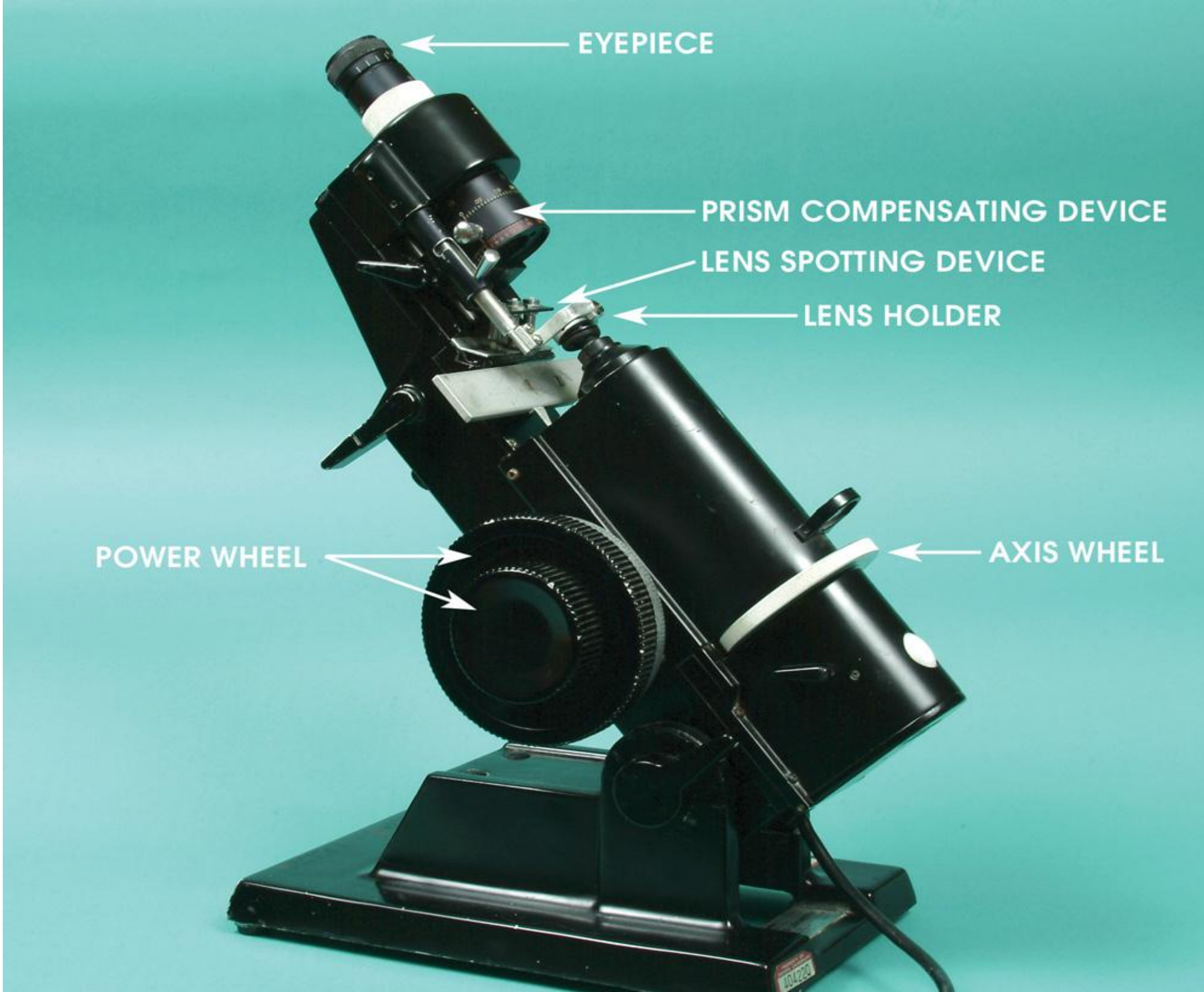
Lensmeter

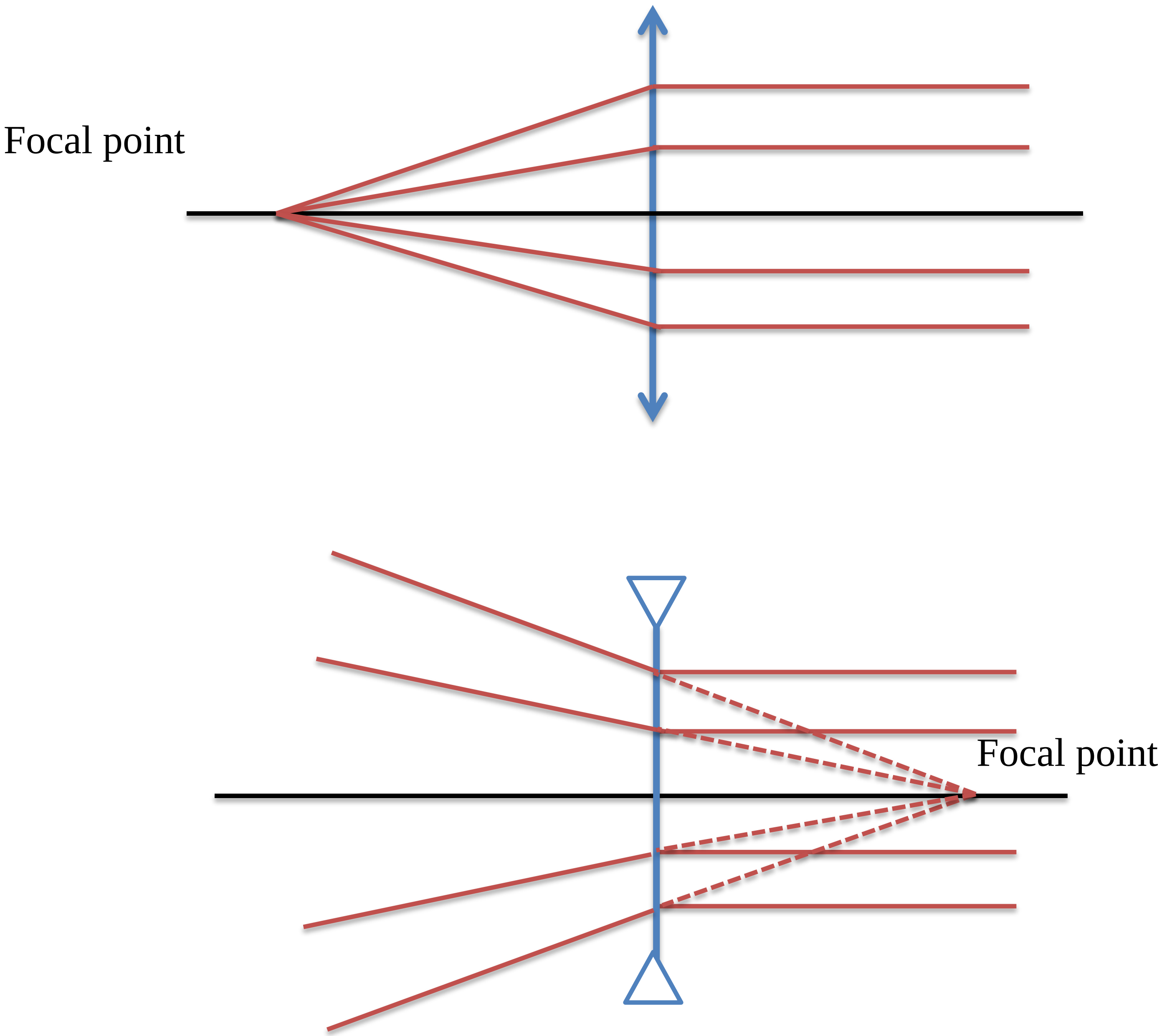
- Lensmeter (commercially known as a Lensometer, Focimeter, or Vertometer)

