Tensile strength: If a bar, 1″ square, of iron is torn asunder by a strain of 4,500, what force will be required to break a bar 3″ square?

$$\begin{array}{rcrcr} 1'' & : & 3^2 & :: & 4{,}500 \\ 1 & : & 9 & :: & 4{,}500 \\ & & & & 9 \\ \hline & & & & 1)40{,}500 \\ \hline & & & & 40{,}500 \text{ lbs.} \end{array}$$

Calculate the weight of an iron ball six inch by six inch diameter.

$$\begin{array}{r} 6'' \\ 6'' \\ \hline 36 \\ 6 \\ \hline 216 \text{ cube of ball.} \end{array} \qquad \begin{array}{r} .1377 \text{ constant number} \\ 216 \\ \hline 8262 \\ 1377 \\ 2754 \\ \hline 29.7432 \text{ lbs. weight.} \end{array}$$

Now as this is only a little over one quarter of a pound too heavy, it may be used with a good deal of certainty when scales are not handy, or the ball not easy to remove, etc.; for a 6″x6″ iron ball weighs by scale 29.484 lbs. and by calculation 29.7432 lbs., showing a little over a quarter of a pound in error.

To what height must a safety-valve, 8″ diameter, be lifted to allow a free escape of steam equal to area of valve?

Rule:

$$\frac{d^2 \times .7854}{d \times 3.1416} = \frac{d}{4}$$

$$8 \times 8 = \frac{64 \times .7854}{8 \times 3.1416} = \frac{50.2656}{25.1328} = 2'' \text{ or } \frac{8}{4} = \frac{^{4}8}{-} \; 2'' \text{ height.}$$