and the annual payment will be

$$\frac{A}{n} - \frac{A-a}{m} R' R^{n-m-1}$$ + accrued interest on

the unpaid part of $$\frac{mA}{n} - (A-a) R' R^{n-m-1}$$

Suppose p the number of payments yet to make, p being not greater than m; the first of these will be

$$\left\{ \frac{A}{n} - \frac{A-a}{m} R' R^{n-m-1} \right\} \left\{ pR-(p-1) \right\}$$

Since this is the first payment after $n-p$ have been made it may be called the $n-p+1$ payment.

Applying these formula to the above problems, we have

Prob. 105, *case I.*

$A=\$1300$, $a=\$1169.84$; $R' = \frac{383}{365}$, $R = 1.08$, $n=5$, $m=p=1$;

hence the fifth or last payment should be

$$\$\{ 260-130.16 \times \tfrac{383}{365} \times 1.08^3 \} \times 1.08 = \$94.986$$

For \$110 out of the \$1300 the payment should be \$8.04.

Prob. 105, *case II.*,

$A=\$450$; $a=\$486.14$, the other quantities the same as in case I.; the last payment should be

$$\$\{ 90 + 36.14 \times \tfrac{383}{365} \times 1.08^3 \} \times 1.08 = \$148.79$$

and of this B should pay \$28.44.

Prob. 106, *case I.*,

$A=\$79$; $a=\$76$, $R'=\frac{37808}{36500}$, $R=1.06$, $n=5$, $m=2$, $p=2$ and 1,

hence the fourth and fifth payments should be respectively

$$\$\{ 15.80 - 1.50 \times \tfrac{37808}{36500} \times 1.06^2 \} \times 1.12 = \$15.74$$

and $$\$\{ 15.80 - 1.50 \times \tfrac{37808}{36500} \times 1.06 \} \times 1.06 = \$14.90.$$

Prob. 106, *case II.*; the fourth and fifth payments may similarly be found to be \$18.98 and \$17.96 respectively.

(The above are two of the best problems in interest we have for a long time seen, they are out of the common groove, yet as the proposer states, they occurred in actual business transactions).

(107). Three masses of gold, silver, and a compound of gold and silver, weigh respectively, P Q and R ounces in air, and p, q and r ounces in water. Shew what is the order of magnitude of the quantities

$$p : P,\ q : Q,\ r : R.$$

GEO. SHARMAN, Forest.

The specific gravities of the gold, the compound, and the silver are respectively

$$P : P-p;\ R : R-r : Q : Q-q$$

these are therefore arrranged in decreasing order of magnitude.

Hence $1 : 1 - \frac{p}{P}$; $1 : 1 - \frac{r}{R}$; $1 : 1 - \frac{q}{Q}$; are in decreasing order of magnitude. But the antecedents are the same, hence the consequents are in increasing order of magnitude. But the minuends of these are the same, hence their subtrahends, $p : P$, $r : R$, $q : Q$ are in decreasing order of magnitude.

(108.) The tube of a Mercurial Barometer is vertical, and of uniform base. On a syringeful of air being introduced into the upper part of the tube the mercury falls 1 inch; and it falls eight-tenths of an inch more when another syringeful is introduced. The mercury in the cistern being kept at the same level throughout, find the length of that portion of the tube which was originally a vacuum.

DITTO.

Let h equal the length sought. The first syringeful occupies $h+1$ inches of the tube at a pressure of one inch of mercury. When the second syringeful is added the two occupy $h+1.8$ inches of the tube at a pressure of 1.8 inches of mercury, hence one syringeful at that pressure would occupy $\frac{1}{2}(h+1.8)$ inches of the tube. Therefore by Boyle's Law

$$h+1 = .9(h+1.8)$$
$$\therefore\ h=6.2.$$

(109.) Find the pressure against the valve, which opens into the receiver of a condenser, after fifteen strokes of the piston, when A equals content of the receiver, B equals content of the barrel, and P equals the atmospheric pressure.

DITTO.

After fifteen strokes the receiver contains in volume A, air which at pressure P filled volume $A+15B$, hence by Boyle's Law the pressure on the valve will be

$$P(A+15B) \div A$$

EDITOR'S DRAWER.

—We purpose publishing Mr. Godfrey's valuable paper on Phonetic Orthography in the January No. of the TEACHER.

—We would direct attention to the advertisement of Littell's *Living Age*, on cover. It contains the cream of current literature, and is one of the very best magazines published anywhere.

THE EDUCATIONAL VOICE.—This is the name of a new monthly, published at Pittsburg, Pa., U. S., the first No. of which has reached us. Its typo-