7.—de Prony's with Wiesbach's Coefficients.

Mean velocity—

$$\begin{aligned} v &= (\cdot 00024 + 9675\, mi)^{\frac{1}{2}} - \cdot 013 \\ &= (\cdot 00024 + 8676 \times 19\cdot 9 \times \cdot 000025) - \cdot 015 \\ &= (\cdot 00024 + 4\cdot 29413)^{\frac{1}{2}} - \cdot 015 \\ &= \sqrt{4\cdot 29437} - \cdot 015 \\ &= 2\cdot 072 - \cdot 015 \\ &= 2\cdot 057 \text{ feet per second.} \end{aligned}$$

8.—Rankine's Formula.

Mean velocity—

$$v = 8\cdot 025 \sqrt{\frac{m\,i}{\cdot 007565}} = \sqrt{8512\, mi} = 92\cdot 26 \sqrt{mi}$$

$$= 92\cdot 26 \sqrt{18\cdot 8 \times \cdot 000025}$$

$$= 92\cdot 26 \times \cdot 02225$$

$$= 2\cdot 053 \text{ feet per second.}$$

Mean velocities.

1.	By Kutter's formula	$v = 2\cdot 5$	feet per second.
2.	" de Prony's "	$v = 2\cdot 073$	"
3.	" Dupuit's "	$v = 2\cdot 055$	"
4.	" Chezy's "	$v = 2\cdot 225$	"
5.	" Humphrey's and Abbot's formula	$v = 3\cdot 197$	"
6.	" Hagen's formula	$v = 3\cdot 341$	"
7.	" de Prony's with Wiesbach's Coefficients	$v = 2\cdot 057$	"
8.	" Rankine's formula	$v = 2\cdot 053$	"
		$8)\overline{19\cdot 501}$	
	Grand mean velocity	$v = 2\cdot 438$	"

To find the probable errors by the method of least squares, assuming each of the formulæ to have equal weights:

No. of Formula.	Velocity.	Difference from Mean.	Square of Residuals.
1	2·5	− 0·062	0·0038
2	2·073	+ 0·365	0·1322
3	2·055	+ 0·383	0·1467
4	2·225	+ 0·213	0·0454
5	3·197	− 0·759	0·5761
6	3·341	− 0·901	0·8118
7	2·057	+ 0·381	0·1452
8	2·053	+ 0·385	0·1482
	Mean = 2·438		$[n\,n_1] = 2\cdot 0104$

Probable error—

$$r = \cdot 6745 \sqrt{\frac{[n\,n_1]}{m-1}} = \cdot 6745 \sqrt{\frac{2\cdot 0104}{8-1}}$$

$$= \cdot 6745 \sqrt{0\cdot 2872} = 6\cdot 745 \times \pm 0\cdot 53$$

$$= \pm 0\cdot 36 \text{ feet.}$$

Probable error of Arithmetical Mean—

$$r\,(x) = \frac{\cdot 6745}{\sqrt{m}} \sqrt{\frac{[n\,n_1]}{m-1}} = \frac{\cdot 6475}{\sqrt{8}} \sqrt{\frac{2\cdot 0104}{8-1}}$$

$$= \frac{\cdot 6745}{2\cdot 8284} \sqrt{0\cdot 2872} = \cdot 2385 \times \pm 0\cdot 53$$

$$= \pm 0\cdot 126 \text{ feet}$$

Mean discharge.... ..... $D = 6179\cdot 52 \times 2\cdot 438 = 15{,}066$ cubic feet per second.