

Turning Spheres

Presentation by

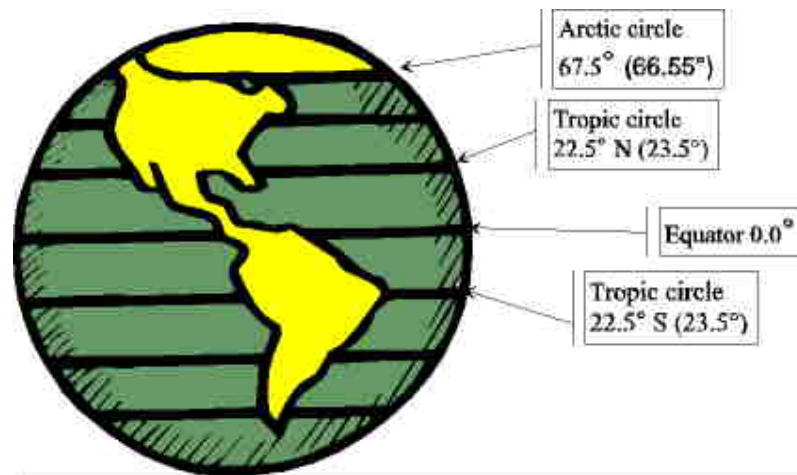
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Turning Spheres

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1. Terminology:

- a. Equator: a line around the sphere located at the center between opposite ends, the middle
- b. Tropic circles: a line around the sphere displaced 22.5° from the equator
- c. Polar circle: a line around the sphere displaced 67.5° from the equator (or 22.5° from the pole)
- d. Pole: the point equidistant from the equator or 90° radially from the equator
- e. Sphere: a ball

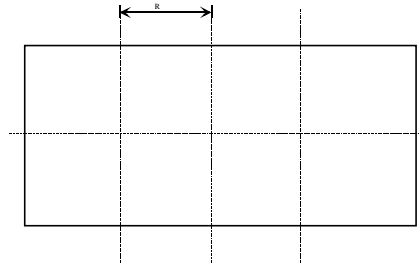


2. Requirements

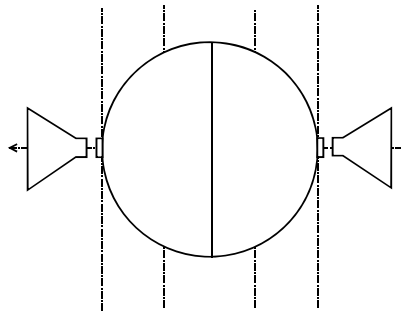
- a. Calipers, ruler, dividers, pencil, compass, graph paper, cutoff saw
- b. Cup chuck, live center with cone, spur drive
- c. Gouges, skewers, parting tool
- d. Good, bright light

3. Free hand method

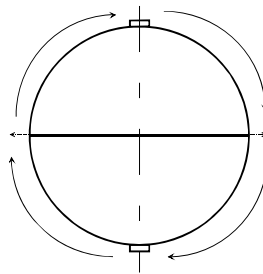
- a. Mount stock
- b. Turn to cylinder
- c. Transfer diameter to long axis with pencil



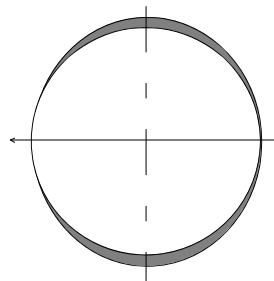
- d. Reduce stock beyond pencil marks
- e. Turn into sphere
- f. Cut off endstock beyond pencil marks