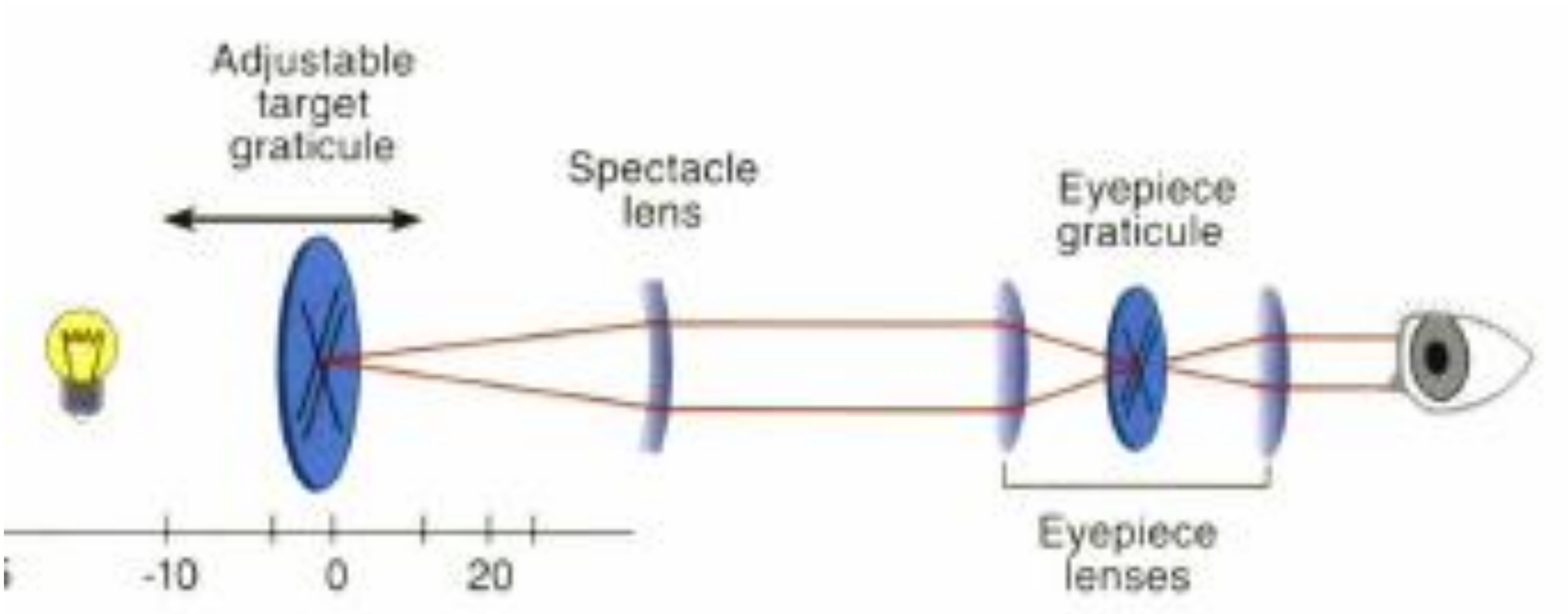
- Used in :
  - Measuring the power of spectacles and contact lenses.
  - Laying out lenses .

- Lensmeters may work manually or automatically.

- The most commonly used lensmeters are manual and use a crossed line target.


