XXVIII. *Recent* Canal-boat Experiments.—Description and Tabulated Results of a Series of Experiments made to ascertain the actual Tractive Power exerted in drawing Boats on Canals, under various circumstances of Load, Speed, &c. By JOHN MACNEILL, Esq., M.I.C.E., F.R.A.S., M.R.I.A.*

THE series of Tables which I now have the honour of presenting to the Institution, have no merit beyond that of an honest and accurate Register of Facts. That the Experiments which they record were made neither to support nor to invalidate any theory, the following account of their origin will demonstrate.

The attention of the Committee of Management of the Forth and Clyde Canal Company, had frequently, in the course of their extensive and varied experience, been directed to some results, in the use of boats of different forms, on different canals, which appeared to contradict notions considered to be long established. The paradoxical character and important consequences of these results, at length determined the Committee, that a careful examination of the circumstances under which they had been observed should be made, and that upon a scale which should be free from the usual objections attending experiments made with models. I had the honour of receiving their commands to design and conduct this inquiry. In July, last year, I carried the examination into effect, with the boats, and on the canals, which had apparently presented the anomalous facts. The object aimed at, and which was supposed would satisfactorily settle every question, was to ascertain the tractive power exerted in drawing these boats on the canals in question, under very various circumstances of load, speed, &c. At least, one beneficial result seemed certain to be attained by the parties who had the spirit to undertake the inquiry, in consequence of their being interested in the navigation of the canals, viz.—it would determine which of the boats in use was best adapted for the purpose for which it was intended.

* This term is preserved to distinguish these Experiments from others of the same kind, which Mr. Macneill had previously made on the Grand Junction Canal, &c.

Though thus somewhat restricted by the very object of the inquiry, I could not help hoping, that a vigilant attention to all the circumstances attending the numerous and varied experiments which would be necessary to solve the problem, and a faithful register of every influential fact, might add some authentic data to the very small stock, hitherto collected from actual experiment, on this most important and interesting, but intricate, subject of physical science.

It is in this way that, I conceive, the practical engineer may frequently assist the physico-mathematician, and enable the latter to investigate and reduce to simple laws many of those apparent anomalies which often puzzle, and sometimes disappoint, the former. As neither my professional engagements, nor my acquirements, will permit me in any case to attempt mathematical discussions of this high and important character, I have aimed at no other distinction than that of a careful observer, and a faithful reporter of facts. This is the utmost of my pretensions in the present Paper, and so far as this, I must acknowledge, I am ambitious to establish a claim.

Canals.—The canals on which the experiments, which it is the object of this Paper to record, were made, are, viz.—the Forth and Clyde Canal, the Monkland Canal, and the Paisley (*Glasgow and Paisley*) Canal. These were measured in several places. Sections made out from these measurements are given in Plate 28, and they show, that each canal differs very materially from either of the others. These peculiarities should constantly be borne in mind in comparing and reasoning upon the experiments.

Courses.—The portions of the canals selected for the sites of the experiments in Tables I.—X. were straight, and as nearly uniform in breadth and depth as could be obtained. These sites are designated, for distinction, the *courses*. On the Forth and Clyde Canal, there was no difficulty in the choice of a proper course of any desirable length. On the Monkland and on the Paisley Canals, no long line, free from objection, could be obtained; and, therefore, the courses on them were necessarily shorter.

Courses on the Forth and Clyde Canal.—Six stakes, marked *a, b, c, d, e, f*, were driven into the bank of the canal at intervals of 110 yards $= \frac{1}{16}$ of a mile. The first stake-interval *a-b* was used for getting the horses into the proper speed, and the boat into a uniform velocity, it is therefore not regarded in the Tables. The instants of the boat's passage of the stakes *b, c, d, e, f*, were accurately observed. These are given exactly as they stand

in the minute-books of the recorders, in column C of the Tables. From these epochs the times of the passage of the boat through the stake-intervals, or *runs*, *b-c*, *c-d*, *d-e* and *e-f*, were obtained by simple subtraction. These times are given in column E. The velocity in *miles per hour* and *feet per second* were then calculated from the preceding data, and the results are given in the columns F and H. In the experiment given in Table XII., the run extended about eight miles, but in this the tractive power only was observed.

Courses on the Monkland and Paisley Canals.—From reasons already stated, the courses on these canals were necessarily short. They had but three stake-intervals, and consequently only two runs. In every other respect they were the same as the course on the Forth and Clyde Canal. In the experiment given in Table XI., the run extended along the whole canal, and was about eight miles in length; but in this, as in the similar long run on the Forth and Clyde, the tractive power only was observed.

Boats.—All the boats had been, or were, in actual use on the canals in question, except one which had never been tried before, which is called “New Boat,” to distinguish it. Plans, &c. of the most remarkable boats are given in Plate 27. Their weights will be found in column P of the Tables.

The loads and speeds of the boats were varied so as to include every case that had occurred, or was likely to occur, in practice. The speeds or velocities are given in columns F and H, and the loads in column J. The effects of the various loads, and of the different distributions of them, upon the draught of the boats, are given in columns L and M.

Instruments, and Manner of using them.—The *Dynamometer*, or instrument for ascertaining the tractive power exerted, was made a part of the connexion of the towing-line with the boat, so that all efforts to draw the boat by pulling the towing-line acted upon the instrument, and were indicated by it. Efforts from 1lb. up to nearly 600lbs. were clearly indicated on a large dial-plate, and could be satisfactorily read off.*

* This instrument was similar to one I had previously designed and caused to be constructed, for ascertaining the amount of the draught of carriages drawn by horses on turnpike-roads. The principle is the same as that used in the spring-weighing machine, but the index of this

The times of the runs were observed with chronometers in the following manner:—An assistant was so placed on the outside of the boat, that he could accurately observe the moment of passing a stake. When this happened, he called out, and the instant was observed and registered by two assistants, each with a separate chronometer. These time-observers were found, on comparing their registers, never to have differed more than half a second from each other, and that in a very few instances only. The tractive power was obtained by three assistants: one gave a signal every two seconds; another, on this signal, read off aloud the figures at which the index pointed; and a third registered. By this arrangement all hurry and confusion were avoided; each assistant had ample time to do the work allotted to him; and it is believed, that few errors, and none of any magnitude, occurred in making or noting the observations. The numbers representing the tractive power were written down in columns, each column corresponding to a run, or stake-interval. The sum of a column divided by the number of observations, gave a number which was considered to be the mean tractive power in lbs. exerted during each run. These calculations were afterwards checked by two other persons.

In many of the experiments the level of a theodolite, steadily fixed in the boat, was observed under the following circumstances:—The boat, with its load distributed for the experiment, being at rest, the bubble was brought to the middle of the tube, and the index set at zero. The bubble being preserved in the same place during the experiment, the angle read off on the limb gave the angle of variation, which the keel of the boat made with its

instrument in its simple form, when applied to measure horse-draught, vibrates too frequently, and over too large an arc, for correct observation. This is a consequence of the peculiar nature of horse-draught, which is not a uniform pull, as is popularly supposed, but a succession of impulses or strokes of the animal's shoulder against the collar. I added an apparatus, which indicated the mean force of the pulls, and not only reduced the vibrations of the index, but, like the fusee of a watch, compensated for the increasing resistance of the spring in high efforts. A detailed description of this Road-Dynamometer, and its application on the whole length of road from London to Holyhead, is given in the *Seventh Report of the Parliamentary Commissioners for Maintaining the Road from London to Holyhead*. The instrument is also described in the *Further Report made by the Commissioners appointed to Inquire into the Post-Office Department, on the Subject of the Mail Coaches, dated 13th Aug. 1835*. The instrument used on the canals was made from my designs, by Messrs. Bramah, of Pimlico, and was most carefully and beautifully finished.

position before starting, or the difference, if any, between a state of rest and one of motion. Many of the angles observed are given in column O.

For the purpose of ascertaining if the boat was raised in the water, a fine wire was stretched across the canal, over two pulleys placed in posts erected on the banks, by heavy weights attached to the end of it, so that it was very nearly level across the canal, and about eight inches higher than the boat. A bit of paper upon it marked the middle of the canal. On the top of the boat four slips of thin wood were placed,—one near the bow, one near the stern, and the other two at equal distances between them. These slips of wood were suspended vertically on fine wire pivots a little above their centre, so that they hung upright, except when they came in contact with the wire stretched across the canal; the moment they did so, they gave way, inclined backwards, and allowed the boat to pass freely under the wire: the edges of these slips were hollowed out, and the groove filled with tallow, projecting a little before the edge of the slip. The slips were divided into inches and tenths. When the boat was prepared and ready for an experiment, it was brought under the wire, and, being steadied near the paper-mark, the division cut by the wire on each slip was noted down. When the boat in motion passed under the same point, the wire struck the slips in succession, and stripped off all the tallow above a certain point with a sharp and clean cut, so that it was perfectly easy to determine the height to which the boat rose when in motion, by examining the slips, and comparing the divisions at which the tallow terminated with those previously noted.

Weather.—The weather was, almost without exception, extremely favourable for the purpose. The direction of the wind, its force, &c., are noted in column K.

Tables.—Such parts of the experiments as would admit of it, are classed together and tabulated to facilitate reference and comparison. Most of the columns have been described in the preceding paragraphs—the others require no explanation. The Tables I.—X. contain the experiments made on the courses. Tables XI. and XII. are the two eight-mile runs. In these the tractive power, indicated by the dynamometer, was read off as quick as it could be written down.

OBSERVATIONS.

1. That in the wide and deep canal, the tractive power was observed to increase with the velocity, but not in any uniform ratio.

2. That in the shallow and narrow canals, the increase of tractive power had a limit at a certain velocity; and, under certain circumstances, even decreased with the increase of velocity; so that it appears probable, that if the size of the canal bear a certain proportion to that of the boat, there is a certain velocity at which a boat may be drawn on a canal with a minimum tractive power. This velocity, on the Monkland and Paisley Canals, with boats like the Zephyr and the Swift, appears to be about nine miles per hour. And I think it probable that a similar effect would be observed on the Forth and Clyde Canal, if a boat similarly proportioned to that canal were used, though the velocity and the minimum tractive power in such a case might be different from those on the other canals.

3. That, in the long run on the Forth and Clyde Canal, the surface of the water regarded on the side of the boat, when in motion, was concave or hollow about the middle of the length of the boat, rising at the bow and quarter, as is shown by the line *a b c*, in Fig. 1.

4. That, in the long run on the Paisley Canal, precisely the opposite effect took place, the surface of the water about the middle of the length of the boat being convex, and higher there than at the bow and quarter, as *d e f*, in Fig. 2.

5. That there appears a relation between the tractive power and the horizontal position of the keel, the tractive power, it will be observed, diminishing and increasing in some ratio or other, as the angle of variation is smaller or larger.

6. That the boat absolutely rises during its motion. This fact was most satisfactorily demonstrated by the apparatus designed for the purpose. In some of the experiments, the mean of the several rises indicated by the four slips, was about four inches, the bow being, in every case, more elevated than the middle and stern. As this phenomenon is of recent observation, and as the persons who have observed and announced it have been held up to unmerited ridicule, I beg leave to conclude with an extract from a paper read before the Philosophical Society of Cam-

bridge, and published in their Transactions. The article is by one of the most profound physico-mathematicians in Great Britain, probably in the world, the Rev. James Challis, late Fellow of Trinity College,* Cambridge. The article is entitled, *Researches in the Theory of the Motion of Fluids*. Mr. Challis prefaces his Paper thus :—

“The subjects treated of in this communication are of a miscellaneous character, referring to several points of the theory of fluid motion, respecting which the author conceived he had something new to advance. In illustration of the principles he has attempted to establish, solutions are given of two problems of considerable interest :—the resistance to the motion of a ball-pendulum ; and, the resistance of the motion of a body partly immersed in water and drawn along at the surface in the horizontal direction. The principal object in the solution of the latter problem is, to account for the rising of the body in the vertical direction on increasing the velocity of draught, which, in some recent experiments on Canal Navigation, has been observed to take place.”

After an elaborate investigation of the law of this phenomenon, and showing that it must follow from the principles established by the Author in the preceding part of the Paper, he concludes by observing, that,

“To obtain a numerical result respecting the rise of the body corresponding to a given velocity, we will suppose, for the sake of simplicity of calculation, that when the vessel is at rest, the centres of the spherical ends, and consequently the axis of the cylindrical part, are in the plane of the horizontal surface of the water. This circumstance may be produced by *loading* the upper part of the body without altering its specific gravity. Let l = the length of the axis of the cylindrical portion ; then the area of the horizontal section of the vessel, at the level of the water surface, is $lD + \frac{\pi D^2}{4} - \frac{D^2}{2}$, its breadth being D . Now $W - w$ must be equal to the difference of the quantities of fluid displaced in the states of rest and motion, and is therefore equal to $\gamma g (lD + \frac{\pi D^2}{4} - \frac{D^2}{2})$, γ being small. Therefore neglecting powers of $\frac{\gamma}{a}$ above the first,

* This gentleman has since succeeded to the Plumian Professorship of Astronomy, in the University of Cambridge, vacant by the appointment of Professor Airy as Astronomer-royal.

$$\left(lD + \frac{\pi D^2}{4} - \frac{D^2}{2}\right) \gamma g = \frac{V^2 D^2}{8} \left(2 - \frac{\pi}{4}\right).$$

Let $\frac{l}{D} = 3$. It will then be found that $V^2 = 696 \text{ ft.} \times \gamma$. And if $\gamma = \text{one inch, or } \frac{1}{12}$, this equation gives $V = 5.19 \text{ miles per hour}$; consequently, if $V = 10.4 \text{ miles per hour}$, $\gamma = 4 \text{ inches}$.

In general, neglecting $\frac{\gamma^2}{a^2}$, &c.

$$W - w = \frac{V^2 a^2}{2} (\sin \theta \cos \theta (2 \sin^2 \theta + 1) - \frac{\theta}{2}),$$

Also, $W - w = \gamma g \left\{ lD + \frac{D^2}{2 \sin^2 \theta} (\theta - \sin \theta \cos \theta) \right\}$ nearly;
therefore, as $D = 2a \sin \theta$, it will be found that

$$\gamma = \frac{V^2 \sin 2\theta (2 \sin^2 \theta + 1) - \theta}{4g \cdot 4m \sin^2 \theta - \sin 2\theta + 2\theta}, \text{ } m \text{ being put for } \frac{l}{D}.$$

If θ be assumed equal to 15° , and $m = 3$, this equation gives $V = 7.35 \text{ miles per hour}$ when $\gamma = 4 \text{ inches}$."

"These results, which probably are but very rough approximations to matters of fact, may yet suffice to show, that when vessels and boats of the usual forms sail in the open sea, they may be expected to rise in some degree upon an increase of their velocity, and so much the more as they are less adapted to *cleave* the water. Our theory shows that the rise is the same for bodies of the same shape and proportions, moving with the same velocity, whatever be their absolute magnitudes; also, that this effect is equally due to the pressures on the front and stern of the vessel. The theory, in fact, determines these pressures to be in every respect alike; so that if we proceeded to investigate the total pressure in the horizontal direction, we should find it to be nothing when the motion is uniform. This may serve to show, that, if friction be left out of consideration, a front ill adapted to cleave the water is not unfavourable to speedy motion, if the stern be of the same shape; and that the resistance to the motion of vessels in the open sea is principally owing to the friction of the water against their surface. This cause operates to produce unequal actions on the front and stern, making the directions of the motions of the particles in contact with the surface of the former *less* inclined to the horizon than they would be in the case of no friction, and of those in contact with the surface of the latter *more* inclined. To counteract this inequality, probably the stern should be less curved than the front."

JOHN MACNEILL.

December, 1835.

CANAL-BOAT EXPERIMENTS.

TABLE I.—THE RAPID (FIRST SET—89 *Experiments*).