- g. Rotate sphere 90°, remount in cup chuck

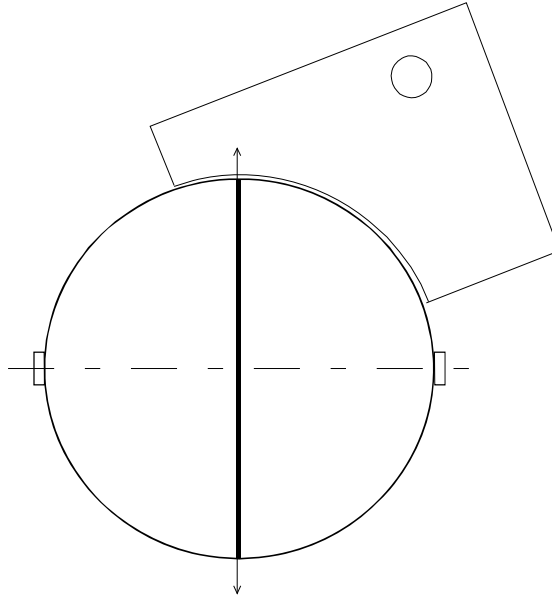


- h. Turn away any shadows



4. Template method

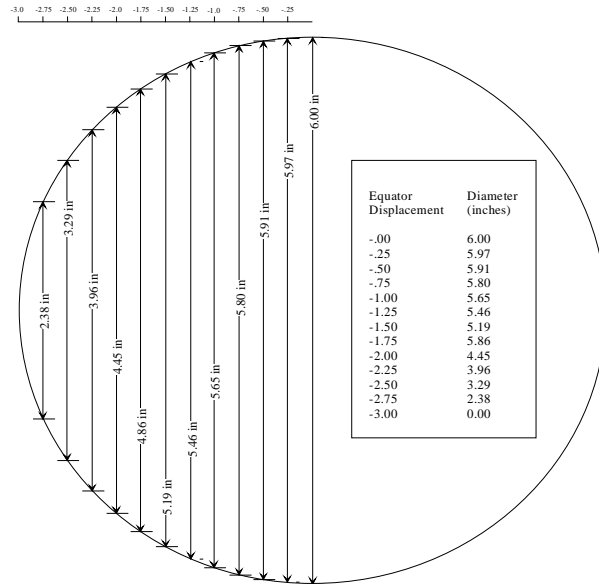
- a. Mount and turn as above
- b. Check progress against a prepared $\frac{1}{4}$ circle template



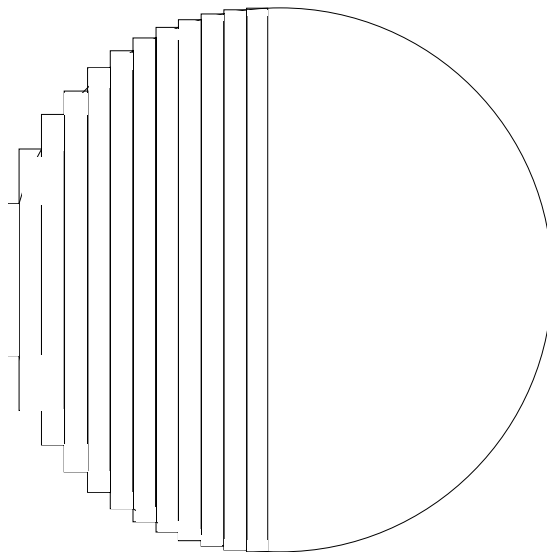
- c. Complete as above

5. Step method

- a. Draw circle the exact diameter of sphere
- b. Measure cord of circle at fixed steps from equator



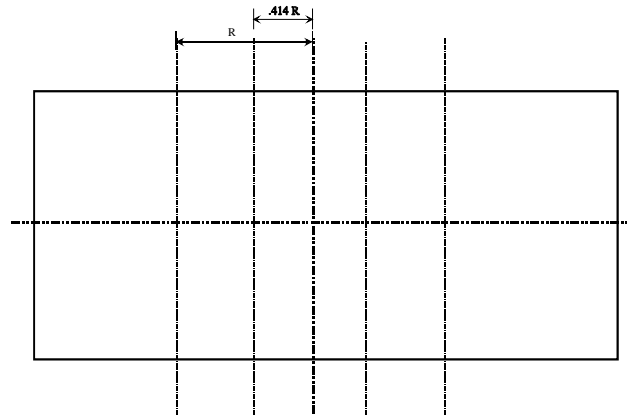
- c. Create a cylinder
- d. With parting tool, transfer cord measurement to the cylinder
- e. Turn sphere by connecting the cord steps