EYEPIECE
PRISM COMPENSATING DEVICE
LENS SPOTTING DEVICE
LENS HOLDER
POWER WHEEL
AXIS WHEEL


Focal point
Focal point

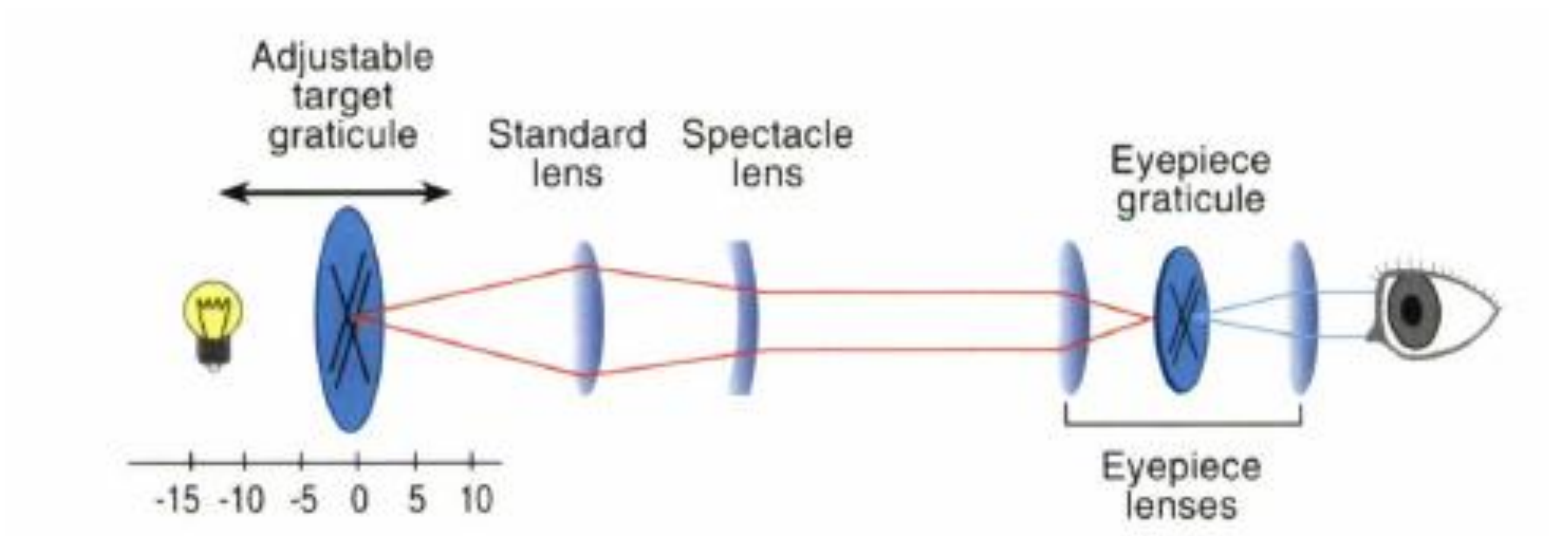


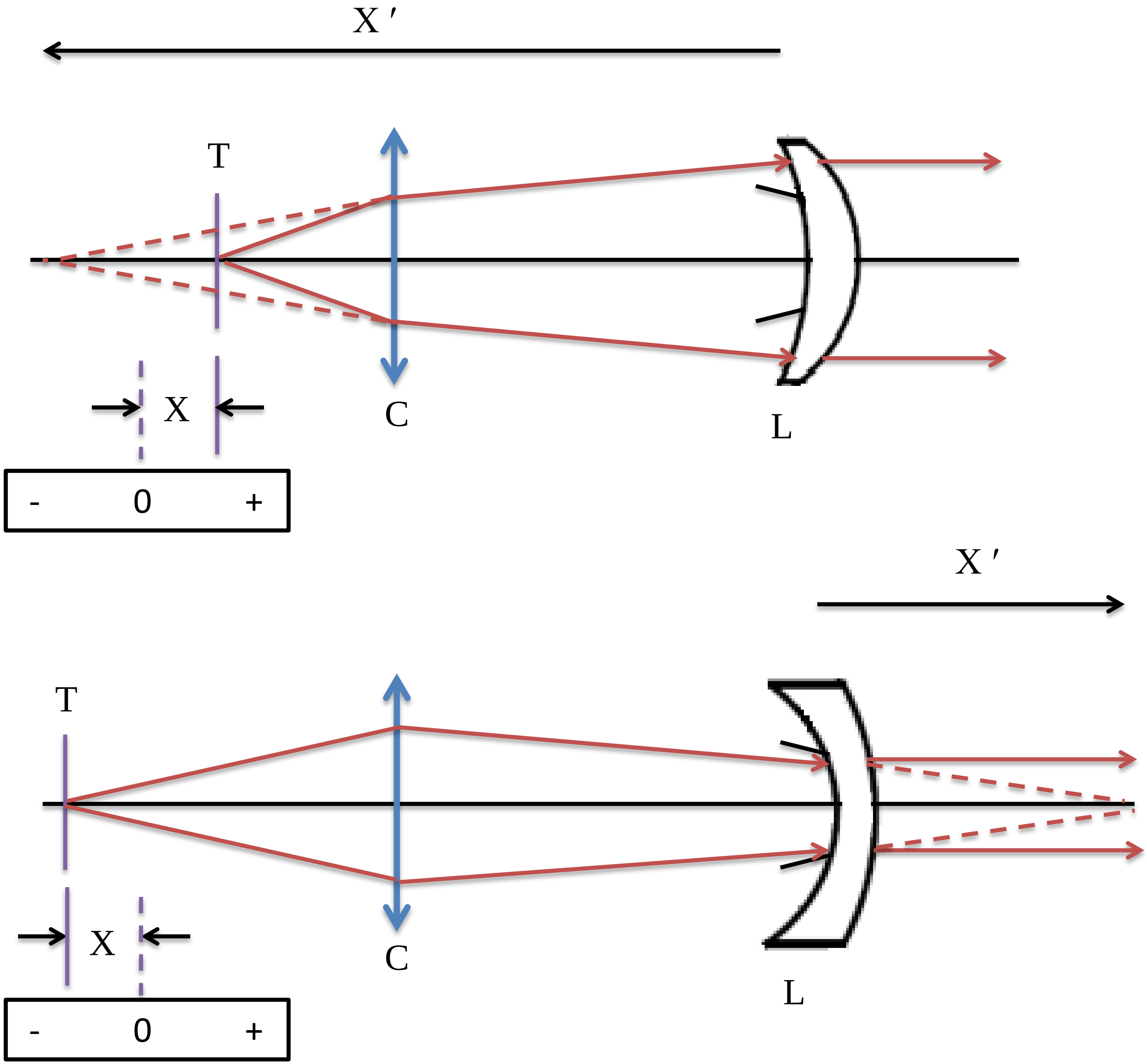
There are 2 major problems with the simple lensmeter. :