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
No. of Experiment.	Boat's Name.	Instant of passing the Stake.	Stakes 110 yards apart.	Time of passing the Stake—interval.	Miles per Hour.	Tractive Power in lbs.	Feet per Second.	Kind of Tractive Power.	Load.	Wind.	Draught.		Position of Wave.	Variation in Level.	REMARKS.
											Bow	Stern			
1	RAPID.	min. sec. 56 58 58 05½ 59 09 14 1 16	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	sec. 67½ 63½ 65 62	miles. 3·33 3·54 3·46 3·63	lbs. 33 39 38·5 37·1	feet. 4·89 5·20 5·08 5·32	One Horse.	7 passen- gers, = <i>c. q. lb.</i> 9 2 1	unf. light	in. 12¼	in. 9	not obs.	not obs.	Weight of RAPID, when empty, 3 ton, 8cwt. 2qr. 20lb. Towing-line, 116ft. long, attached 4½ft. from bow, and passed through two pulleys. Load distributed from bow to stern.
2	RAPID.	5 53 7 03 8 17 9 20 10 22	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	60 64 63 62	3·75 3·52 3·57 3·63	30 25 31·3 30·4	5·50 5·16 5·24 5·32	do.	do.	fav. do.	do.	do.	do.	do.	
3	RAPID.	22 21 24 03 25 45 27 25½ 28 59	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	102 102 100½ 94½	2·21 2·21 2·24 2·38	24 23·5 23·5 23·5	3·24 3·24 3·28 3·49	One Man.	6 passen- gers, = <i>c. q. lb.</i> 8 0 15	unf.	not obs.	not obs.	do.	do.	
4	RAPID.	33 54 35 28 36 57 38 27 40 00	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	94 89 90 93	2·39 2·53 2·50 2·42	19·4 18·25 18 18	3·51 3·71 3·67 3·55	do.	do.	fav.	do.	do.	do.	do.	
5	RAPID.	50 03 51 13½ 52 24½ 58 37 54 51	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	70½ 71 72½ 74	3·19 3·17 3·10 3·04	33·1 28·3 28 27·8	4·68 4·65 4·55 4·46	do.	do	unf.	do.	do.	do.	do.	
6	RAPID.	20 1 29½ 2 38 3 46 4 57	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	69½ 68½ 68 71	3·24 3·29 3·31 3·17	26·8 24·8 24·1 23	4·75 4·82 4·85 4·65	do.	7 passen- gers, = <i>c. q. lb.</i> 9 2 1	fav.	in. 12¼	in. 9	do.	do.	
7	RAPID.	23 14 23 55 24 37 25 14½ 25 50½	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	41 42 37½ 36	5·49 5·36 6·00 6·25	76·1 64·5 98·7 99·7	8·05 7·86 8·80 9·17	One Horse.	9 passen- gers, = <i>c. q. lb.</i> 12 0 25	unf.	not obs.	not obs.	do.	do.	Bad experiment from irregular draught.
8	RAPID.	35 08½ 35 46 36 23 37 00 33 38	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	38½ 37 37 38	5·84 6·08 6·08 5·92	95 97 89 84	8·57 8·92 8·92 8·68	do.	7 passen- gers, = <i>c. q. lb.</i> 9 2 1	fav.	in. 12¼	in. 9	do.	do.	

TABLE I. CONTINUED.—THE RAPID (FIRST SET).

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
No. of Experiment.	Boat's Name.	Instant of passing the Stake.	Stakes 110 yards apart.	Time of passing the Stake-interval.	Miles per Hour.	Tractive Power in lbs.	Feet per Second.	Kind of Tractive Power.	Load.	Wind.	Draught.		Position of Wave.	Variation in Level.	REMARKS. PLACE OF EXPERIMENT, FORTH AND CLYDE CANAL.
											Bow	Stern			
9	RAPID.	min. sec. 43 30 44 05 44 40 45 15 45 51	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	sec. 35 35 35 36	miles. 6·43 6·43 6·43 6·25	lbs. 104·4 105 104 99·6	feet. 9·43 9·43 9·43 9·17	One Horse.	7 passen- gers, and 10cwt. = c. q. lb. 19 2 1	fav.	in. 11¼	in. 11¼	not obs.	not obs.	
10	RAPID.	51 25 52 00 52 34½ 53 09 53 44	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	35 34½ 34½ 35	6·43 6·52 6·52 6·43	131 121 118 110·9	9·43 9·57 9·57 9·43	Two Horses	do.	do.	do.	do.	do.	do.	
11	RAPID.	2 10½ 2 36 2 57½ 3 19 3 40½	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	25½ 21½ 21½ 21½ 21½	8·82 10·47 10·47 10·47	261 302 299 286	12·94 15·35 15·35 15·35	do.	do.	do.	do.	do.	do.	do.	
12	RAPID.	10 53 11 16 11 37½ 11 59 12 21	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	23 21½ 21½ 22	9·78 10·47 10·47 10·23	294 293 297 278	14·35 15·35 15·35 15·00	do.	do.	do.	do.	do.	do.	do.	
13	RAPID.	19 51½ 20 13 20 33½ 20 54½ 21 17	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	21½ 20½ 21 22½	10·47 10·91 10·71 9·98	316 300 306·8 290·1	15·35 16·09 15·71 14·67	do.	do.	do.	do.	do.	do.	do.	
14	RAPID.	25 55½ 26 17 26 38 26 59½ 27 21	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	21½ 21 21½ 21½	10·47 10·71 10·47 10·47	298 290 295 290	15·35 15·71 15·35 15·35	do.	do.	do.	do.	do.	do.	do.	
15	RAPID.	39 00½ 39 45½ 40 31½ 41 16½ 42 00	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	45 46 45 43½	5·00 4·89 5·00 5·17	73 71 78·7 72·5	7·33 7·17 7·33 7·59	do.	do.	do.	do.	do.	do.	do.	
16	RAPID.	49 13½ 50 06 50 54½ 51 41 52 26	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	52½ 48½ 46½ 45	4·29 4·64 4·84 5·00	54·0 61·9 62·9 70·3	6·29 6·80 7·10 7·33	do.	do.	do.	do.	do.	do.	do.	
17	RAPID.	19 28 20 15 21 03 21 52 22 42½	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	47 48 49 50½	4·79 4·69 4·59 4·46	68 56 60·2 55·7	7·02 6·88 6·73 6·53	do.	7 passen- gers, and 1 ton, = c. q. lb. 29 2 1	do.	12¼	12¼	do.	do.	Heavy Rain.

TABLE I. CONTINUED.—THE RAPID (FIRST SET).

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
No. of Experiment.	Boat's Name.	Instant of passing the Stake.	Stakes 110 yards apart.	Time of passing the Stake-interval.	Miles per Hour.	Tractive Power in lbs.	Feet per Second.	Kind of Tractive Power.	Load.	Wind.	Draught.		Position of Wave.	Variation in Level.	REMARKS.
											Bow	Stern			PLACE OF EXPERIMENT, FORTH AND CLYDE CANAL.
18	RAPID.	min. sec. 29 18 30 04 $\frac{1}{2}$ 30 52 31 39 32 30 $\frac{1}{2}$	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	sec. 46 $\frac{1}{2}$ 48 $\frac{3}{4}$ 47 50 $\frac{1}{2}$	miles. 4.84 4.64 4.79 4.46	lbs. 68 63.9 68.8 52.2	feet. 7.10 6.80 7.02 6.53	Two Horses.	7 passengers, and 1 ton, = c. q. lb. 29 2 1	fav.	in. 12 $\frac{1}{4}$	in. 12 $\frac{1}{4}$	not obs.	not obs.	
19	RAPID.	40 45 $\frac{1}{2}$ 41 09 41 30 $\frac{1}{2}$ 41 52 42 13 $\frac{1}{2}$	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	23 $\frac{1}{2}$ 21 $\frac{1}{2}$ 21 $\frac{1}{2}$ 21 $\frac{1}{2}$ 21 $\frac{1}{2}$	9.57 10.47 10.47 10.47	308 308 310 300	14.04 15.35 15.35 15.35	do.	do.	light	do.	do.	do.	do.	
20	RAPID.	7 15 7 38 8 00 8 22 8 43	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	23 22 22 21	9.78 10.23 10.23 10.71	292 289 292 296	14.35 15.00 15.00 15.71	do.	do.	do.	do.	do.	do.	do.	
21	RAPID.	14 11 14 39 15 08 15 37 16 06 $\frac{1}{2}$	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	28 29 29 29 $\frac{1}{2}$	8.03 7.76 7.76 7.59	312 327 350? 356?	11.79 11.38 11.38 11.19	do.	7 passengers, and 4 $\frac{1}{4}$ ton, = c. q. lb. 94 2 1	none	17	17	do.	do.	Tractive power doubtful. See Remark, Experiment, No. 44.
22	RAPID.	23 22 $\frac{1}{2}$ 23 49 $\frac{1}{2}$ 24 17 $\frac{1}{2}$ 24 46 25 14 $\frac{1}{2}$	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	27 28 29 28 $\frac{1}{2}$	8.33 8.03 7.76 7.90	325 332 342 344	12.22 11.79 11.38 11.58	do.	do.	do.	do.	do.	do.	do.	
23	RAPID.	32 19 33 08 33 50 34 35 35 23 $\frac{1}{2}$	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	49 42 45 48 $\frac{1}{2}$	4.59 5.36 5.00 4.64	59.6 118 61.8 69.8	6.73 7.86 7.33 6.80	do.	do.	do.	do.	do.	do.	do.	Bad experiment. Horses going irregularly.
24	RAPID.	41 32 $\frac{1}{2}$ 42 24 $\frac{1}{2}$ 43 16 44 07 44 55	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	52 51 $\frac{1}{2}$ 51 48	4.33 4.37 4.41 4.69	74 52 57 70	6.35 6.41 6.47 6.88	do.	do.	do.	do.	do.	do.	do.	
25	RAPID.	42 55 $\frac{1}{2}$ 43 23 $\frac{1}{2}$ 43 52 44 21 $\frac{1}{2}$ 44 51	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	28 29 $\frac{1}{2}$ 29 $\frac{1}{2}$ 29 $\frac{1}{2}$ 29 $\frac{1}{2}$	8.03 7.59 7.59 7.59	355? 356? 360? 363?	11.79 11.19 11.19 11.19	do.	do.	do.	do.	do.	do.	do.	Bad experiment. Boy off horse. Tractive power doubtful. See Remark, Experiment, No. 44.
26	RAPID.	3 11 $\frac{1}{2}$ 3 34 3 58 4 21 4 44	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	22 $\frac{1}{2}$ 24 23 23	10.00 9.38 9.78 9.78	360? 348 351? 353?	14.67 13.75 14.35 14.35	do.	do.	do.	do.	do.	do.	do.	do.

TABLE I. CONTINUED.—THE RAPID (FIRST SET).

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
No. of Experiment.	Boat's Name.	Instant of passing the Stake.	Stakes 110 yards apart.	Time of passing the Stake-interval.	Miles per Hour.	Tractive Power in lbs.	Feet per Second.	Kind of Tractive Power.	Load.	Wind.	Draught.		Position of Wave.	Variation in Level.	REMARKS.
											Bow	Stern			
27	RAPID.	min. sec.	<i>b</i>	sec.	miles.	lbs.	feet.	Two Horses.	7 passengers, and $4\frac{1}{4}$ ton, = c. q. lb. 94 2 1	none	in. 17	in. 17	not obs.	not obs.	Tractive Power doubtful. See Remark, Experiment, No. 44.
		13 23	<i>c</i>	23	9.78	374 ?	14.35								
		13 46	<i>d</i>	23 $\frac{1}{2}$	9.57	369 ?	14.04								
		14 09 $\frac{1}{2}$	<i>e</i>	25	9.00	366 ?	13.20								
		14 34 $\frac{1}{2}$	<i>f</i>	27	8.33	365 ?	12.22								
28	RAPID.	27 51	<i>b</i>	23 $\frac{1}{2}$	9.57	364 ?	14.04	do.	do.	do.	do.	do.	do.	do.	do.
		28 14 $\frac{1}{2}$	<i>c</i>	25	9.00	345 ?	13.20								
		28 39 $\frac{1}{2}$	<i>d</i>	26 $\frac{1}{2}$	8.49	354 ?	12.45								
		29 06	<i>e</i>	28 $\frac{1}{2}$	7.90	355 ?	11.58								
		29 34 $\frac{1}{2}$	<i>f</i>												
29	RAPID.	56 50 $\frac{1}{2}$	<i>b</i>	26	8.65	354 ?	12.69	do.	do.	do.	do.	do.	do.	do.	do.
		57 16 $\frac{1}{2}$	<i>c</i>	26	8.65	356 ?	12.69								
		57 42	<i>d</i>	28 $\frac{1}{2}$	7.90	363 ?	11.58								
		58 10 $\frac{1}{2}$	<i>e</i>	28	8.03	366.4	11.79								
		58 38 $\frac{1}{2}$	<i>f</i>												
30	RAPID.	6 19 $\frac{1}{2}$	<i>b</i>	28 $\frac{1}{2}$	7.90	316	11.58	do.	do.	unf. light	do.	do.	do.	do.	
		6 48	<i>c</i>	29 $\frac{1}{2}$	7.59	324	11.19								
		7 17 $\frac{1}{2}$	<i>d</i>	28 $\frac{1}{2}$	7.90	340	11.58								
		7 46	<i>e</i>	28 $\frac{1}{2}$	7.90	341	11.58								
		8 14 $\frac{1}{2}$	<i>f</i>												
31	RAPID.	23 31	<i>b</i>	87	2.59	31	3.79	One Man.	do.	fav. light	do.	do.	do.	do.	
		24 58	<i>c</i>	75 $\frac{1}{2}$	2.98	34	4.37								
		26 13 $\frac{1}{2}$	<i>d</i>	87 $\frac{1}{2}$	2.57	30	3.77								
		27 41	<i>e</i>	79	2.85	30	4.18								
		29 00	<i>f</i>												
32	RAPID.	37 09	<i>b</i>	87	2.59	27	3.79	do.	do.	do.	do.	do.	do.	do.	
		38 36	<i>c</i>	88	2.56	25	3.75								
		40 04	<i>d</i>	88	2.56	26	3.75								
		41 32	<i>e</i>	88	2.56	25	3.75								
		43 00	<i>f</i>												
33	RAPID.	13 21	<i>b</i>	22	10.23	354 ?	15.00	Two Horses.	7 passengers, and $3\frac{1}{2}$ ton, = c. q. lb. 79 2 1	do.	16	16	do.	do.	Tractive Power doubtful. See Remark, Experiment, No. 44.
		13 43	<i>c</i>												
		14 05	<i>d</i>												
			<i>f</i>												
34	RAPID.	19 59	<i>b</i>	23 $\frac{1}{2}$	9.57	358 ?	14.04	do.	6 passengers, and $3\frac{1}{2}$ ton, = c. q. lb. 78 0 15	do.	not obs.	not obs.	do.	do.	do.
		20 22 $\frac{1}{2}$	<i>c</i>	22 $\frac{1}{2}$	10.00	353 ?	14.67								
		20 45	<i>d</i>	24 $\frac{1}{2}$	9.18	334	13.47								
		21 09 $\frac{1}{2}$	<i>e</i>	23 $\frac{1}{2}$	9.57	334	14.04								
		21 33	<i>f</i>												
35	RAPID.	31 27 $\frac{1}{2}$	<i>b</i>	27 $\frac{1}{2}$	8.18	328	12.00	do.	7 passengers, and $3\frac{1}{2}$ ton, = c. q. lb. 79 2 1	do.	16	16	do.	do.	do.
		31 55	<i>c</i>	27 $\frac{1}{2}$	8.18	337	12.00								
		32 22 $\frac{1}{2}$	<i>d</i>	28 $\frac{1}{2}$	7.90	351 ?	11.58								
		32 51	<i>e</i>	28	8.03	357 ?	11.79								
		33 19	<i>f</i>												

TABLE I. CONTINUED.—THE RAPID (FIRST SET).