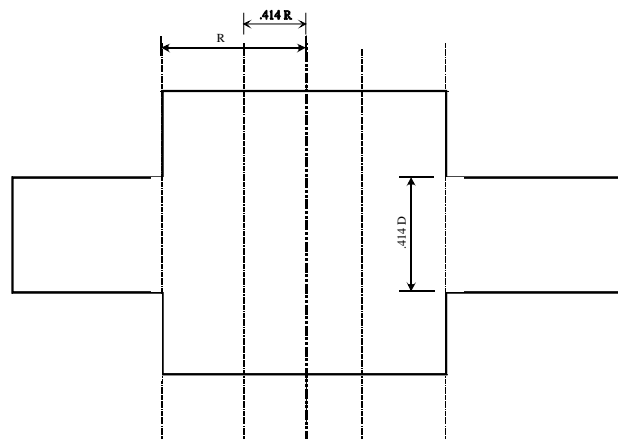
- f. Complete as in other methods

6. Octagon method

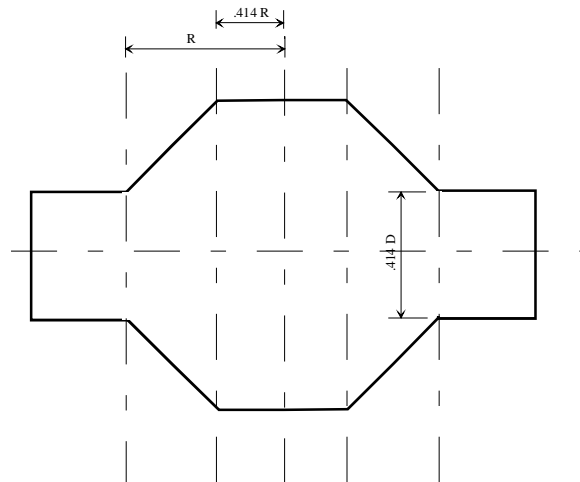
- a. Create a cylinder
- b. Lay out equator, tropic circles, and polar circle locations



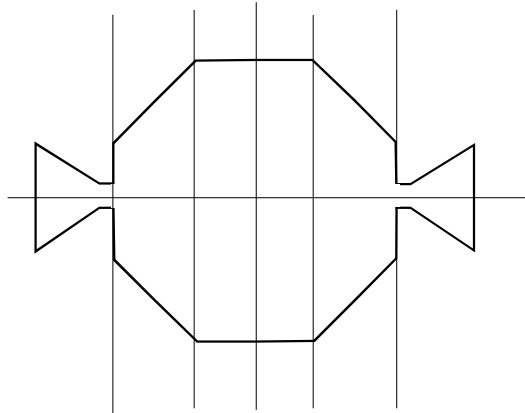
- c. Reduce end to polar circle dimension



