Then we have

$$\frac{x^2y}{30-x} = 320 \text{ and } 30y - x\,y = 245$$

Solving this equation $x = 16$.

(2) If a carriage wheel $14\frac{2}{3}$ ft. in circumference take one second more to revolve, the rate of the carriage per hour will be $2\frac{2}{3}$ miles less; how fast is the carriage travelling?

Let x = the number of miles per hour.

Then $5280\,x$ = " feet "

" = " " in 3600 sec.

But the number of revolutions will $= \frac{5280x}{14\frac{2}{3}}$

Then 1 revolution will take $\left\{3600 \div \frac{5280x}{14\frac{2}{3}}\right\}$ sec.

" 1 " " $\frac{10}{x}$ sec.

At the slower rate 1 revolution would take $\left\{1 + \frac{10}{2}\right\}$ sec

In one hour the number of revolutions would be $\frac{3600}{1+\frac{10}{x}}$, and the distance would be $\frac{3600 \times 14\frac{2}{3}}{1+\frac{10}{x}}$ ft.

or $\frac{3600 \times 14\frac{2}{3}}{(1+\frac{10}{x})\,5200}$ miles per hour.

Then $x - \frac{3600 \times 14\frac{2}{3}}{(1+\frac{10}{x})5280} = 2\frac{2}{3}$

$x = 6\frac{2}{3}$.

(3) Given a square and one side of a rectangle which is equal to the square, find the other side. Let AB be one side of the rectangle and BC at right angles to AB be equal to one side of the square. Join CA and from C draw CD at right angles to CA to meet AB produced. Then BD will be the required side. Because ACD is a right angle it can easily be shown that a semicircle can be described about ACD. Then, as in II., 14, AB.BD = CB².

(4) If two sides of a triangle are unequal, and if from their point of intersection three straight lines are drawn, namely, the bisector of the vertical angle, the median, and the perpendicular to the base, the first is intermediate in position and magnitude to the other two.

In the figure on page 94 (Hall & Stevens) let AD be perpendicular to BC.

Then angle DAC = the complement of angle ACD,
and " DAB = " " ABD;
but " ACD is greater than angle ABC;
therefore angle DAC is less than angle DAB.
Therefore angle BAD is greater than half the vertical angle BAC.

Therefore AD lies within the angle PAC.

Then by exercise 12 AP lies between AD and AX, and by exercise 3 it is intermediate between them in magnitude.

(5) Construct a triangle, having given the perpendicular from the vertex on the base, and the difference between each side and the adjacent segment of the base.

Let AD be the given perpendicular and let the two given differences be X and Y. On AD as base describe the triangle ABD, having angle ADB a right angle, and the difference of AB and BD = X. Also on the other side of AD describe a triangle ADC, having the angle ADC a right angle, and the difference of AC and DC = Y. Then ABC is the required triangle.

J. B. M.—ABC is any triangle: required to draw a straight line parallel to the base BC, and meeting the other sides in D and E, so that DE may be equal to the difference of BD and CE.

Produce BC to F. Bisect the angles ACF, ABF by CO, BO. Draw OED parallel to BC, meeting AE in E and AB in D. Then DO = BD, EO = EC. That is, DE is the difference between BD and CE.

Note.—If the line to be drawn parallel is to be equal to the difference between BD and DE, as stated (probably unintentionally), the sixth book of Euclid will be required. In that case find a fourth proportion to (AB + 2BC), AB, and BC, and it will be the required line.

P. M. G.—(1) Hamblin Smith's Arith., page 101, Quest. 4.

Note.—There are three exercises on this page numbered 4. Which is meant?

(2) Hamblin Smith's Arith., page 108, Ex. 12.

$$\sqrt{11\tfrac{37}{49}} = \sqrt{5\tfrac{76}{49}} = \tfrac{24}{7} = 3\tfrac{3}{7}.$$

(3) Hamblin Smith's Arith., page 109, Ex. 17.

$76\frac{14}{17} = 76.82352941+$

The square of which is $8.7649+$

(4) Hamblin Smith's Arith., page 113, Ex. 16.

$$\sqrt[3]{3\tfrac{1}{5}} = \sqrt[3]{3.2} = 1.473+$$

(5) Kennedy & O'Hearn's Arith., page 27, Quest. 5.

Note.—This Arithmetic consists of three parts. Which part is meant?

A. L. G.—(1) Hamblin Smith's Arith., page 166, Ex 5.

Amount which the work falls behind daily
$= (\frac{1}{6} + \frac{1}{7} + \frac{1}{8} - \frac{1}{8} - \frac{1}{10})$ of a day's work;
Therefore in 84 days it falls behind
$84 \times (\frac{1}{6} + \frac{1}{7} + \frac{1}{8} - \frac{1}{8} - \frac{1}{10})$ of a day's work,
= 17.6 days' work;
Therefore the part which 17 men must do more =
.6 of a day's work;
Therefore the part which 1 man must do more =
$\frac{.6}{17} = \frac{3}{85}$.

(2) Hamblin Smith's Arith., page 182, Ex. 18.

Sum on which \$.80 is int. for 8 mos. = \$20.;
Therefore sum on which \$20.80 is int. for 8 mo. =
$\$\frac{20.80 \times 20}{.80} = \$5.20$.

Int. on \$ 20. for 8 mo. = \$.80.
" \$100. " 12 mo. = \$6.