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
No. of Experiment.	Boat's Name.	Instant of passing the Stake.	Stakes 110 yards apart.	Time of passing the Stake-Interval.	Miles per Hour.	Tractive Power in lbs.	Feet per Second.	Kind of Tractive Power.	Load.	Wind.	Draught.		Position of Wave.	Variation in Level.	REMARKS.
											Bow	Stern			
36	RAPID.	min. sec. 38 14 38 41 39 09½ 39 37 40 06	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	sec. 27 28½ 28½ 29	miles. 8·33 7·90 7·90 7·76	lbs. 326 333 341 348	feet. 12·22 11·58 11·58 11·38	Two Horses.	7 passengers, and 3½ ton, = c. q. lb. 79 2 1	fav. light	in. 16	in. 16	not obs.	not obs.	
37	RAPID.	46 01 46 30½ 47 00½ 47 32½ 48 03½	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	29½ 29 32 31	7·59 7·76 7·03 7·26	238 249 245 238	11·19 11·38 10·31 10·65	do.	do.	do.	do.	do.	do.	do.	
38	RAPID.	55 41 56 12½ 56 44 57 15 57 46	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	31½ 31½ 31 31	7·14 7·14 7·26 7·26	274 247 256 243	10·48 10·48 10·65 10·65	do.	do.	unf. light	do.	do.	do.	do.	Heavy rain.
39	RAPID.	7 03 7 51½ 8 42 9 35 10 28	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	48½ 50½ 53 53	4·64 4·46 4·25 4·25	65 67 59 62	6·80 6·53 6·23 6·23	do.	do.	fav. light	do.	do.	do.	do.	Light rain.
40	RAPID.	17 21 18 27 19 35 20 41 21 45	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	66 68 66 64	3·41 3·31 3·41 3·52	46·4 44 45 46	5·00 4·85 5·00 5·16	do.	do.	none	do.	do.	do.	do.	
41	RAPID.	15 31½ 15 55½ 16 18 16 39½ 17 01	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	24 22½ 21½ 21½	9·38 10·00 10·47 10·47	366? 376? 376? 375?	13·75 14·67 15·35 15·35	do.	do.	fav. light	do.	do.	do.	do.	Tractive power doubtful. See Remark, Experiment, No. 44. Boat grazed.
42	RAPID.	22 57 23 23½ 23 48 24 13½ 24 39½	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	25½ 24½ 25½ 26	8·82 9·18 8·82 8·65	335 357? 367? 365?	12·94 13·47 12·94 12·69	do.	do.	unf. strng brze.	do.	do.	do.	do.	Tractive power doubtful. See Remark, Experiment, No. 44.
43	RAPID.	28 32 29 00 29 30 29 59 30 28	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	28 30 29 29	8·03 7·50 7·76 7·76	337 328 337 338	11·79 11·00 11·38 11·38	do.	do.	fav.	do.	do.	do.	do.	
44	RAPID.	39 32½ 40 02½ 40 33 41 03½ 41 33½	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	30 30½ 30½ 30	7·50 7·38 7·38 7·50	317 314 316 307	11·00 10·82 10·82 11·00	do.	do.	unf.	do.	do.	do.	do.	Observed that the piston of the dynamometer had not range enough, therefore all preceding experiments, in which the tractive power exceeds 350lb., are doubtful. Gave sufficient range to the piston.

TABLE I. CONTINUED.—THE RAPID (FIRST SET).

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
No. of Experiment.	Boat's Name.	Instant of passing the Stake.	Stakes 110 yards apart.	Time of passing the Stake—interval.	Miles per Hour.	Tractive Power in lbs.	Feet per Second.	Kind of Tractive Power.	Load.	Wind.	Draught.		Position of Wave.	Variation in Level.	REMARKS.
											Bow.	Stern.			
45	RAPID.	min. sec. 49 28 $\frac{1}{2}$ 49 57 50 26 $\frac{1}{2}$ 51 11 51 38	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	sec. 29 $\frac{1}{2}$ 29 $\frac{1}{2}$ 27	miles. 7.59 7.59 8.33	lbs. 316 324	feet. 11.19 11.19 12.22	Two Horses.	7 passengers, and 3 $\frac{1}{2}$ ton, = c. q. lb. 79 2 1	fav.	in. 16	in. 16	not obs.	not obs.	Bad experiment. Horse broke loose.
46	RAPID.	56 56 57 28 57 57 $\frac{1}{2}$ 58 29 59 59 $\frac{1}{2}$	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	32 29 $\frac{1}{2}$ 32 $\frac{1}{2}$ 30 $\frac{1}{2}$	7.03 7.59 6.91 7.38	274 278 279 291	10.31 11.19 10.15 10.82	do.	do.	unf.	do.	do.	do.	do.	
47	RAPID.	2 42 3 03 $\frac{1}{2}$ 3 24 3 44 4 05 $\frac{1}{2}$	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	21 $\frac{1}{2}$ 20 $\frac{1}{2}$ 20 20 $\frac{1}{2}$	10.47 10.93 11.25 10.93	497 498 486 469	15.35 16.09 16.50 16.09	do.	do.	fav.	do.	do.	do.	do.	
48	RAPID.	12 35 12 58 13 20 13 42 $\frac{1}{2}$ 14 04 $\frac{1}{2}$	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	23 22 22 $\frac{1}{2}$ 22	9.78 10.23 10.00 10.23	466 426 416 417	14.35 15.00 14.67 15.00	do.	do.	unf.	do.	do.	do.	do.	
49	RAPID.	39 37 $\frac{1}{2}$ 40 01 $\frac{1}{2}$ 40 24 40 46 41 08 $\frac{1}{2}$	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	24 22 $\frac{1}{2}$ 22 22 $\frac{1}{2}$	9.38 10.00 10.23 10.00	437 451 428 427	13.75 14.67 15.00 14.67	do.	7 passengers, and 4 $\frac{1}{4}$ ton, = c. q. lb. 94 2 1	fav.	17	17	do.	do.	
50	RAPID.	46 53 47 17 $\frac{1}{2}$ 47 42 48 06 $\frac{1}{2}$ 48 32 $\frac{1}{2}$	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	24 $\frac{1}{2}$ 24 $\frac{1}{2}$ 24 $\frac{1}{2}$ 26	9.18 9.18 9.18 8.65	435 433 426 428	13.47 13.47 13.47 12.69	do.	do.	unf.	do.	do.	do.	do.	
51	RAPID.	8 25 8 53 9 22 $\frac{1}{2}$ 9 52 $\frac{1}{2}$ 10 22 $\frac{1}{2}$	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	28 29 $\frac{1}{2}$ 30 30	8.03 7.59 7.50 7.50	343 344 350 332	11.79 11.19 11.00 11.00	do.	do.	fav. light	do.	do.	do.	do.	Warm sunshine.
52	RAPID.	16 16 16 47 17 18 17 47 $\frac{1}{2}$ 18 18 $\frac{1}{2}$	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	31 31 28 $\frac{1}{2}$ 31	7.26 7.26 7.90 7.26	291 286 309 304.5	10.65 10.65 11.58 10.65	do.	do.	unf.	do.	do.	do.	do.	
53	RAPID.	21 22 21 53 22 25 22 54 $\frac{1}{2}$ 23 25 $\frac{1}{2}$	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	31 32 29 $\frac{1}{2}$ 29	7.26 7.03 7.59 7.76	321 305 326 310	10.65 10.31 11.19 11.38	do.	do.	fav.	do.	do.	do.	do.	

TABLE I. CONTINUED.—THE RAPID (FIRST SET).

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
No. of Experiment.	Boat's Name.	Instant of passing the Stake.	Stakes 110 yards apart.	Time of passing the Stake-interval.	Miles per Hour.	Tractive Power in lbs.	Feet per Second.	Kind of Tractive Power.	Load.	Wind.	Draught.		Position of Wave.	Variation in Level.	REMARKS.
											Bow	Stern			
54	RAPID.	min. sec. 35 07 35 40 36 12 36 42 37 14	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	sec. 33 32 30 32	miles. 6·82 7·03 7·50 7·03	lbs. 269 237 273 286	feet. 10·00 10·31 11·00 10·31	Two Horses.	7 passengers, and 4½ ton, = c. q. lb. 94 2 1	fav. light	in. 17	in. 17	not obs.	not obs.	
55	RAPID.	43 37 44 29 45 20½ 46 12 47 02	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	52 51½ 51½ 50	4·33 4·37 4·37 4·50	66 60 67 62	6·35 6·41 6·41 6·60	One Horse. Boy leading	do.	do.	do.	do.	do.	do.	
56	RAPID.	58 49 59 55 1 00½ 2 07 3 10	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	66 64½ 66½ 63	3·41 3·49 3·38 3·57	54 49 46 56	5·00 5·12 4·96 5·24	do.	do.	do.	do.	do.	do.	do.	
57	RAPID.	9 37 9 59½ 10 22½ 10 45 11 07½	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	22½ 23 22½ 22½	10·00 9·78 10·00 10·00	487 457 446 421	14·67 14·35 14·67 14·67	Two Horses.	do.	fav. very light	do.	do.	do.	do.	
58	RAPID.	16 04 16 27½ 16 51½ 17 16½ 17 43	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	23½ 24 25 26½	9·57 9·38 9·00 8·49	445 419 421 417	14·04 13·75 13·20 12·45	do.	do.	unf. very light	do.	do.	do.	do.	
59	RAPID.	37 46½ 38 14 38 41½ 39 10 39 39	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	27½ 26½ 28½ 29	8·18 8·49 7·90 7·76	391 383 405 402	12·00 12·45 11·58 11·38	do.	do.	do.	19½	15½	do.	do.	Weight shifted forward.
60	RAPID.	44 28 44 55 45 25 45 54 46 23½	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	27 30 29 29½	8·33 7·50 7·76 7·59	388 404 416 409	12·22 11·00 11·38 11·19	do	do.	do. light	do.	do.	do.	do.	
61	RAPID.	9 34 10 02 10 31 11 00 11 29½	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	28 29 29 29½	8·03 7·76 7·76 7·59	412 410 437 430	11·79 11·38 11·38 11·19	do.	do.	fav. very light	do.	do.	do.	do.	
62	RAPID.	16 37½ 17 06 17 36 18 05½ 18 35½	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	28½ 30 29½ 30	7·90 7·50 7·59 7·50	356 364 378·9 353	11·58 11·00 11·19 11·00	do.	do.	unf. very light	do.	do.	do.	do.	

TABLE I. CONTINUED.—THE RAPID (FIRST SET).

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P.
No. of Experiment.	Boat's Name.	Instant of passing the Stake.	Stakes 110 yards apart.	Time of passing the Stake—interval.	Miles per Hour.	Tractive Power in lbs.	Feet per Second.	Kind of Tractive Power.	Load.	Wind.	Draught.		Position of Wave.	Variation in Level.	REMARKS.
											Bow.	Stern			
63	RAPID.	min. sec. 33 02 33 30 33 59 34 27½ 34 56	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	sec. 28 29 28½ 28½	miles. 8·03 7·76 7·90 7·90	lbs. 403 384 419 430	feet. 11·79 11·38 11·58 11·58	Two Horses.	7 passengers, and 4½ tons, = c. q. lb. 94 2 1	unf. very light	in. 19½	in. 15½	not obs.	not obs.	Towing-line attached 5½ ft. from bow.
64	RAPID.	49 41 50 10½ 50 40 51 10½ 51 40	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	29½ 29½ 30½ 29½	7·59 7·59 7·38 7·59	386·8 413 414·6 428	11·19 11·19 10·82 11·19	do.	do.	do.	do.	do.	do.	do.	Towing-line taken through one pulley only, and 4 ft. 1 in. from the bow.
65	RAPID.	28 54 29 21 29 49 30 18 30 46½	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	27 28 29 28½	8·33 8·03 7·76 7·90	316 323 360·6 367·8	12·22 11·79 11·38 11·58	do.	do.	do.	do.	do.	do.	do.	Outrigger used 6 ft. 4 in. from the gunwale, and 5 ft. from the bow.
66	RAPID.	42 51 43 21 43 50½ 44 20 44 50½	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	30 29½ 29½ 30½	7·50 7·59 7·59 7·38	295·6 292·3 315·2 301·4	11·00 11·19 11·19 10·82	do.	do.	do.	do.	do.	do.	do.	No outrigger.
67	RAPID.	18 31 19 01 19 32 20 02 20 33	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	30 31 30 31	7·50 7·26 7·50 7·26	303 272·5 281 261	11·00 10·65 11·00 10·65	do.	do.	do.	do.	do.	do.	do.	Outrigger, 3 ft. 8 in. from gunwale, 5 ft. 6 in. from bow.
68	RAPID.	31 55 32 21½ 32 48 33 17 33 45	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	26½ 26½ 29 28	8·49 8·49 7·76 8·03	366 378 382·6 419	12·45 12·45 11·38 11·79	do.	do.	do.	do.	do.	do.	do.	
69	RAPID.	53 20 53 48 54 17 54 45 54 13½	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	28 29 28 28½	8·03 7·76 8·03 7·90	468 438·5 473·5 477·7	11·79 11·38 11·79 11·58	do.	do.	fav. light	do.	do.	do.	do.	Towing-line from the bow.
70	RAPID.	18 44½ 1 13½ 1 41 2 09	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	26½ 29 27½ 28	8·49 7·76 8·18 8·03	328·4 314·2 386·4 365	12·45 11·38 12·00 11·79	do.	7 passengers, and 3 ton, = c. q. lb. 69 2 1	none	15½	15½	do.	do.	A barge passed at 1 m. 12s.
71	RAPID.	8 10½ 8 37 9 05½ 9 33 10 01½	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	27½ 28½ 27½ 27½	8·18 7·90 8·18 8·18	326·6 351·1 362·6 364·7	12·00 11·58 12·00 12·00	do.	do.	unf. light	do.	do.	do.	do.	

TABLE I. CONTINUED.—THE RAPID (FIRST SET).

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
No. of Experiment.	Boat's Name.	Instant of passing the Stake.	Stakes 110 yards apart.	Time of passing the Stake—interval.	Miles per Hour.	Tractive Power in lbs.	Feet per Second.	Kind of Tractive Power.	Load.	Wind.	Draught.		Position of Wave.	Variation in Level.	REMARKS.
											Bow	Stern			
72	RAPID.	min. sec. 13 54 $\frac{1}{2}$ 14 21 14 48 15 16 15 44	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	sec. 26 $\frac{1}{2}$ 27 27 28 28	miles. 8·49 8·33 8·03 8·03	lbs. 337 339 358 365	feet. 12·45 12·22 11·79 11·79	Two Horses.	7 passen- gers, and 3 ton, = <i>c. q. lb.</i> 69 2 1	unf. light	in. 15 $\frac{3}{8}$	in. 15 $\frac{3}{8}$	not obs.	not obs.	
73	RAPID.	26 03 27 11 27 39 28 07 $\frac{1}{2}$ 29 36 $\frac{1}{2}$	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	28 28 28 $\frac{1}{2}$ 29	8·03 8·03 7·90 7·76	289·3 301·5 318·3 312·4	11·79 11·79 11·58 11·38	do.	do.	do.	do.	do.	do.	do.	
74	RAPID.	57 51 58 18 58 46 59 15 59 43	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	27 28 29 28	8·33 8·03 7·76 8·03	335·7 335·5 351·4 382·6	12·22 11·79 11·38 11·79	do.	do.	do.	do.	do.	do.	do.	
75	RAPID.	10 19 10 43 11 09 11 34 11 59	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	24 26 25 25	9·38 8·65 9·00 9·00	396·3 363 406·4 410	13·75 12·69 13·20 13·20	do.	do.	do.	do.	do.	do.	do.	
76	RAPID.	25 29 25 55 $\frac{1}{2}$ 26 22 26 50 27 18	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	26 $\frac{1}{2}$ 26 $\frac{1}{2}$ 28 28	8·49 8·49 8·03 8·03	386·5 384·5 393·5 405·5	12·45 12·45 11·79 11·79	do.	do.	do.	do.	do.	do.	do.	
77	RAPID.	37 07 37 35 $\frac{1}{2}$ 38 04 $\frac{1}{2}$ 38 33 39 02 $\frac{1}{2}$	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	28 $\frac{1}{2}$ 29 28 $\frac{1}{2}$ 29 $\frac{1}{2}$	7·90 7·76 7·90 7·59	319·4 307·4 346·3 348·8	11·58 11·38 11·58 11·19	do.	do.	do.	do.	do.	do.	do.	
78	RAPID.	49 52 50 14 50 35 50 56 51 17	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	22 21 21 21	10·23 10·71 10·71 10·71	474·1 454·5 438 440·6	15·00 15·71 15·71 15·71	do.	do.	do.	do.	do.	do.	do.	
79	RAPID.	6 48 7 44 8 41 9 39 10 38	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	56 57 58 59	4·02 3·95 3·88 3·81	64·6 56 53·7 52·6	5·89 5·78 5·69 5·59	Two Men.	do.	do.	do.	do.	do.	do.	
80	RAPID.	53 28 53 58 54 26 54 55 55 24	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	30 28 29 29	7·50 8·03 7·76 7·76	253 280·8 301 292·3	11·00 11·79 11·38 11·38	Two Horses.	7 passen- gers, and 2 ton, = <i>c. q. lb.</i> 49 2 1	do.	14	14	do.	do.	