- The first is that the instrument would have to be too large to be practical.
  - To measure a +0.25 D lens, the instrument would have to be 4 m long!
- The second problem is that the scale for measuring the lens power would be nonlinear.

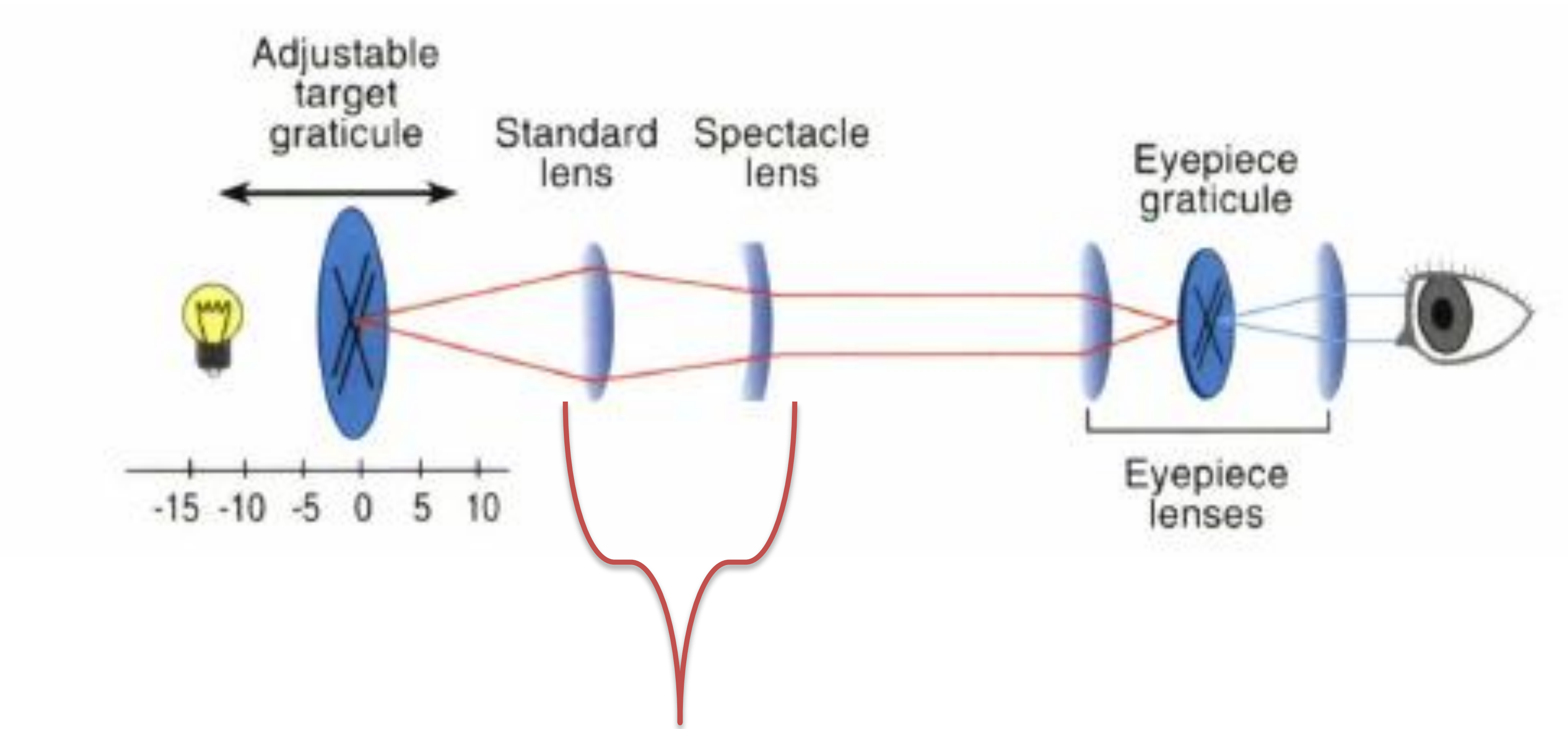
Introducing another lens into a simplified lens meter (standard lens)

