space of 2 inches. Now, it is a fundamental principle in mechanics, that the *weight* and *power* will exactly balance each other, when they are *inversely* as the spaces they pass over. Hence, in this example, 2 pounds, 8 feet from the prop, will balance 8 pounds 2 feet from the prop; therefore if we *divide* the distance of the *power* from the prop by the distance of the weight from the prop, the quotient will always express the *ratio* of the weight to the *power*; $\frac{8}{2}=4$, that is, the weight will be four times as much as the power, $42\times4=168$. Ans. 168 lbs.

192. Supposing the lever as above, what power would it require to raise 1000 pounds? Ans. $\frac{1000}{4}=250$ lbs.

193. If the weight to be raised be 5 times as much as the power to be applied, and the distance of the weight from the prop be 4 feet, how far from the prop must the power be applied? *Ans.* 20 feet.

194. If the greater distance be 40 feet, and the less half of a foot, and the power 175 lbs., what is the weight?

Ans. 14000 pounds.

195. Two men carry a kettle weighing 200 pounds; the kettle is suspended on a pole, the bale being 2 feet 6 inches from the hands of one, and 3 feet 4 inches from the hands of the other; how many pounds does each bear.

Ans. $114\frac{2}{7}$ lbs. and $85\frac{5}{7}$ lbs.

196. There is a windlass, the wheel of which is 60 inches in diameter, and the axis, around which the rope coils, is 6 inches in diameter; how many pounds on the axle will be balanced by 240 pounds at the wheel?

Note. The spaces passed over are evidently as the *diameters* or the *circumferences*; therefore, $\frac{60}{6}=10$, ratio.

Ans. 2400 pounds.

197. If the diameter of the wheel be 60 inches, what must be the diameter of the axle, that the ratio of the weight to the power may be 10 to 1? *Ans.* 6 inches.

Note. This calculation is on the supposition that there is no friction, for which it is usual to add $\frac{1}{3}$ to the power which is to work the machine.

198. There is a screw whose threads are 1 inch asunder, which is turned by a lever 5 feet=60 inches long; what is the ratio of the weight to the power?

Note. The power applied at the end of the lever will de-