TABLE I. CONTINUED—THE RAPID (FIRST SET).

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
No. of Experiment.	Boat's Name.	Instant of passing the Stake.	Stakes 110 yards apart.	Time of passing the Stake-interval.	Miles per Hour.	Tractive Power in lbs.	Feet per Second.	Kind of Tractive Power.	Load.	Wind.	Draught.		Position of Wave.	Variation in Level.	REMARKS. PLACE OF EXPERIMENT, FORTH AND CLYDE CANAL.
											Bow	Stern			
81	RAPID.	min. sec.		sec.	miles.	lbs.	feet.								
		22 05	<i>b</i>	25½	8·82	337·3	12·94								
		22 30½	<i>c</i>	25	9·00	355·8	13·20								
		22 55½	<i>d</i>	25	9·00	356·5	13·20								
		23 20½	<i>e</i>	25½	8·82	351·2	12·94	Two Horses.	7 passengers, and 2 ton, = c. q. lb. 49 2 1	fav. light	in. 14	in. 14	not obs.	not obs.	
82	RAPID.	36 25	<i>b</i>	19	11·84	482	17·37								
		36 44	<i>c</i>	19½	11·54	483·2	16·92								
		37 03½	<i>d</i>	20	11·25	461	16·50	do.	do.	do.	do.	do.	do.	do.	
		37 23½	<i>e</i>	20½	10·93	434·5	16·09								
		37 44	<i>f</i>												
83	RAPID.	56 26	<i>b</i>	66	3·41	47	5·00								
		57 32	<i>c</i>	63	3·57	44	5·24								
		58 35	<i>d</i>	63	3·57	43·5	5·24	Two Men.	do.	do.	do.	do.	do.	do.	
		59 38	<i>e</i>	62½	3·60	41	5·28								
		40½	<i>f</i>												
84	RAPID.	30 06½	<i>b</i>	20½	10·93	420	16·09								
		30 27	<i>c</i>	20½	10·93	372	16·09								
		30 47½	<i>d</i>	20½	10·93	380·8	16·09	Two Horses.	7 passengers, and 1 ton, = c. q. lb. 29 2 1	fav. strong	12½	12½	do.	do.	
		31 08	<i>e</i>	20½	10·93	374·8	16·09								
		31 28½	<i>f</i>												
85	RAPID.	40 45	<i>b</i>	26	8·65	302·3	12·69								
		41 11	<i>c</i>	24½	9·18	300	13·47								
		41 35½	<i>d</i>	25	9·00	294·2	13·20	do.	do.	do.	do.	do.	do.	do.	
		42 00½	<i>e</i>	26	8·65	300	12·69								
		42 26½	<i>f</i>												
86	RAPID.	55 32	<i>b</i>	28	8·03	234·6	11·79								
		56 00	<i>c</i>	28	8·03	242·2	11·79								
		56 28	<i>d</i>	28	8·03	261·3	11·79	do.	do.	do.	do.	do.	do.	do.	
		56 56	<i>e</i>	29½	7·59	250·6	11·19								
		57 25½	<i>f</i>												
87	RAPID.	6 18	<i>b</i>	58½	3·84	45·2	5·64								
		7 16½	<i>c</i>	56	4·02	45·7	5·89								
		8 12½	<i>d</i>	58½	3·84	41·7	5·64	One Horse.	do.	do.	do.	do.	do.	do.	
		9 11	<i>e</i>	57	3·95	43·8	5·78	Boy leading							
		10 08	<i>f</i>												
88	RAPID.	27 45	<i>b</i>	61	3·69	56·8	5·41								
		28 46	<i>c</i>	56	4·02	45·1	5·90								
		29 42	<i>d</i>	58	3·88	42	5·69	Two Men.	do.	fav. light	do.	do.	do.	do.	
		30 40	<i>e</i>	56½	3·98	42	5·84								
		31 36½	<i>f</i>												
89	RAPID.	51 21	<i>b</i>	25	9·00	263·6	13·20								
		51 46	<i>c</i>	24½	9·18	264·4	13·47								
		52 10½	<i>d</i>	25½	8·82	248	12·94	Two Horses.	7 passengers, = c. q. lb. 9 2 1	do.	12¼	9	do.	do.	
		52 36	<i>e</i>	25	9·00	255	13·20								
		53 01	<i>f</i>												

TABLE II.—THE ZEPHYR (FIRST SET—36 *Experiments*).

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
No. of Experiment.	Boat's Name.	Instant of passing the Stake.	Stakes 110 yards apart.	Time of passing the Stake-interval.	Miles per Hour.	Tractive Power in lbs.	Feet per Second.	Kind of Tractive Power.	Load.	Wind.	Draught.		Position of Wave.	Variation in Level.	REMARKS.
											Bow	Stern			
90	ZEPHYR.	min. sec. 5 03 5 52 6 42 7 33 8 27	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	sec. 49 50 51 54	miles. 4·59 4·50 4·41 4·17	lbs. 35·5 38·4 41·6 39·1	feet. 6·73 6·60 6·47 6·11	Two Horses.	7 passen- gers, = c. q. lb. 9 2 1	fav. light	in. 7	in. 5	not obs.	not obs.	Weight of ZEPHYR, when empty, 2 ton, 2 cwt. 2 qr. 5lb. Towing-line 11 ft. from bow.
91	ZEPHYR.	16 35 17 00 ¹ / ₂ 17 26 ¹ / ₂ 17 54 18 20 ¹ / ₂	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	25 ¹ / ₂ 26 27 ¹ / ₂ 26 ¹ / ₂	8·82 8·65 8·18 8·49	175·5 169 164·6 155·6	12·94 12·69 12·00 12·45	do.	do.	do.	do.	do.	do.	do.	
92	ZEPHYR.	28 50 ¹ / ₂ 29 15 29 39 30 03 30 27	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	24 ¹ / ₂ 24 24 24	9·18 9·38 9·38 9·38	202 188·7 181·2 175·6	13·47 13·75 13·75 13·75	do.	do.	do.	do.	do.	do.	do.	
93	ZEPHYR.	39 10 ¹ / ₂ 39 27 39 44 40 01 40 18	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	17 ¹ / ₂ 17 17 17	12·86 13·24 13·24 13·24	347 343·8 349 349	18·86 19·41 19·41 19·41	do.	do.	do.	do.	do.	do.	do.	
94	ZEPHYR.	39 20 39 39 39 57 40 15 40 33	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	19 18 18 18	11·84 12·50 12·50 12·50	357·5 360 372·8 361	17·37 18·33 18·33 18·33	do.	7 passen- gers, and 1 ton, = c. q. lb. 29 2 1	do.	8 ¹ / ₄	7 ¹ / ₄	do.	do.	
95	ZEPHYR.	47 04 47 28 ¹ / ₂ 47 52 48 17 48 40 ¹ / ₂	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	24 ¹ / ₂ 23 ¹ / ₂ 25 23 ¹ / ₂	9·18 9·57 9·00 9·57	237·4 230·5 211 222·7	13·47 14·04 13·20 14·04	do.	do.	do.	do.	do.	do.	do.	
96	ZEPHYR.	1 15 ¹ / ₂ 2 17 3 14 ¹ / ₂ 4 13 ¹ / ₂ 5 18	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	61 ¹ / ₂ 57 ¹ / ₂ 59 64 ¹ / ₂	3·66 3·91 3·81 3·49	36·5 42·7 34·9 31·5	5·37 5·74 5·59 5·12	One Horse. Boy leading	do.	do.	do.	do.	do.	do.	
97	ZEPHYR.	13 59 ¹ / ₂ 14 52 ¹ / ₂ 15 45 ¹ / ₂ 16 38 17 32	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	53 53 53 ¹ / ₂ 54	4·25 4·25 4·21 4·17	47 46 38 39	6·23 6·23 6·17 6·11	One Horse. Boy riding.	do.	do.	do.	do.	do.	do.	
98	ZEPHYR.	47 23 ¹ / ₂ 47 42 48 00 ¹ / ₂ 48 19 ¹ / ₂ 48 38	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	181 ¹ / ₂ 181 ¹ / ₂ 19 181 ¹ / ₂	12·16 12·16 11·84 12·16	370 370·8 360 369·2	17·84 17·84 17·37 17·84	Two Horses.	7 passen- gers, & 1t. 6 cwt. = c. q. lb. 35 2 1	do.	9 ¹ / ₄	7 ¹ / ₂	do.	do.	ZEPHYR, with 1 ton 6 cwt. and 7 passengers, nearly equal to the weight of the RAPID and 7 passengers.

TABLE II. CONTINUED.—THE ZEPHYR (FIRST SET).

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
No. of Experiment.	Boat's Name.	Instant of passing the Stake.	Stakes 110 yards apart.	Time of passing the Stake-interval.	Miles per Hour.	Tractive Power in lbs.	Feet per Second.	Kind of Tractive Power.	Load.	Wind.	Draught.		Position of Wave.	Variation in Level.	REMARKS.
											Bow	Stern			
99	ZEPHYR.	min. sec. 55 14 55 37 $\frac{1}{2}$ 56 01 $\frac{1}{2}$ 56 26 56 51	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	sec. 23 $\frac{1}{2}$ 24 24 $\frac{1}{2}$ 25	miles. 9.57 9.38 9.18 9.00	lbs. 259.8 227.4 223 224.7	feet. 14.04 13.75 13.47 13.20	Two Horses.	7 passengers & 1 t. 6 cwt. = c. q. lb. 35 2 1	fav. light	in. 9 $\frac{1}{4}$	in. 7 $\frac{1}{2}$	not obs.	not obs.	A barge passed, 56m. 40s.
100	ZEPHYR.	2 01 2 32 $\frac{1}{2}$ 3 04 3 33 $\frac{1}{2}$ 4 03 $\frac{1}{2}$	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	31 $\frac{1}{2}$ 31 $\frac{1}{2}$ 29 $\frac{1}{2}$ 30	7.14 7.14 7.59 7.50	138.5 152.5 167.2 156.9	10.48 10.48 11.19 11.00	do.	do.	do.	do.	do.	do.	do.	
101	ZEPHYR.	12 14 $\frac{1}{2}$ 13 08 14 03 14 58 15 53	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	53 $\frac{1}{2}$ 55 55 55	4.21 4.09 4.09 4.09	45.5 45.2 40 41.1	6.17 6.00 6.00 6.00	do.	do.	do.	do.	do.	do.	do.	
102	ZEPHYR.	34 22 34 41 $\frac{1}{2}$ 35 00 35 19 $\frac{1}{2}$ 35 39	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	19 $\frac{1}{2}$ 18 $\frac{1}{4}$ 19 $\frac{1}{2}$ 19 $\frac{1}{2}$	11.54 12.16 11.54 11.54	410.4 391.5 456.4 345.2	16.92 17.84 16.92 16.92	do.	7 passengers, and 2 ton, $\square$ c. q. lb. 49 2 1	do.	10	9	do.	do.	
103	ZEPHYR.	57 49 58 14 58 39 59 05 59 31	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	25 25 26 26	9.00 9.00 8.65 8.65	272 243.6 240.2 250.2	13.20 13.20 12.69 12.69	do.	do.	fav. very light	do.	do.	do.	do.	
104	ZEPHYR.	1 27 1 50 2 13 2 35 $\frac{1}{2}$ 2 58	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	23 23 22 $\frac{1}{2}$ 22 $\frac{1}{2}$	9.78 9.78 10.00 10.00	317.7 281.2 274.8 252.8	14.35 14.35 14.67 14.67	do.	do.	do.	do.	do.	do.	do.	
105	ZEPHYR.	13 31 $\frac{1}{2}$ 14 23 $\frac{1}{2}$ 15 12 $\frac{1}{2}$ 16 05 16 58	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	52 49 52 $\frac{1}{2}$ 53	4.33 4.59 4.29 4.25	44.2 55.4 45.4 47.4	6.35 6.73 6.29 6.23	do.	do.	do.	do.	do.	do.	do.	
106	ZEPHYR.	48 49 49 44 50 40 51 36 52 31 $\frac{1}{2}$	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	55 56 56 55 $\frac{1}{2}$	4.09 4.02 4.02 4.05	54.1 50.9 47.8 48.8	6.00 5.89 5.89 5.95	Two Men.	7 passengers, and 3 ton, $\square$ c. q. lb. 69 2 1	do.	12	11	do.	do.	
107	ZEPHYR.	3 09 4 10 5 10 $\frac{1}{2}$ 6 10 $\frac{1}{2}$ 7 10 $\frac{1}{2}$	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	61 60 $\frac{1}{2}$ 60 60	3.69 3.72 3.75 3.75	92.8 76.4 69.7 65.8	5.41 5.45 5.50 5.50	do.	do.	do.	do.	do.	do.	do.	Stern drawn foremost.

TABLE II. CONTINUED.—THE ZEPHYR.

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
No. of Experiment.	Boat's Name.	Instant of passing the Stake.	Stakes 110 yards apart.	Time of passing the Stake—interval.	Miles per Hour.	Tractive Power in lbs.	Feet per Second.	Kind of Tractive Power.	Load.	Wind.	Draught.		Position of Wave.	Variation in Level.	REMARKS.
											Bow.	Stern.			PLACE OF EXPERIMENT, FORTH AND CLYDE CANAL.
108	ZEPHYR.	min. sec. 10 11 10 30 10 49½ 11 09 11 28	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	sec. 19 19½ 19½ 19	miles. 11·84 11·54 11·54 11·84	lbs. 449·8 434·2 418·4 407·4	feet. 17·37 16·92 16·92 17·37	Two Horses.	7 passengers, and 3 ton, = <i>c. q. lb.</i> 69 2 1	fav. light	in. 12	in. 11	not obs.	not obs.	
109	ZEPHYR.	20 58 21 25 21 51 22 18 22 45	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	27 26 27 27	8·33 8·65 8·33 8·33	272·3 262·7 299·5 291·3	12·22 12·69 12·22 12·22	do.	do.	do.	do.	do.	do.	do.	
110	ZEPHYR.	29 41 30 08 30 33 30 59 31 25	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	27 25 26 26	8·33 9·00 8·65 8·65	293·0 295·7 283·5 306·5	12·22 13·20 12·69 12·69	do.	do.	do.	do.	do.	do.	do.	
111	ZEPHYR.	20 12½ 20 34 20 55 21 16 21 36½	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	21½ 21 21 20½	10·47 10·71 10·71 10·97	441·1 418·2 406·4 423·4	15·35 15·71 15·71 16·09	do.	7 passengers, and 4¼ ton, = <i>c. q. lb.</i> 94 2 1	do.	13¾	12¾	do.	do.	
112	ZEPHYR.	33 36 34 04½ 34 32 34 59 35 27	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	28½ 27½ 27 28	7·90 8·18 8·33 8·03	275·0 321·0 351·0 377·5	11·58 12·00 12·22 11·79	do.	do.	do.	do.	do.	do.	do.	
113	ZEPHYR.	42 54 43 49 44 42 45 33 46 24	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	55 53 51 51	4·09 4·25 4·41 4·41	59·8 59·8 62·7 57·6	6·00 6·23 6·47 6·47	do.	do.	do.	do.	do.	do.	do.	
114	ZEPHYR.	34 41 34 59 35 18 35 37 35 55	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	18 19 19 18	12·50 11·84 11·84 12·50	401·0 384·0 375·6 372·7	18·33 17·37 17·37 18·33	do.	7 passengers, & 1t. 13cwt. = <i>c. q. lb.</i> 42 2 1	do.	9¾	8½	do.	do.	1 ton 13cwt. made the ZEPHYR and 7 passengers nearly equal to the VELOCITY, with 7 passengers.
115	ZEPHYR.	17 03 17 26 17 48½ 18 11½ 18 33½	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	23 22½ 23 22	9·78 10·00 9·78 10·23	291·5 271·0 267·0 269·4	14·35 14·67 14·35 15·00	do.	do.	do.	do.	do.	do.	dur. run. bow elev. 11'	
116	ZEPHYR.	58 18 59 05 59 52 0 40 1 28½	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	47 47 48 48½	4·79 4·79 4·69 4·64	67·1 59·1 53·5 59·9	7·02 7·02 6·88 6·80	do.	do.	do.	do.	do.	do.		Bubble vibrating a little.