- d. Turn diagonal from tropic circles to polar circles diminution

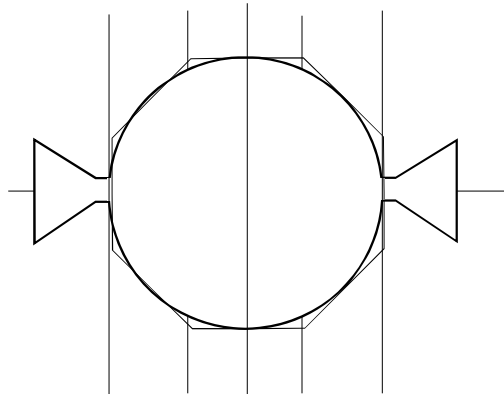


e. Reduce tendons



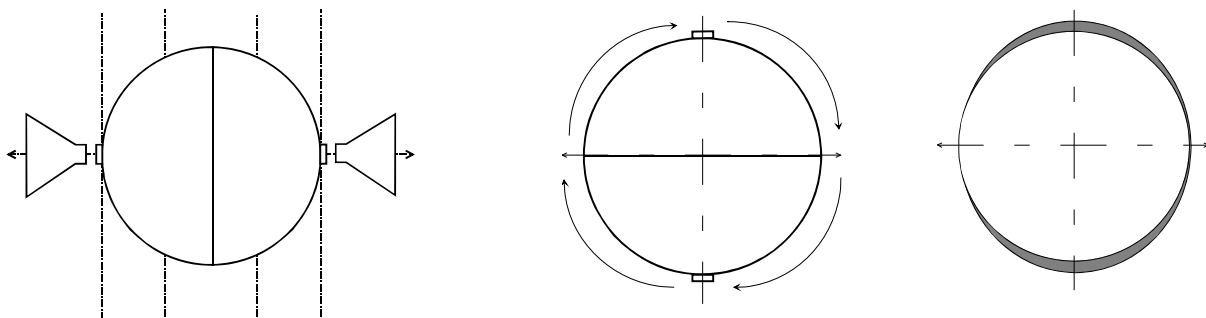
f. Mark center of all flats

g. Turn sphere leaving all lines



h. Rotate sphere 90°, remount in cup chuck

i. Turn away any shadows



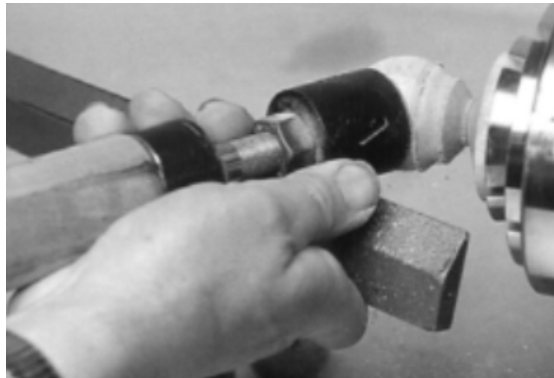
1. Circle cutter method

- a. Prepare a hole cutter to become a turning scraper



- b. Complete turning on first axis

- c. Apply circle cutter to smooth surface



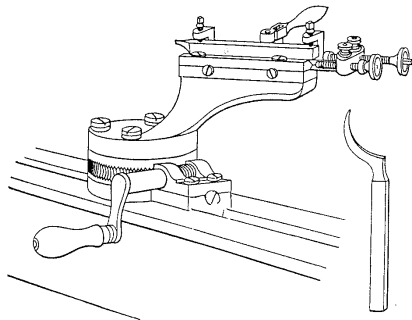
- d. Rotate sphere 90°, remount in cup chuck

- e. Turn away any shadows

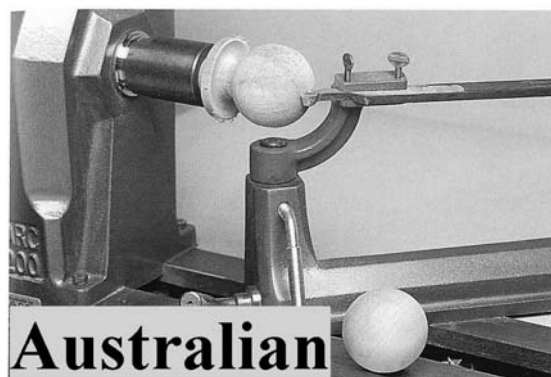
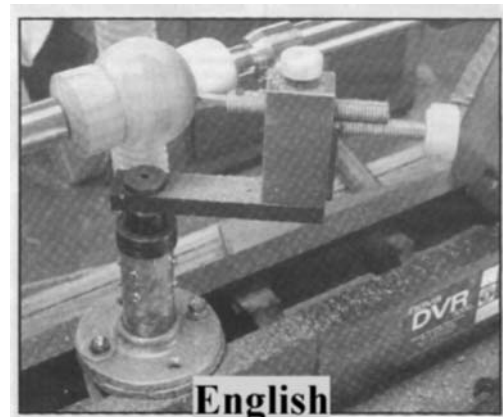
- f. Apply circle cutter to smooth surface

1. Mechanical aids requirements

- a. Device must be mechanically stable and robust
- b. Device must rotate at center of ways at lathe's axis
 - i. Must move smoothly
 - ii. Must cover a minimum of 90° from perpendicular to axis
- c. Cutter must be at center height
- d. Cutter must advance toward center on axis
 - i. Macro advance, to set sphere diameter
 - ii. Fine advance, to cut sphere



A 19th-century sphere turner. It has two cutters, that shown on the right being for parting off.



Notes