- Shortens the required length of the instrument considerably.
- Makes the dioptric scale of the instrument linear (and therefore more accurate at higher dioptric powers).

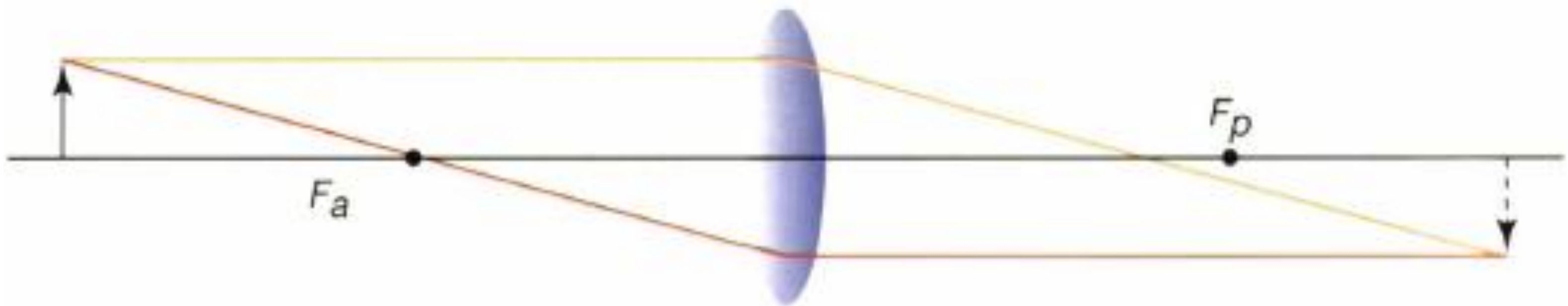



X′
T
X
C
L
- 0 +
X′
T
X
C
L
- 0 +

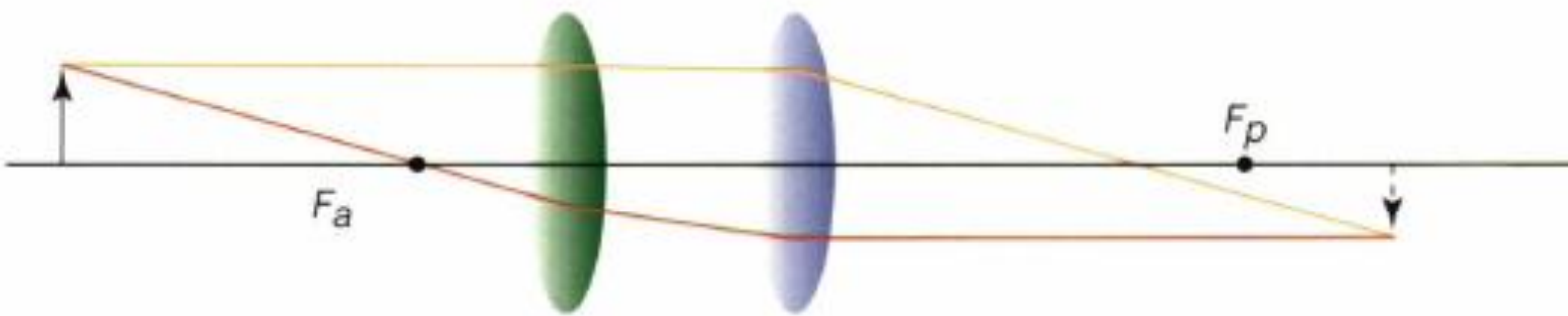
- The relationship of target movement to power of unknown lens can be deduced from Newton's relationship :
  - $f_s^2 = - x \cdot x'$ >>> linear relationship
  - $(1000 \times 1000) / F_s^2 = - x \cdot 1000/F_u$
  - $x = (F_u \times 1000) / F_s^2$
- Therefore, for a standard lens +25D , target movement (x) per diopter will be 1.6 mm /D
- For a range of +10 D to -10 D the target movement of only 32 mm is required.



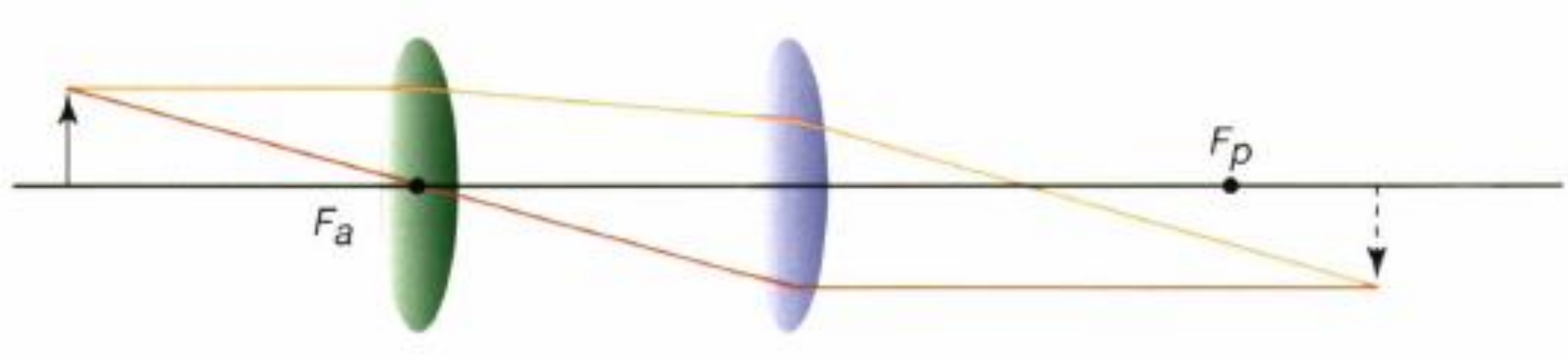
Different unknown lenses powers and the distance between the unknown lens and standard lens will change both the target image size and location.