TABLE II. CONTINUED.—THE ZEPHYR.

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
No. of Experiment.	Boat's Name.	Instant of passing the Stake.	Stakes 110 yards apart.	Time of passing the Stake—interval.	Miles per Hour.	Tractive Power in lbs.	Feet per Second.	Kind of Tractive Power.	Load.	Wind.	Draught.		Position of Wave.	Variation in Level.	REMARKS.
		min. sec.		sec.	miles.	lbs.	feet.				Bow	Stern			PLACE OF EXPERIMENT, FORTH AND CLYDE CANAL.
117	ZEPHYR.	8 52 9 55 10 55 11 52 12 47	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	63 60 57 55	3.57 3.75 3.95 4.09	37.8 39.9 50.2 42.0	5.24 5.50 5.78 6.00	Two Horses.	7 passengers, & 1t. 13 cwt. = <i>c. g. lb.</i> 42 2 1	fav. light	in. 9 $\frac{3}{4}$	in. 8 $\frac{1}{2}$	not obs.		
118	ZEPHYR.	19 52 20 10 20 28 $\frac{1}{2}$ 20 47 21 06	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	18 18 $\frac{1}{2}$ 18 $\frac{1}{2}$ 19	12.50 12.16 12.16 11.84	414.5 386.3 372.0 372.0	18.33 17.84 17.84 17.37	do.	do.	do.	do.	do.	do.	dur. run. bow elev. 27'	
119	ZEPHYR.	38 52 39 15 39 37 $\frac{1}{2}$ 40 00 40 23	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	23 22 $\frac{1}{2}$ 22 $\frac{1}{2}$ 23	9.78 10.00 10.00 9.78	302.6 270.8 258.3 258.6	14.35 14.67 14.67 14.35	do.	do.	do.	11 $\frac{1}{4}$	7 $\frac{1}{4}$	do.	do. elev. 7 $\frac{1}{2}$	Weight shifted forward.
120	ZEPHYR.	51 20 51 44 52 07 $\frac{1}{2}$ 52 30 52 53	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	24 23 $\frac{1}{2}$ 22 $\frac{1}{2}$ 23	9.38 9.57 10.00 9.78	280.8 259.2 266.7 250.6	13.75 14.04 14.67 14.35	do.	do.	do.	8 $\frac{1}{4}$	10 $\frac{1}{4}$	do.	do. elev. 15 $\frac{1}{2}$	do. aft.
121	ZEPHYR.	10 25 10 47 11 08 $\frac{1}{2}$ 11 29 11 50 $\frac{1}{2}$	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	22 21 $\frac{1}{2}$ 20 $\frac{1}{2}$ 21 $\frac{1}{2}$	10.23 10.47 10.97 10.47	328.8 311.2 317.3 283.0	15.00 15.35 16.09 15.35	do.	do.	do.	9 $\frac{1}{2}$	8 $\frac{1}{2}$	do.	do. dep. 20'	Weight distributed equally.
122	ZEPHYR.	12 06 $\frac{1}{2}$ 12 32 12 57 13 24 13 50	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	25 $\frac{1}{2}$ 25 27 26	8.82 9.00 8.33 8.65	230.2 241.8 237.1 238.6	12.94 13.20 12.22 12.69	do.	do.	do.	do.	do.	do.	do. elev. 22'	
123	ZEPHYR.	21 18 21 41 $\frac{1}{2}$ 22 06 22 30 22 53	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	23 $\frac{1}{2}$ 24 $\frac{1}{2}$ 24 23	9.57 9.18 9.38 9.78	257.5 253.0 256.7 245.2	14.04 13.47 13.75 14.35	do.	do.	do.	do.	do.	do.	do. elev. 22 $\frac{1}{2}$	
124	ZEPHYR.	34 27 34 51 35 16 35 40 36 03	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	24 24 24 23	9.38 9.00 9.38 9.78	246.0 253.6 255.2 249.0	13.75 13.20 13.75 14.35	do.	do.	do.	8	10	do.	do. elev. 26'	Weight shifted aft.
125	ZEPHYR.	50 54 51 18 $\frac{1}{2}$ 51 44 52 09 $\frac{1}{2}$ 52 35	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	23 $\frac{1}{2}$ 25 $\frac{1}{2}$ 25 $\frac{1}{2}$ 25 $\frac{1}{2}$	9.57 8.82 8.82 8.82	254.5 243.0 253.2 259.2	14.04 12.94 12.94 12.94	do.	do.	do.	11 $\frac{1}{2}$	7 $\frac{1}{4}$	do.	do. elev. 32'	Weight shifted forward.

TABLE III.—THE LARK (31 Experiments).

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
No. of Experiment.	Boat's Name.	Instant of passing the Stake.	Stakes 110 yards apart.	Time of passing the Stake—interval.	Miles per Hour.	Tractive Power in lbs.	Feet per Second.	Tractive Power.	Load.	Wind.	Draught.		Position of Wave.	Variation in Level.	REMARKS.
											Bow	Stern			PLACE OF EXPERIMENT, FORTH AND CLYDE CANAL.
		min. sec.		sec.	miles.	lbs.	feet.								
126	LARK.	1 18 $\frac{1}{2}$ 1 36 1 57 2 17 $\frac{1}{2}$ 2 38	b c d e f	17 $\frac{1}{2}$ 21 20 $\frac{1}{2}$ 20 $\frac{1}{2}$	12.86 10.71 10.97 10.97	386.0 355.0 337.0 317.7	18.86 15.71 16.09 16.09	Two Horses	7 passen- gers, = c. q. lb. 9 2 1	fav. light	in. 10 $\frac{1}{4}$	in. 10 $\frac{1}{4}$	not obs.	dur. run. bow elev. 25 $\frac{1}{2}$ '	Weight of LARK, when empty, 3 ton 3 cwt. 1qr. 4lb.
127	LARK.	27 05 27 30 27 54 28 18 $\frac{1}{2}$ 28 42	b c d e f	25 24 24 $\frac{1}{2}$ 23 $\frac{1}{2}$	9.00 9.38 9.18 9.57	256.5 253.6 256.1 264.8	13.20 13.75 13.47 14.04	do.	do.	do.	do.	do.	do.	do. do. elev. 15'	
128	LARK.	41 04 41 53 42 45 43 35 44 30 $\frac{1}{2}$	b c d e f	49 52 50 54 $\frac{1}{2}$	4.59 4.33 4.50 4.13	64.7 55.9 56.5 46.5	6.73 6.35 6.60 6.06	do.	do.	fav. stronger than last.	do.	do.	do.	do. do. level.	
129	LARK.	52 44 53 53 55 02 56 12 57 25	b c d e f	69 69 70 73	3.26 3.26 3.21 3.08	26.0 23.3 20.8 28.6	4.78 4.78 4.71 4.52	do.	do.	not steady.	do.	do.	do.	do.	
130	LARK.	18 30 18 48 19 08 19 27 $\frac{1}{2}$ 19 47	b c d e f	18 20 19 $\frac{1}{2}$ 20 $\frac{1}{2}$	12.50 11.25 11.54 10.97	396.0 368.7 370.6 364.5	18.33 16.50 16.92 16.09	do.	7 passen- gers, and 5 cwt. = c. q. lb. 14 2 1	fav. light	10 $\frac{1}{2}$	10 $\frac{1}{2}$	do.	do. do. elev. 27'	5cwt. made the LARK and 7 passengers nearly equal to the RAPID, and 7 pas- sengers.
131	LARK.	27 02 $\frac{1}{2}$ 27 26 $\frac{1}{2}$ 27 50 28 13 $\frac{1}{2}$ 28 36	b c d e f	24 23 $\frac{1}{2}$ 23 $\frac{1}{2}$ 22 $\frac{1}{2}$	9.38 9.57 9.57 10.00	279.7 270.8 251.5 265.0	13.75 14.04 14.04 14.67	do.	do.	do.	do.	do.	do.	do. do. elev. 17'	
132	LARK.	36 51 $\frac{1}{2}$ 37 47 38 43 39 35 40 33	b c d e f	56 $\frac{1}{2}$ 56 52 48	3.98 4.02 4.33 4.69	43.8 50.1 43.4 39.1	5.84 5.89 6.35 6.88	do.	do.	fav. stronger than last.	do.	do.	do.	do. do. elev. 3'	
133	LARK.	0 38 0 57 1 16 $\frac{1}{2}$ 1 36 1 56	b c d e f	19 19 $\frac{1}{2}$ 20 $\frac{1}{2}$ 20	11.84 11.54 10.97 11.25	393.4 372.3 363.6 366.8	17.37 16.92 16.09 16.50	do.	7 passen- gers, and 12 cwt. = c. q. lb. 21 2 1	do.	11 $\frac{1}{2}$	11 $\frac{1}{2}$	do.	do. do. elev. 29'	12cwt. made the LARK, and 7 passengers nearly equal to the VELOCITY, and 7 pas- sengers.
134	LARK.	8 46 9 09 $\frac{1}{2}$ 9 33 $\frac{1}{2}$ 9 57 10 20 $\frac{1}{2}$	b c d e f	23 $\frac{1}{2}$ 24 23 $\frac{1}{2}$ 23 $\frac{1}{2}$	9.57 9.38 9.57 9.57	286.2 280.2 278.5 265.6	14.04 13.75 14.04 14.04	do.	do.	fav. light	do.	do.	do.	do. do. elev. 19'	

TABLE III. CONTINUED.—THE LARK.

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P.
No. of Experiment.	Boat's Name.	Instant of passing the Stake.	Stakes 110 yards apart.	Time of passing the Stake-interval.	Miles per Hour.	Tractive Power in lbs.	Feet per Second.	Kind of Tractive Power.	Load.	Wind.	Draught.		Position of Wave.	Variation in Level.	REMARKS.
											Bow.	Stern			PLACE OF EXPERIMENT, FORTH AND CLYDE CANAL.
135	LARK.	min. sec. 22 35 23 33 24 30 25 27 26 24½	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	sec. 58 57 57 57½	miles. 3·88 3·95 3·95 3·91	lbs. 34·6 35·2 45·5 39·2	feet. 5·69 5·78 5·78 5·74	Two Horses.	7 passengers, and 12 cwt. = <i>c. q. lb.</i> 21 2 1	fav. breeze.	in. 11½	in. 11½	not obs.	dur. run. bow elev. 1½'	
136	LARK.	52 34 52 53½ 53 12½ 53 32 53 51½	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	19½ 19 19½ 19½ 19½	11·54 11·84 11·54 11·54 11·54	404·8 398·3 382·3 388·0	16·92 17·37 16·92 16·92	do.	7 passengers, and 1 ton, = <i>c. q. lb.</i> 29 2 1	do.	11¾	11¾	do.	do. do. elev. 24'	
137	LARK.	2 18½ 2 43 3 07 3 31 3 53	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	24½ 24 24 22	9·18 9·38 9·38 10·23	295·0 295·2 293·1 293·5	13·47 13·75 13·75 15·00	do.	do.	do.	do.	do.	do.	do. do. elev. 13'	
138	LARK.	14 45 15 40 16 39 17 37 18 34	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	55 59 58 57	4·09 3·81 3·88 3·95	37·0 36·5 35·0 36·0	6·00 5·59 5·69 5·78	do.	do.	do.	do.	do.	do.	do. do. level.	
139	LARK.	27 52 30 30 32 55 34 10 36 03	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>					do.	do.	do.	do.	do.	do.		Boat drifted with the wind.
140	LARK.	44 45 45 05 45 26 45 47 46 07½	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	20 21 21 20½	11·25 10·71 10·71 10·97	435·0 415·0 393·0 387·0	16·50 15·71 15·71 16·09	do.	7 passengers, and 2 ton, = <i>c. q. lb.</i> 49 2 1	do.	13½	13½	do.	do. do. elev. 29'	
141	LARK.	57 35½ 58 01 58 26 58 51½ 59 17	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	25½ 25 25½ 25½	8·82 9·00 8·82 8·82	338·7 334·0 329·0 334·7	12·94 13·20 12·94 12·94	do.	do.	do.	do.	do.	do.	do. do. elev. 26'	
142	LARK.	7 17 8 15 9 10½ 10 04 11 01	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	58 55½ 53½ 57	3·88 4·05 4·21 3·95	46·2 48·2 46·6 39·1	5·69 5·95 6·17 5·78	do.	do.	do.	do.	do.	do.	do. do. level.	
143	LARK.	36 01½ 36 23 36 44½ 37 06 37 27	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	21½ 21½ 21½ 21	10·47 10·47 10·47 10·71	448·7 422·6 400·0 401·0	15·35 15·35 15·35 15·71	do.	7 passengers, and 3 ton, = <i>c. q. lb.</i> 69 2 1	do.	14¾	14¾	do.	do. do. elev.	

TABLE III. CONTINUED.—THE LARK.

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
No. of Experiment.	Boat's Name.	Instant of passing the Stake.	Stakes 110 yards apart.	Time of passing the Stake—interval.	Miles per Hour.	Tractive Power in lbs.	Feet per Second.	Kind of Tractive Power.	Load.	Wind.	Draught.		Position of Wave.	Variation in Level.	REMARKS.
											Bow	Stern			
144	LARK.	min. sec. 46 33 47 32 48 29 49 28 50 26	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	sec. 59 57 59 58	miles. 3·81 3·95 3·81 3·88	lbs. 41·3 56·6 49·3 34·0	feet. 5·59 5·78 5·59 5·69	Two Horses.	7 passengers, and 3 ton, = fresh c. g. lb. 69 2 1	fav. brze.	in. 14 $\frac{3}{4}$	in. 14 $\frac{3}{4}$	not obs.	dur. run. bow elev. 3 $\frac{1}{2}$	The towing-line dragged along the water a short distance.
145	LARK.	58 29 58 55 59 21 $\frac{1}{2}$ 59 48 14	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	26 26 $\frac{1}{2}$ 26 $\frac{1}{2}$ 26	8·65 8·49 8·49 8·65	359·2 359·3 364·4 379·0	12·69 12·45 12·45 12·69	do.	do.	do.	do.	do.	do.	do. elev. 28'	
146	LARK.	41 46 42 11 42 36 $\frac{1}{2}$ 43 05 43 36 $\frac{1}{2}$	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	25 25 $\frac{1}{2}$ 28 $\frac{1}{2}$ 31 $\frac{1}{2}$	9·00 8·82 7·90 7·14	432·3 408·0 380·6 372·1	13·20 12·94 11·58 10·48	do.	7 passengers, and 4 $\frac{1}{2}$ ton, = very light c. g. lb. 94 2 1	fav. light	16 $\frac{1}{2}$	16 $\frac{1}{2}$	do.	do. elev. 30'	
147	LARK.	56 05 57 07 58 10 59 13 14	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	62 63 63 61	3·63 3·57 3·57 3·69	47·3 43·2 56·8 45·8	5·32 5·24 5·24 5·41	do.	do.	do.	do.	do.	do.	do. level	
148	LARK.	9 29 $\frac{1}{2}$ 10 01 10 35 $\frac{1}{2}$ 11 08 $\frac{1}{2}$ 11 41	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	31 $\frac{1}{2}$ 34 $\frac{1}{2}$ 33 33 $\frac{1}{2}$	7·14 6·52 6·82 6·72	248·5 181·6 195·2 176·7	10·48 9·57 10·00 9·85	do.	do.	do.	do.	do.	do.	do. elev. 5'	
149	LARK.	24 36 25 02 25 28 25 54 26 24	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	26 26 26 30	8·65 8·65 8·65 7·50	421·2 413·4 432·4 419·5	12·69 12·69 12·69 11·00	do.	do.	do.	do.	do.	do.	not obs.	
150	LARK.	12 05 $\frac{1}{2}$ 12 29 $\frac{1}{2}$ 12 52 13 14 $\frac{1}{2}$ 13 37	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	24 23 $\frac{1}{2}$ 22 $\frac{1}{2}$ 22 $\frac{1}{2}$	9·38 9·57 10·00 10·00	463·7 456·2 430·7 412·0	13·75 14·04 14·67 14·67	do.	do.	do.	do.	do.	do.	do. elev. 45'	
151	LARK.	22 07 $\frac{1}{2}$ 22 34 $\frac{1}{2}$ 23 01 $\frac{1}{2}$ 23 29 23 57	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	27 27 27 $\frac{1}{2}$ 28	8·33 8·33 8·18 8·03	377·8 377·5 402·6 422·0	12·22 12·22 12·00 11·79	do.	do.	do.	do.	do.	do.	do. elev. 37'	
152	LARK.	39 28 39 51 40 13 $\frac{1}{2}$ 40 36 40 57	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	23 22 $\frac{1}{2}$ 22 $\frac{1}{2}$ 21	9·78 10·00 10·00 10·71	474·0 458·2 431·0 424·7	14·35 14·67 14·67 15·71	do.	do.	do.	18	15	do.	do. elev. 34'	Weight shifted forward.

