values as they are given in the tables, and to consider the losses as due solely to sudden enlargement.

Upon examination of the curves of Hydraulic Gradient, as shown on Fig. 3, it is evident that the observations for loss of head due to the enlargement must include a length of at least 35 diameters of the larger pipe

In the case of enlargement from 1½ inches to 2 inches diameter the value of K obtained from the table is approximately 0.98.

Had the excess frictional loss of head due to the presence of the piezometers previously referred to been applied these values of the co-efficient K would have been

Loss of Head Due to Enlargement.

Pipe enlarged from 1.069 inches to 2.096 inches diameter.
Length of section below enlargement, 6.16 ft. 35.3 diameters.

TABLE I.

V_2 mean velocity by weight in 2″ pipe. Ft. per sec.	$h_1 - h_2$ observed loss of head in section (E—5). Feet.	$\frac{V_1^2 - V_2^2}{2g}$ loss of velocity head. Feet.	$\frac{V_1^2 - V_2^2}{2g} + (h_1 - h_2)$ total loss of head in section (E—5). Feet.	H_f loss of head straight pipe length 6.16′ Feet.	H_e loss due to enlargement (4) — (5) Feet.	$H_b \left(\frac{A_2}{A_1} - 1\right)^2 \frac{V_2^2}{2g}$ Borda's formula for loss due enlargement. Feet.	K Coefficient $= \frac{H_e}{H_b}$
3.419	—0.908	2.500	1.592	0.147	1.445	1.469	0.985
3.375	—0.903	2.420	1.517	0.143	1.374	1.435	0.958
3.325	—0.820	2.360	1.540	0.139	1.401	1.400	1.000
3.175	—0.583	2.155	1.372	0.129	1.243	1.270	0.978
3.072	—0.731	2.021	1.290	0.121	1.169	1.189	0.984
2.708	—0.575	1.575	1.000	0.098	0.902	9.924	0.978
2.427	—0.465	1.264	0.799	0.080	0.719	0.742	0.969
2.053	—0.335	0.908	0.573	0.060	0.513	0.530	0.970
2.029	—0.329	0.885	0.556	0.059	0.497	0.519	0.958
1.700	—0.229	0.620	0.319	0.043	0.348	0.364	0.957
1.584	—0.198	0.552	0.354	0.040	0.314	0.316	0.994
1.397	—0.154	0.424	0.270	0.031	0.239	0.245	0.976
0.903	—0.064	0.175	0.111	0.015	0.096	0.103	0.933
0.758	—0.016	0.124	0.108	0.011	0.097	0.107	0.910
						Mean	0.967

Loss of Head Due to Enlargement.

Pipe enlarged from 1½ ins. to 2.096 ins. diameter.
Length of section below enlargement 6.27 ft. 35.9 diameters.

TABLE II.

V_2 mean velocity by weight in 2″ pipe. Ft. per sec.	$h_1 - h_2$ observed loss of head in section (E—5). Feet.	$\frac{V_1^2 - V_2^2}{2g}$ loss of velocity head. Feet.	$\frac{V_1^2 - V_1^2}{2g} + (h_1 - h_2)$ total loss of head in section (E—5). Feet.	H_f loss of head straight pipe length 6.16′ Feet.	H_e loss due to enlargement (4) — (5) Feet.	$H_b \left(\frac{A_2}{A_1} - 1\right)^2 \frac{V_2^2}{2g}$ Borda's formula for loss due enlargement. Feet.	K Coefficient $= \frac{H_e}{H_b}$
3.881	—0.275	0.666	0.391	0.175	0.216	0.216	1.000
3.722	—0.257	0.613	0.356	0.158	0.198	0.199	0.995
3.247	—0.184	0.465	0.281	0.131	0.150	0.151	0.993
2.640	—0.125	0.307	0.182	0.087	0.095	0.099	0.960
2.214	—0.083	0.215	0.132	0.065	0.067	0.070	0.958
2.099	—0.079	0.193	0.114	0.058	0.056	0.063	0.890*
1.690	—0.049	0.125	0.076	0.041	0.035	0.041	0.854*
1.572	—0.048	0.109	0.061	0.035	0.026	0.035	0.744*
1.253	—0.024	0.069	0.045	0.023	0.022	0.022	1.000
0.970	—0.014	0.047	0.033	0.016	0.017	0.013	——*
0.802	—0.008	0.028	0.020	0.011	0.009	0.009	1.090
						Mean	0.987

*Rejected.

on the down-stream side. Since the effect of the disturbances dies out so gradually it appears that a length of 50 diameters might better be chosen in order to insure that all of the loss due to the enlargement be included in the observations.

The mean value of the coefficient K in the case of enlargement of pipe from one inch to two inches diameter is found from the results given in Table I. to be 0.967.

slightly reduced by an amount in no case exceeding one and one-half per cent.

Conclusions.—The final results obtained in this investigation may be briefly summarized as follows:—

1. The Pitot tube measures with a fair degree of accuracy, always within two or three per cent. and more frequently within one per cent., the velocities of flow in a pipe where the resultant motion of the water throughout