F_p
F_a



F_p
F_a

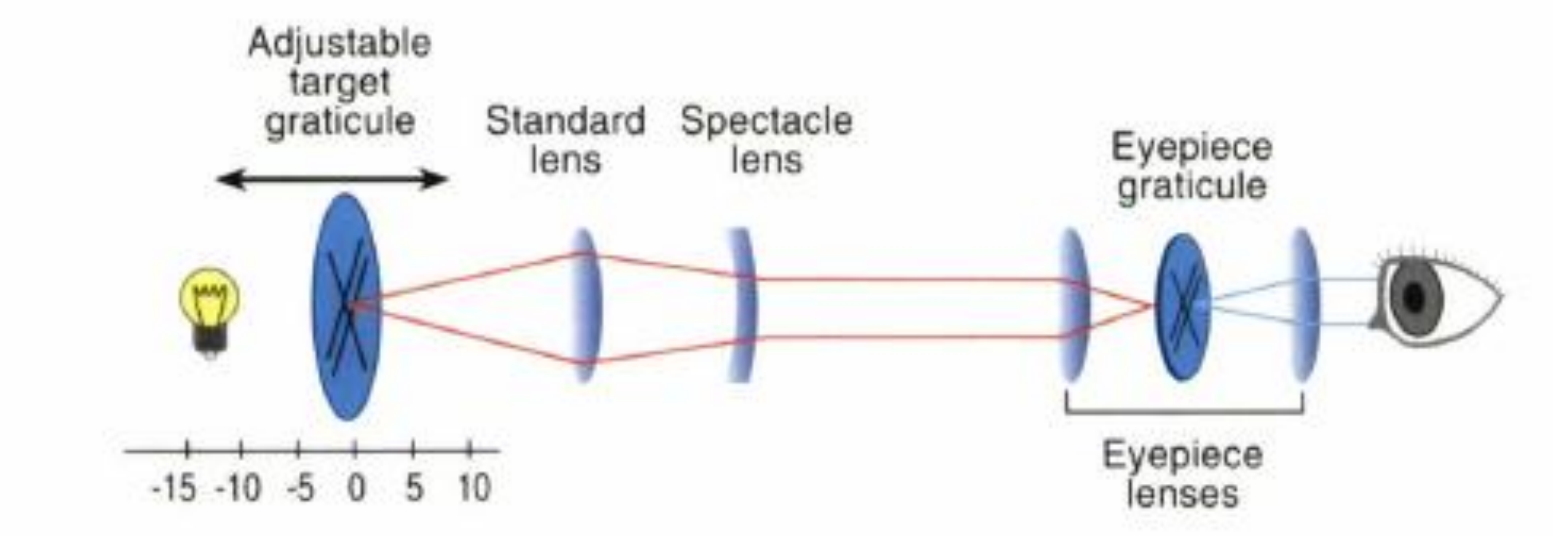


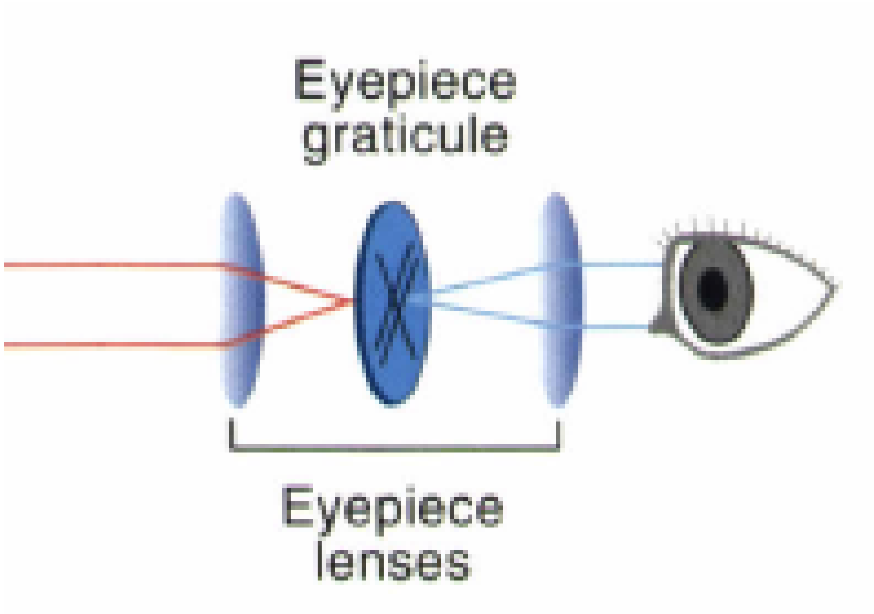
Knapp's law

The image size does not change if the posterior nodal point of the second lens coincides with the anterior focal point of the original lens.

Knapp's law, the Badal Principle and the lensmeter

- Manual lensmeters make use of the same principle.
- When applied to lensmeters, Knapp's law is called the Badal principle.





Astronomical telescope :

- Consisting of an objective and an eye piece .
- Is adjusted so that it is focused on infinity, and therefore only parallel light will be seen in focus