TABLE III. CONTINUED.—THE LARK.

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
No. of Experiment.	Boat's Name.	Instant of passing the Stake.	Stakes 110 yards apart.	Time of passing the Stake-interval.	Miles per Hour.	Tractive Power in lbs.	Feet per Second.	Kind of Tractive Power.	Load.	Wind.	Draught.		Position of Wave.	Variation in Level.	REMARKS.
											Bow	Stern			PLACE OF EXPERIMENT, FORTH AND CLYDE CANAL.
153	LARK.	min. sec. 52 35 53 02 $\frac{1}{2}$ 53 30 $\frac{1}{2}$ 53 58 54 26	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	sec. 27 $\frac{1}{2}$ 28 28 $\frac{1}{2}$ 28	miles. 8-18 8-03 7-90 8-03	lbs. 398-3 382-1 413-0 426-0	feet. 12-00 11-79 11-58 11-79	Two Horses.	7 passen- gers, and 4 $\frac{1}{2}$ ton, = c. q. lb. 94 2 1	fav. light	in. 18	in. 15	not obs.	dur. run. bow elev. 35'	
154	LARK.	6 13 $\frac{1}{2}$ 7 10 8 08 9 08 10 11	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	56 $\frac{1}{2}$ 58 60 63	3-98 3-88 3-75 3-57	50-9 55-6 44-8 40-6	5-84 5-69 5-50 5-24	do.	do.	do.	do.	do.	do.	do. do. level.	
155	LARK.	37 53 38 17 $\frac{1}{2}$ 38 40 $\frac{1}{2}$ 39 03 $\frac{1}{2}$ 39 26 $\frac{1}{2}$	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	24 $\frac{1}{2}$ 23 23 23	9-18 9-78 9-78 9-78	444-4 449-3 436-0 422-2	13-47 14-35 14-35 14-35	do.	do.	do.	14 $\frac{3}{4}$	17 $\frac{3}{4}$	do.	do. do. elev. 32'	Weight shifted aft.
156	LARK.	59 03 59 26 59 50 12 35	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	23 24 22 23	9-78 9-38 10-23 9-78	479-0 460-5 449-2 439-7	14-35 13-75 15-00 14-35	do.	do.	fav. very light	19 $\frac{1}{2}$	13	do.	do. do. elev. 5'. At rest. depd 4'	Weight shifted forward. Towing-line 5 ft. from the Stern. Dynamometer 5 ft. 6 in. from the bow.

TABLE IV.—THE VELOCITY (23 Experiments).

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
No. of Experiment.	Boat's Name.	Instant of passing the Stake.	Stakes 110 yards apart.	Time of passing the Stake—interval.	Miles per Hour.	Tractive Power in lbs.	Feet per Second.	Kind of Tractive Power.	Load.	Wind.	Draught.		Position of Wave.	Variation in Level.	REMARKS.
											Bow.	Stern			PLACE OF EXPERIMENT, FORTH AND CLYDE CANAL.
157	VELOCITY.	min. sec. 14 16 14 36 14 55½ 15 15 15 35½	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	sec. 20 19½ 19½ 20½	miles. 11·25 11·54 11·54 10·97	lbs. 407·8 396·7 382·3 375·1	feet. 16·50 16·92 16·92 16·09	Two Horses.	7 passengers, = <i>c. q. lb.</i> 9 2 1	not obs.	in. 11	in. 8	not obs.	dur. run. bow elev. 43'	Weight of VELOCITY, when empty, 3 ton. 15 cwt. 2 qr. 9 lb.
158	VELOCITY.	29 38 30 04 30 29 30 53 31 19½	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	26 25 24 26½	8·65 9·00 9·38 8·49	283·0 267·2 259·6 261·4	12·69 13·20 13·75 12·45	do.	do.	do.	do.	do.	do.	do. elev. 29'	
159	VELOCITY.	59 13 59 31½ 59 51 11 29½	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	18½ 19½ 20 18½	12·16 11·54 11·25 12·16	440·5 415·2 383·4 382·4	17·84 16·92 16·50 17·84	do.	do.	do.	do.	do.	do.	do. elev. 36'	
160	VELOCITY.	25 40 26 06 26 31½ 26 55 27 21	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	26 25½ 23½ 26	8·65 8·82 9·57 8·65	314·1 327·0 360·6 347·2	12·69 12·94 14·04 12·69	do.	7 passengers, and 1 ton, = <i>c. q. lb.</i> 29 2 1	do.	11	11	do.	at rest. bow dep. 11' dur. run. elev. 33'	
161	VELOCITY.	35 21½ 35 41 36 01 36 21 36 41½	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	19½ 20 20 20½	11·54 11·25 11·25 10·97	467·7 444·7 426·7 423·8	16·92 16·50 16·50 16·09	do.	do.	do.	do.	do.	do.	do. elev. 43'	
162	VELOCITY.	44 56 45 51 46 46 47 44½ 48 43	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	55 55 58½ 58½	4·09 4·09 3·84 3·84	47·0 42·1 38·4 37·5	6·00 6·00 5·64 5·64	do.	do.	very light	do.	do.	do.	do. level	
163	VELOCITY.	21 12½ 21 33½ 21 55 22 17 22 38	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	21 21½ 22 21	10·71 10·47 10·23 10·71	474·6 442·4 425·4 429·0	15·71 15·35 15·00 15·71	do.	7 passengers, and 2 ton, = <i>c. q. lb.</i> 49 2 1	do.	12¼	12¼	do.	do. elev. 30'	
164	VELOCITY.	32 43 33 10 33 36½ 34 03½ 34 30	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	27 26½ 27 26½	8·33 8·49 8·33 8·49	362·6 358·4 381·0 386·7	12·22 12·45 12·22 12·45	do.	do.	do.	do.	do.	do.	do. elev. 43'	
165	VELOCITY.	43 54 44 44 45 37 46 30 47 22½	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	50 53 53 52½	4·50 4·25 4·25 4·29	63·2 57·3 51·5 55·5	6·60 6·23 6·23 6·29	do.	do.	do.	do.	do.	do.	do. level.	

TABLE IV. CONTINUED.—THE VELOCITY.

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
No. of Experiment.	Boat's Name.	Instant of passing the Stake.	Stakes 110 yards apart.	Time of passing the Stake—interval.	Miles per Hour.	Tractive Power in lbs.	Feet per Second.	Kind of Tractive Power.	Load.	Wind.	Draught.		Position of Wave.	Variation in Level.	REMARKS.
											Bow	Stern			
166	VELOCITY.	min. sec. 18 22 18 46 19 09 19 31½ 19 54	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	sec. 24 23 22½ 22½	miles. 9·38 9·78 10·00 10·00	lbs. 484·5 467·3 451·0 424·5	feet. 13·75 14·35 14·67 14·67	Two Horses.	7 passengers, and 3 ton, = c. q. lb. 69 2 1	very light	in. 13½	in. 13½	not obs.	dur. run. bow elev. 36'	
167	VELOCITY.	28 08 28 36 29 03½ 29 32 30 00½	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	28 27½ 28½ 28½ 28½	8·03 8·18 7·90 7·90	386·0 376·7 387·8 412·0	11·79 12·00 11·58 11·58	do.	do.	do.	do.	do.	do.	do. elev. 40'	
168	VELOCITY.	39 17 40 11½ 40 05½ 41 00 41 54	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	54½ 54 54½ 54 54	4·13 4·17 4·13 4·17	53·4 50·4 57·6 54·3	6·06 6·11 6·06 6·11	do.	do.	do.	do.	do.	do.	do. level	
169	VELOCITY.	6 29 6 52 7 14½ 7 37 8 58	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	23 22½ 22½ 21	9·78 10·00 10·00 10·71	462·8 455·0 447·5 438·2	14·35 14·67 14·67 15·71	do.	do.	do.	17½	10	do.	at rest. bow dep. 43' dur. run. elev. 28'	Weight shifted forward.
170	VELOCITY.	25 55 26 21 26 47 27 13 27 41	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	26 26 26 28	8·65 8·65 8·65 8·03	432·6 419·3 424·3 436·2	12·69 12·69 12·69 11·79	do.	do.	none	15½	12	do.	dur. run. bow elev. 52'	do.
171	VELOCITY.	35 42½ 36 06 36 28 36 50 37 12½	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	23½ 22 22 22½	9·57 10·23 10·23 10·00	488 471·2 15·00 423·6	14·04 15·00 15·00 14·67	do.	do.	do.	do.	do.	do.	do. elev. 29'	
172	VELOCITY.	1 32 1 55½ 2 19 2 41½ 3 40	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	23½ 23½ 22½ 22½	9·57 9·57 10·00 10·00	482·5 461·5 447·3 440·7	14·04 14·04 14·67 14·67	do.	do.	do.	16½	11½	do.	do. elev. 24'	Weight shifted aft.
173	VELOCITY.	30 23½ 30 48 31 12 31 38 32 07	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	24½ 24 26 29	9·18 9·38 8·65 7·76	524·5 489·2 481·3 485·7	13·47 13·75 12·69 11·38	do.	7 passengers, and 4¼ ton, = c. q. lb. 94 2 1	do.	15½	15½		do. elev. 54'	Heavy swell.
174	VELOCITY.	41 31 42 26 43 20 44 15 45 14	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	55 54 55 59	4·09 4·17 4·09 3·81	51·3 53·2 55·8 46·1	6·00 6·11 6·00 5·59	do.	do.	do.	do.	do.	not obs.	do. level	

TABLE IV. CONTINUED.—THE VELOCITY.

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
No. of Experiment.	Boat's Name.	Instant of passing the Stake.	Stakes 110 yards apart.	Time of passing the Stake—interval.	Miles per Hour.	Tractive Power in lbs.	Feet per Second.	Kind of Tractive Power.	Load.	Wind.	Draught.		Position of Wave.	Variation in Level.	REMARKS.
											Bow	Stern			
175	VELOCITY.	min. sec. 54 16 $\frac{1}{2}$ 54 44 55 12 $\frac{1}{2}$ 55 42 56 12	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	sec. 27 $\frac{1}{2}$ 28 $\frac{1}{2}$ 29 $\frac{1}{2}$ 30	miles. 8·18 7·90 7·59 7·50	lbs. 450·5 443·0 450·0 449·0	feet. 12·00 11·58 11·19 11·00	Two Horses.	7 passengers, and 4 $\frac{1}{4}$ ton, = c. q. lb. 94 2 1	none	water in. 15 $\frac{1}{2}$	water in. 15 $\frac{1}{2}$	not obs.	dur. run. bow elev. 45'	
176	VELOCITY.	15 15 15 40 16 08 16 26 17 06	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	25 28 28 30	9·00 8·03 8·03 7·50	484·8 491·7 491·3 487·4	13·20 11·79 11·79 11·00	do.	do.	do.	20 $\frac{1}{2}$	10		at rest, dep. 45'	Little Swell. Weight shifted forward.
177	VELOCITY.	6 10 $\frac{1}{2}$ 6 35 7 00 7 27 7 54	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	24 $\frac{1}{2}$ 25 27 27	9·18 9·00 8·33 8·33	500·4 505·6 506·0 522·0	13·47 13·20 12·22 12·22	do.	do.	do.	do.	do.	not obs.	at rest dep. 45' during run. bow elev.	
178	VELOCITY.	22 49 23 14 23 39 24 05 24 32	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	25 25 26 27	9·00 9·00 8·65 8·33	489·5 492·8 504·2 512·1	13·20 13·20 12·69 12·22	do.	do.	do.	18	13	do.	do. do. bow elev. 52'	Weight shifted aft.
179	VELOCITY.	40 56 41 20 41 45 42 11 $\frac{1}{2}$ 42 38 $\frac{1}{2}$	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	26 25 26 $\frac{1}{2}$ 27	8·65 9·00 8·49 8·33	489·2 502·0 460·0 509·0	12·69 13·20 12·45 12·22	do.	do.	do.	12 $\frac{3}{4}$	18	do.		do.

TABLE V.—THE EAGLE (28 Experiments).

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
No. of Experiment.	Boat's Name.	Instant of passing the Stake.	Stakes 110 yards apart.	Time of passing the Stake—interval.	Miles per Hour.	Tractive Power in lbs.	Feet per Second.	Kind of Tractive Power.	Load.	Wind.	Draught.		Position of Wave.	Variation in Level.	REMARKS.
											Bow	Stern			PLACE OF EXPERIMENT, FORTH AND CLYDE CANAL.
		min. sec.		sec.	miles.	lbs.	feet.				watr. in.	watr. in.		dur. run.	Weight of EAGLE, 3 ton. 14cwt.0qr.15lb. Towing-line fixed 15½ ft. from bow. The lines of draught not being marked on this boat; the depths were therefore taken from two marks placed above the water at stem and stern.
180	EAGLE.	10 10 10 31 10 49 11 08½ 11 28½	b c d e f	21 18 19½ 20	10·71 12·50 11·54 11·25	381·6 335·5 415·6 400·0	15·71 18·33 16·92 16·50	Two Horses.	7 passengers. = c. q. lb. 9 2 1	none	18	18	not obs.	bow elev. 13'	
181	EAGLE.	22 51 23 16½ 23 40½ 24 05 24 29	b c d e f	25½ 24 25 24	8·82 9·38 9·00 9·38	292·1 295·4 303·0 300·8	12·94 13·75 13·20 13·75	do.	do.	do.	do.	do.	do.	do. elev. 15'	
182	EAGLE.	34 15½ 35 10 36 05 36 59½ 37 54	b c d e f	54½ 55 54½ 54½	4·13 4·09 4·13 4·13	63·6 57·5 59·7 55·9	6·06 6·00 6·06 6·06	do.	do.	do.	do.	do.	do.	do. level	
183	EAGLE.	48 59 49 22½ 49 44 50 07½ 50 31	b c d e f	23½ 21½ 23½ 23½	9·57 10·47 9·57 9·57	336·3 322·8 310·4 289·3	14·04 15·35 14·04 14·04	do.	do.	do.	do.	do.	do.	do. elev. 10'	
184	EAGLE.	14 00½ 14 21 14 40½ 15 00 15 20½	b c d e f	20½ 19½ 19½ 20½	10·97 11·54 11·54 10·97	418·8 417·1 407·0 395·2	16·09 16·92 16·92 16·09	do.	7 passengers, and 1 ton, = c. q. lb. 29 2 1	do.	16½ from mrk.	16½ from mrk.	do.	do. elev. 16'	
185	EAGLE.	24 56½ 25 21 25 46 26 11 26 37	b c d e f	21½ 25 25 26	10·47 9·00 9·00 8·65	334·6 322·8 316·4 300·6	15·35 13·20 13·20 12·69	do.	do.	do.	do.	do.	do.	do. elev. 16'	
186	EAGLE.	36 02 36 54 37 46 38 39½ 39 33	b c d e f	52 52 53½ 53½	4·33 4·33 4·21 4·21	69·8 60·4 55·2 59·4	6·35 6·35 6·17 6·17	do.	do.	do.	do.	do.	do.	do. level	
187	EAGLE.	2 16 2 37 2 57 3 17½ 3 38	b c d e f	21 20 20½ 21½	10·71 11·25 10·97 10·47	404·3 416·7 395·5 378·3	15·71 16·50 16·09 15·35	do.	do.	do.	14 from mrk.	17½ from mrk.	do.	do. elev. 1'	Weight shifted forward.
188	EAGLE.	21 34 21 56 22 15½ 23 35½ 23 56½	b c d e f	22 19½ 20 21	10·23 11·54 11·25 10·71	396·2 404·1 375·2 369·5	15·00 16·92 16·50 15·71	do.	do.	do.	17¼ from mrk.	14½ from mrk.	do.	do. elev. 38'	do. aft. Little swell.

TABLE V. CONTINUED.—THE EAGLE.

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
No. of Experiment.	Boat's Name.	Instant of passing the Stake.	Stakes 110 yards apart.	Time of passing the Stake—interval.	Miles per Hour.	Tractive Power in lbs.	Feet per Second.	Kind of Tractive Power.	Load.	Wind.	Draught.		Position of Wave.	Variation in Level.	REMARKS.
		min. sec.		sec.	miles.	lbs.	feet.				Bow	Stern			PLACE OF EXPERIMENT, FORTH AND CLYDE CANAL.
189	EAGLE.	50 50 51 12 51 32 51 53 52 14½	b c d e f	22 20 21 21½	10·23 11·25 10·71 10·47	415·8 426·8 414·5 402·0	15·00 16·50 15·71 15·35	Two Horses.	7 passengers, and 2 ton, = c. q. lb. 49 2 1	none	wa. tr. in. 14½	wa. tr. in. 14½		dur. run. bow elev. 2'	Very little swell.
190	EAGLE.	2 45 3 11 3 36 4 01 4 27	b c d e f	26 25 25 26	8·65 9·00 9·00 8·65	363·0 354·5 336·5 341·8	12·69 13·20 13·20 12·69	do.	do.	do.	do.	do.	near bow	do. do. elev. 16'	
191	EAGLE.	18 07 18 46½ 19 25 20 06 20 46½	b c d e f	39½ 38½ 41 40½	5·69 5·84 5·49 5·56	122·1 119·8 105·1 102·2	8·35 8·57 8·05 8·15	do.	do.	do.	do.	do.	not obs.	do. do. level.	
192	EAGLE.	42 38 43 00½ 43 21½ 43 42 44 04	b c d e f	22½ 21 21 22	10·00 10·71 10·71 10·23	404·2 404·2 374·0 367·1	14·67 15·71 15·71 15·00	do.	do.	do.	13½ from mrk.	16½ from mrk.		at rest. bow dep. 15' during run. elev. 15'	Weight shifted forward.
193	EAGLE.	22 05 22 27 22 49 23 10½ 23 32	b c d e f	22 22 21½ 21½	10·23 10·23 10·47 10·47	419·7 400·0 421·8 388·0	15·00 15·00 15·35 15·35	do.	do.	do.	16½ from mrk.	13½ from mrk.	do.	at rest. bow elev. 15' during run. 30'	do. aft.
194	EAGLE.	51 28 51 50½ 52 13 52 35 52 56	b c d e f	22½ 22½ 22 21	10·00 10·00 10·23 10·71	426·4 417·8 416·7 399·7	14·67 14·67 15·00 15·71	do.	7 passengers, and 3 ton, = c. q. lb. 69 2 1	do.	13½ from mrk.	13½ from mrk.	20 ft. from the bow.	do. do. elev. 14'	
195	EAGLE.	8 31½ 8 57 9 22½ 9 48½ 10 16	b c d e f	25½ 25½ 26 27½	8·82 8·82 8·65 8·18	363·1 357·4 372·4 372·0	12·94 12·94 12·69 12·00	do.	do.	do.	do.	do.	10 ft. from the bow.	do. do. elev. 23'	
196	EAGLE.	24 15 24 54 25 32½ 26 12 26 51	b c d e f	39 38½ 39½ 39	5·78 5·84 5·69 5·78	133·3 127·5 121·0 113·5	8·46 8·57 8·35 8·46	do.	do.	do.	do.	do.	none	do. do. level.	
197	EAGLE.	50 31 50 54½ 51 16½ 51 38½ 52 00	b c d e f	23½ 22 22 21½	9·57 10·23 10·23 10·47	414·1 423·5 418·0 391·6	14·04 15·00 15·00 15·35	do.	do.	do.	12½ from mrk.	15½ from mrk.	not obs.	at rest. bow dep. 15' during run. elev. 15'	Weight shifted forward.

TABLE V. CONTINUED.—THE EAGLE.

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
No. of Experiment.	Boat's Name.	Instant of passing the Stake.	Stakes 110 yards apart.	Time of passing the Stake—interval.	Miles per Hour.	Tractive Power in lbs.	Feet per Second.	Kind of Tractive Power.	Load.	Wind.	Draught.		Position of Wave.	Variation in Level.	REMARKS.
											Bow	Stern			PLACE OF EXPERIMENT, FORTH AND CLYDE CANAL.
198	EAGLE.	min. sec. 12 57 13 21 13 44 14 06 14 27½	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	sec. 24 23 22 21½	miles. 9·38 9·78 10·23 10·47	lbs. 415·7 411·7 413·0 400·8	feet. 13·75 14·35 15·00 15·35	Two Horses	7 passengers, and 3 ton. = <i>c. q. lb.</i> 69 2 1	none	watr. in. 15¼ from mrk.	watr. in. 12¼ from mrk.	not obs.	not obs.	Weight shifted aft.
199	EAGLE.	36 59 37 23 37 45½ 38 09½ 38 32	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	24 22½ 24 23	9·38 10·00 9·38 9·78	441·5 446·1 423·5 424·5	13·75 14·67 13·75 14·35	do.	7 passengers, and 4¼ ton. = <i>c. q. lb.</i> 94 2 1	do.	12½ from mrk.	12½ from mrk.	35 ft. from the bow.	dur. run. bow elev. 21'	Towing-line at 15 ft. from bow.
200	EAGLE.	50 01½ 50 27½ 50 54 51 21½ 51 49½	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	26 27 27 28	8·65 8·33 8·33 8·03	452·6 385·7 406·8 413·0	12·69 12·22 12·22 11·79	do.	do.	do.	do.	do.	15 ft. from the bow.	do. elev. 23'	
201	EAGLE.	1 40 2 17½ 2 54 3 29½ 4 06	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	37½ 36½ 35½ 36½	6·00 6·16 6·34 6·16	170·5 151·4 147·4 150·5	8·80 9·04 9·30 9·04	do.	do.	do.	do.	do.	not obs.	do. level.	
202	EAGLE.	20 23 20 47 21 12½ 21 36 22 21½	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	24 25½ 23½ 25½	9·38 8·82 9·57 8·82	422·8 413·3 439·3 427·3	13·75 12·94 14·04 12·94	do.	do.	do.	10¾ from mrk.	14 from mrk.	15 ft. from the bow.	do. elev. 27'	Weight shifted forward.
203	EAGLE.	36 39½ 37 05 37 29 37 53 38 18½	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	26½ 24 24 25½	8·49 9·38 9·38 8·82	429·4 439·0 442·8 432·3	12·45 13·75 13·75 12·94	do.	do.	do.	14 from mrk.	11 from mrk.	not obs.	do. elev. 37'	do. aft.
204	EAGLE.	5 25 5 47 6 09 6 31 6 53	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	22 22 22 22	10·23 10·23 10·23 10·23	438·4 419·7 400·0 372·4	15·00 15·00 15·00 15·00	do.	7 passengers, and 2t. 13ct. = <i>c. q. lb.</i> 62 2 1	do.	14¼ from mrk.	14¼ from mrk.	do.	do. elev. 17'	2 ton. 13cwt. made the EAGLE, and 7 passengers, nearly equal to ZEPHYR, with 4 ton. 4cwt. 2 qr. and 7 passengers.
205	EAGLE.	22 53 23 20 23 46 24 12 24 39	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	27 26 26 27	8·33 8·65 8·65 8·33	357·5 351·0 367·6 375·2	12·22 12·69 12·69 12·22	do.	do.	do.	do.	do.	do.	do. elev. 17'	
206	EAGLE.	39 53½ 40 17 40 40 41 02½ 41 26	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	24½ 23 22½ 23½	9·18 9·78 10·00 9·57	395·1 407·0 411·2 385·6	13·47 14·35 14·67 14·04	do.	do.	do.	do.	do.	do.	do. elev. 31'	Towing-line altered from 15½ ft. to within 3 ft. 9 in. of the bow.

RECENT CANAL-BOAT EXPERIMENTS.

267

TABLE V. CONTINUED.—THE EAGLE.

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
No. of Experiment.	Boat's Name.	Instant of passing the Stake.	Stakes 110 yards apart.	Time of passing the Stake-interval.	Miles per Hour.	Tractive Power in lbs.	Feet per Second.	Kind of Tractive Power.	Load.	Wind.	Draught.		Position of Wave.	Variation in Level.	REMARKS.
											Bow	Stern			PLACE OF EXPERIMENT, FORTH AND CLYDE CANAL.
207	EAGLE.	min. sec.		sec.	miles.	lbs.	feet.								
		52 00	<i>b</i>	27 $\frac{1}{2}$	8.18	361.0	12.00		7 passen-						
		52 27 $\frac{1}{2}$	<i>c</i>	27	8.33	363.8	12.22	Two	gers, & 2t.						
		52 54 $\frac{1}{2}$	<i>d</i>	26 $\frac{1}{2}$	8.49	406.3	12.45	Horses.	13cwt. =	none					
		53 21	<i>e</i>	27	8.33	399.5	12.22		<i>c. q. lb.</i>						
		53 58	<i>f</i>						62 2 1		watr. 14 $\frac{1}{4}$ from mrk.	watr. 14 $\frac{1}{4}$ from mrk.	not obs.	dur. run. bow elev. 37'	Towing-line 8 ft. 9 in. from bow.

TABLE VI.—THE HAWK.—(34 Experiments).

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
No. of Experiment.	Boat's Name.	Instant of passing the Stake.	Stakes 110 yards apart.	Time of passing the Stake-Interval.	Miles per Hour.	Tractive Power in lbs.	Feet per Second.	Kind of Tractive Power.	Load.	Wind.	Draught.		Position of Wave.	Variation in Level.	REMARKS.
											Bow	Stern			PLACE OF EXPERIMENT, FORTH AND CLYDE CANAL.
208	HAWK.	min. sec. 59 59 $\frac{1}{2}$ 18 36 55 1 15 $\frac{1}{2}$	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	sec. 19 $\frac{1}{2}$ 18 19 20 $\frac{1}{2}$	miles. 11.54 12.50 11.84 10.97	lbs. 422.7 417.4 397.1 373.7	feet. 16.92 18.33 17.37 16.09	Two Horses.	7 passengers, = <i>c. g. lb.</i> 9 2 1	none	watr. in. 16 $\frac{5}{8}$ from mrk.	watr. in. 18 $\frac{3}{8}$ from mrk.	not obs.	dur. run. bow elev. 8'	Weight of Hawk, 3ton, 16cwt. 0q. 24lb. Marks 18 $\frac{1}{2}$ in. above the water were made at bow and stern, when the boat was empty.
209	HAWK.	17 34 17 56 $\frac{1}{2}$ 18 19 $\frac{1}{2}$ 18 42 19 05 $\frac{1}{2}$	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	22 $\frac{1}{2}$ 23 22 $\frac{1}{2}$ 23 $\frac{1}{2}$	10.00 9.78 10.00 9.57	347.9 320.5 309.0 297.2	14.67 14.35 14.67 14.04	do.	do.	do.	do.	do.	do.	do. elev. 14'	
210	HAWK.	27 04 $\frac{1}{2}$ 27 39 28 13 $\frac{1}{2}$ 28 48 29 22 $\frac{1}{2}$	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	35 $\frac{1}{2}$ 34 $\frac{1}{2}$ 35 $\frac{1}{2}$ 34 $\frac{1}{2}$	6.34 6.52 6.34 6.52	147.3 127.7 139.0 133.0	9.30 9.57 9.30 9.57	do.	do.	do.	do.	do.	do.	do. elev. 1'	
211	HAWK.	48 14 48 32 $\frac{1}{2}$ 48 52 49 12 49 32	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	18 $\frac{1}{2}$ 19 $\frac{1}{2}$ 20 20	12.16 11.54 11.25 11.25	431.0 408.0 388.2 376.6	17.84 16.92 16.50 16.50	do.	7 passengers, and 7cwt. = <i>c. g. lb.</i> 16 2 1	do.	17 $\frac{1}{8}$ from mrk.	17 $\frac{1}{8}$ from mrk.	do.	do. elev. 18'	7cwt. made the Hawk and 7 passengers nearly equal to the LARK with 1ton and 7 passengers.
212	HAWK.	58 32 $\frac{1}{2}$ 58 56 59 19 $\frac{1}{2}$ 59 42 05 $\frac{1}{2}$	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	23 $\frac{1}{2}$ 23 $\frac{1}{2}$ 23 23 $\frac{1}{2}$	9.57 9.57 9.78 9.57	340.6 323.5 302.0 302.0	14.04 14.04 14.35 14.04	do.	do.	do.	do.	do.	do.	do. elev. 20'	
213	HAWK.	29 23 $\frac{1}{2}$ 29 44 30 04 $\frac{1}{2}$ 30 25 $\frac{1}{2}$ 30 47	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	20 $\frac{1}{2}$ 20 $\frac{1}{2}$ 21 21 $\frac{1}{2}$	10.97 10.97 10.71 10.47	518.3 488.1 443.7 423.6	16.09 16.09 15.71 15.35	do.	7 passengers, and 4 $\frac{1}{4}$ ton, = <i>c. g. lb.</i> 94 2 1	do.	12 $\frac{3}{4}$ from mrk.	12 $\frac{3}{4}$ from mrk.	do.	do. elev. 16'	
214	HAWK.	40 25 $\frac{1}{2}$ 40 51 $\frac{1}{2}$ 41 18 $\frac{1}{2}$ 41 45 $\frac{1}{2}$ 42 13	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	26 27 27 27 $\frac{1}{2}$	8.65 8.33 8.33 8.18	427.0 395.4 430.6 448.2	12.69 12.22 12.22 12.00	do.	do.	do.	do.	do.	15ft. from the bow.	do. elev. 31'	
215	HAWK.	51 16 $\frac{1}{2}$ 52 06 53 53 $\frac{1}{2}$ 54 43 $\frac{1}{2}$ 55 36	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	49 $\frac{1}{2}$ 47 $\frac{1}{2}$ 50 52 $\frac{1}{2}$	4.55 4.76 4.50 4.29	75.35 57.31 64.30 64.80	6.67 6.95 6.60 6.29	do.	do.	do.	do.	do.	not obs.	do. do. level.	
216	HAWK.	12 06 12 31 12 58 13 26 13 53	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	25 27 28 27	9.00 8.33 8.03 8.33	427.6 408.6 421.2 445.1	13.20 12.22 11.79 12.22	do.	do.	fav. light	11 from mrk.	14 from mrk.	do.	do. elev. 35'	

TABLE VI. CONTINUED.—THE HAWK.

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
No. of Experiment.	Boat's Name.	Instant of passing the Stake.	Stakes 110 yards apart.	Time of passing the Stake—interval.	Miles per Hour.	Tractive Power in lbs.	Feet per Second.	Kind of Tractive Power.	Load.	Wind.	Draught.		Position of Wave.	Variation in Level.	REMARKS.
											Bow	Stern			PLACE OF EXPERIMENT, FORTH AND CLYDE CANAL.
		min. sec.		sec.	miles.	lbs.	feet.								
217	HAWK.	24 31 $\frac{1}{2}$ 24 57 25 23 $\frac{1}{2}$ 25 51 26 20 $\frac{1}{2}$	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	25 $\frac{1}{2}$ 26 $\frac{3}{4}$ 27 $\frac{1}{2}$ 29 $\frac{1}{2}$	8·82 8·49 8·18 7·59	412·0 401·0 425·6 417·5	12·94 12·45 12·00 11·19	Two Horses.	7 passen- gers, and 4 $\frac{1}{4}$ ton, = <i>c. q. lb.</i> 94 2 1	fav. light	watr. in. 14 from mrk.	watr. in. 11 from mrk.	not obs.	dur. run. bow elev. 49'	Weights shifted aft.
218	HAWK.	47 23 47 45 48 06 48 27 $\frac{1}{2}$ 48 49	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	22 21 21 $\frac{1}{2}$ 21 $\frac{1}{2}$	10·23 10·71 10·47 10·47	471·2 451·4 435·7 404·7	15·00 15·71 15·35 15·35	do.	7 passen- gers, & 3t. 17cwt. = <i>c. q. lb.</i> 86 2 1	do.	13 from mrk.	13 from mrk.	do.	do. do. elev. 20'	3 ton 17cwt. made the HAWK and 7 passengers nearly equal to the RAPID with 4 $\frac{1}{4}$ ton and 7 passengers.
219	HAWK.	58 44 $\frac{1}{2}$ 59 10 $\frac{1}{2}$ 59 37 $\frac{1}{2}$ 03 $\frac{1}{2}$ 30	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	26 27 26 26 $\frac{1}{2}$	8·65 8·33 8·65 8·49	409·8 392·4 420·0 447·3	12·69 12·22 12·69 12·45	do.	do.	do.	do.	do.	do.	do. do. elev. 29'	3 ton 12cwt. made the HAWK and 7 passengers nearly equal to the LARK with 4 $\frac{1}{4}$ ton and 7 passengers.
220	HAWK.	34 50 35 10 $\frac{1}{2}$ 35 31 35 52 $\frac{1}{2}$ 36 14	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	20 $\frac{1}{2}$ 20 $\frac{1}{2}$ 21 $\frac{1}{2}$ 21 $\frac{1}{2}$	10·97 10·97 10·47 10·47	510·7 453·2 415·0 407·2	16·09 16·09 15·35 15·35	do.	7 passen- gers, & 3t. 12cwt. = <i>c. q. lb.</i> 81 2 1	do.	13 $\frac{1}{4}$ from mrk.	13 $\frac{1}{4}$ from mrk.	do.	do. do. elev. 12'	
221	HAWK.	48 45 49 11 49 37 50 03 50 31	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	26 26 26 28	8·65 8·65 8·65 8·03	411·3 404·3 408·3 414·0	12·69 12·69 12·69 11·79	do.	do.	do.	do.	do.	do.	do. do. elev. 37'	
222	HAWK.	14 29 $\frac{1}{2}$ 14 50 15 11 15 32 $\frac{1}{2}$ 15 55	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	21 $\frac{1}{2}$ 21 21 $\frac{1}{2}$ 22 $\frac{1}{2}$	10·47 10·71 10·47 10·00	465·0 420·5 397·6 369·0	15·35 15·71 15·35 14·67	do.	7 passen- gers, and 3 ton, = <i>c. q. lb.</i> 69 2 1	do.	14 from mrk.	14 from mrk.	do.	do. do. elev. 15'	
223	HAWK.	25 19 25 43 26 08 26 33 $\frac{1}{2}$ 27 00	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	26 25 25 $\frac{1}{2}$ 26 $\frac{1}{2}$	8·65 9·00 8·82 8·49	402·0 380·6 388·0 380·1	12·69 13·20 12·94 12·45	do.	do.	do.	do.	do.	do.	do. do. elev. 31'	
224	HAWK.	42 15 $\frac{1}{2}$ 42 59 $\frac{1}{2}$ 43 48 44 38 45 26 $\frac{1}{2}$	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	44 48 $\frac{1}{2}$ 50 48 $\frac{1}{2}$	5·11 4·64 4·50 4·64	89·7 69·0 67·1 80·0	7·50 6·80 6·60 6·80	do.	do.	do.	do.	do.	do.	do. do. dep. 2'	
225	HAWK.	18 16 $\frac{1}{2}$ 18 36 18 57 19 19 $\frac{1}{2}$ 19 41	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	20 $\frac{1}{2}$ 21 22 $\frac{1}{2}$ 21 $\frac{1}{2}$	10·97 10·71 10·00 10·47	427·0 402·2 390·6	16·09 15·71 14·67 15·35	do.	7 passen- gers, & 2t. 12cwt. = <i>c. q. lb.</i> 61 2 1	do.	14 $\frac{1}{2}$ from mrk.	14 $\frac{1}{2}$ from mrk.	do.	do. do. elev. 15'	2 ton 12cwt. made the HAWK and 7 passengers nearly equal to the RAPID with 3 ton and 7 passengers.

TABLE VI. CONTINUED.—THE HAWK.

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
No. of Experiment.	Boat's Name.	Instant of passing the Stake.	Stakes 110 yards apart.	Time of passing the Stake-interval.	Miles per Hour.	Tractive Power in lbs.	Feet per Second.	Kind of Tractive Power.	Load.	Wind.	Draught.		Position of Wave.	Variation in Level.	REMARKS.
											Bow	Stern			PLACE OF EXPERIMENT, FORTH AND CLYDE CANAL.
226	HAWK.	min. sec. 28 58 29 23 29 49 30 14½ 30 40½	b c d e f	sec. 25 26 25½ 26	miles. 9·00 8·65 8·82 8·65	lbs. 405·5 384·7 386·0 390·6	feet. 13·20 12·69 12·94 12·69	Two Horses.	7 passen- gers & 2 t. 12 cwt. = c. g. lb. 61 2 1	fav. light	watr. in. 14½	watr. in. 14½	not obs.	dur. run. bow elev. 30'	
227	HAWK.	42 11½ 42 32½ 42 54½ 43 16 43 37	b c d e f	21 22 21½ 21	10·71 10·23 10·47 10·71	457·7 406·1 412·5 389·2	15·71 15·00 15·35 15·71	do.	do.	do.	do.	do.	do.	do. elev. 12'	
228	HAWK.	1 23 1 45 2 06 2 27½ 3 18½	b c d e f	22 21 21½ 21	10·23 10·71 10·47 10·71	461·6 397·5 403·3 390·3	15·00 15·71 15·35 15·71	do.	7 passen- gers & 2 t. 7 cwt. = c. g. lb. 56 2 1	fav.	14¾ from mrk.	14¾ from mrk.	do.	do. elev. 13'	2 ton 7 cwt. made the HAWK and 7 passengers nearly equal to the LARK, with 3 ton and 7 passengers.
229	HAWK.	19 30½ 19 55 20 20 20 45 20 10½	b c d e f	25½ 25 25 25½	8·82 9·00 9·00 8·82	401·8 380·7 387·1 384·5	12·94 13·20 13·20 12·94	do.	do.	do.	do.	do.	do.	do. elev. 31'	
230	HAWK.	47 32 47 53 48 14 48 35 48 57	b c d e f	21 21 21 22	10·71 10·71 10·71 10·23	454·4 407·2 382·5 372·6	15·71 15·71 15·71 15·00	do.	7 passen- gers and 2 ton, = c. g. lb. 49 2 1	do.	15 from mrk.	15 from mrk.	do.	do. elev. 14'	
231	HAWK.	51 42½ 52 08 52 33 52 59 53 24	b c d e f	25½ 25 26 25	8·82 9·00 8·65 9·00	393·0 358·8 367·4 379·7	12·94 13·20 12·69 13·20	do.	do.	do.	do.	do.	do.	do. elev. 34'	
232	HAWK.	5 57½ 6 46 7 38½ 8 31 9 21½	b c d e f	48½ 52½ 52½ 50½	4·64 4·29 4·29 4·46	74·6 66·0 60·7 58·1	6·80 6·29 6·29 6·53	do.	do.	do.	do.	do.	do.	do. level	
233	HAWK.	23 19½ 23 44 24 08½ 24 30 24 56	b c d e f	25½ 24½ 23½ 24	8·82 9·18 9·57 9·38	397·9 373·3 382·3 369·4	12·94 13·47 14·04 13·75	do.	do.	do.	13¼ from mrk.	16¾ from mrk.	do.	at rest. dur. run. elev. 29'	Weight shifted forward.
234	HAWK.	50 48 51 12 51 38 52 02½ 52 26	b c d e f	24 26 24½ 23½	9·38 8·65 9·18 9·57	367·8 359·1 390·9 395·7	13·75 12·69 13·47 14·04	do.	do.	fav. light	16½ from mrk.	13½ from mrk.	do.	do. elev. 42'	Weight shifted aft.

TABLE VI. CONTINUED.—THE HAWK.

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
No. of Experiment.	Boat's Name.	Instant of passing the Stake.	Stakes 110 yards apart.	Time of passing the Stake—interval.	Miles per Hour.	Tractive Power in lbs.	Feet per Second.	Kind of Tractive Power.	Load.	Wind.	Draught.		Position of Wave.	Variation in Level.	REMARKS.
		min. sec.		sec.	miles.	lbs.	feet.				Bow.	Stern.			PLACE OF EXPERIMENT, FORTH AND CLYDE CANAL.
235	HAWK.	49 57 50 21 50 46 51 09½ 51 32½	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	24 25 23½ 23	9·38 9·00 9·57 9·78	400 374·5 383 390	13·75 13·20 14·04 14·35	Two Horses.	7 passengers, and 2 ton, = <i>c. q. lb.</i> 49 2 1	fav. very light	watr. in. 18½ from mrk.	watr. in. 11½ from mrk.	not obs.	bow elev. at rest. 30' during run. 57'	Weights shifted.
236	HAWK.	28 24 28 44 29 05 29 26 29 47	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	20 19 21 21 21	11·25 11·84 10·71 10·71	446·6 396·2 386·3 374·5	16·50 17·37 15·71 15·71	do.	7 passengers, & 1 t. 12 cwt. = <i>c. q. lb.</i> 41 2 1	do.	15½ from mrk.	15½ from mrk.	do.	do. elev. 15'	HAWK, with 7 passengers, 1 ton, 12 cwt., nearly equal to RAPID, with 2 ton and 7 passengers.
237	HAWK.	41 04 41 28 41 53 42 16½ 42 40	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	24½ 24½ 23½ 23½ 22½	9·18 9·18 9·57 10·00	379·3 362·5 374·3 360·4	13·47 13·47 14·04 14·67	do.	do.	do.	do.	do.	do.	do. elev. 25'	do.
238	HAWK.	54 42½ 55 03 55 23 55 44 56 06	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	20½ 20 21 22	10·97 11·25 10·71 10·23	456·6 406·2 380 372·6	16·09 16·50 15·71 15·00	do.	7 passengers, & 1 t. 5 cwt. = <i>c. q. lb.</i> 34 2 1	do.	15½ from mrk.	15½ from mrk.	do.	do. elev. 14'	HAWK, with 7 passengers and 1 ton, 5 cwt., nearly equal to LARK, with 1 ton, 18 cwt. 7 passengers, and to ZEPHYR, with 3 ton, 7 passengers.
239	HAWK.	4 38 5 02½ 5 27½ 5 51½ 6 15½	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	24½ 25 24 24	9·18 9·00 9·38 9·38	369·4 348·5 356·6 357·5	13·47 13·20 13·75 13·75	do.	do.	do.	do.	do.	do.	do. elev. 34'	
240	HAWK.	21 50½ 22 10 22 30½ 22 50½ 23 12½	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	19½ 20½ 20 22½	11·54 10·97 11·25 10·00	450·6 381·7 375·2 363·3	16·92 16·09 16·50 14·67	do.	7 passengers, and 12 cwt. = <i>c. q. lb.</i> 21 2 1	do.	11½ from mrk.	11½ from mrk.	do.	do. elev. 6'	HAWK, with 7 passengers and 12 cwt., nearly equal to the RAPID, with 1 ton and 7 passengers.
241	HAWK.	31 40½ 32 04 32 27 33 50 34 14	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	23½ 23 23 24	9·57 9·78 9·78 9·38	366·9 343·1 341·3 318·5	14·04 14·35 14·35 13·75	do.	do.	do.	do.	do.	do.	do. elev. 12'	

TABLE VII.—THE RAPID (SECOND SET—43 *Experiments*).

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
No. of Experiment.	Boat's Name.	Instant of passing the Stake.	Stakes 110 yards apart.	Time of passing the Stake-interval.	Miles per Hour.	Tractive Power in lbs.	Feet per Second.	Kind of Tractive Power.	Load.	Wind.	Draught.		Position of Wave.	Variation in Level.	REMARKS.
											Bow	Stern			PLACE OF EXPERIMENT, FORTH AND CLYDE CANAL.
242	RAPID.	min. sec. 41 20 41 51 $\frac{1}{2}$ 42 23 42 55 43 28	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	sec. 31 $\frac{1}{2}$ 31 $\frac{1}{2}$ 32 33	miles. 7.14 7.14 7.03 6.82	lbs. 338.7 322.1 328.1 273.7	feet. 10.48 10.48 10.31 10.00	Two Horses.	7 passen- gers, and 4 $\frac{1}{4}$ ton, = <i>c. q. lb.</i> 94 2 1	unf. strng	in. 16	in. 16	not obs.	dur. run. bow elev. 17'	RAPID weighed when empty, 3 ton, 8cwt. 2qr. 20lb.
243	RAPID.	53 19 53 45 54 13 54 43 55 15	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	26 28 30 32	8.65 8.03 7.50 7.03	496.4 483.5 492 412.7	12.69 11.79 11.00 10.31	do.	do.	do.	do.	do.	do.	do. elev. 40'	A Passage-boat passed at 5 sec.
244	RAPID.	5 54 6 20 6 48 7 17 $\frac{1}{2}$ 7 47	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	26 28 29 $\frac{1}{2}$ 29 $\frac{1}{2}$	8.65 8.03 7.59 7.59	499.5 477.8 477.5 473.5	12.69 11.79 11.19 11.19	do.	do.	do.	do.	do.	do.	do. elev. 48'	
245	RAPID.	37 51 38 18 38 46 39 15 $\frac{1}{2}$ 39 45	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	27 28 29 $\frac{1}{2}$ 29 $\frac{1}{2}$	8.33 8.03 7.59 7.59	483.8 477.5 547.8 477.2	12.22 11.79 11.19 11.19	do.	7 passen- gers, and 4 ton, = <i>c. q. lb.</i> 89 2 1	do.	16	16 $\frac{1}{4}$	do.	do. elev. 40'	RAPID, with 7 passengers and 4 ton, nearly equal to the LARK, with 4 $\frac{1}{4}$ ton and 7 passengers.
246	RAPID.	35 13 $\frac{1}{2}$ 35 47 36 09 36 40 37 11	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	33 $\frac{1}{2}$ 32 31 31	6.72 7.03 7.26 7.26	488.8 470 466 428	9.85 10.31 10.65 10.65	do.	do.	do.	do.	do.	do.	do. elev. 25'	
247	RAPID.	11 51 12 16 $\frac{1}{2}$ 12.42 $\frac{1}{2}$ 13 10 13 38	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	25 $\frac{1}{2}$ 26 27 $\frac{1}{2}$ 28	8.82 8.65 8.18 8.03	456 442.8 455 467.2	12.94 12.69 12.00 11.79	do.	do.	fav.	do.	do.	do.	do. elev. 1° 6'	
248	RAPID.	49 32 $\frac{1}{2}$ 49 56 $\frac{1}{2}$ 50 21 $\frac{1}{2}$ 50 45 $\frac{1}{2}$ 51 10 $\frac{1}{2}$	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	24 25 24 25	9.38 9.00 9.38 9.00	447.1 447.5 429.6 360.6	13.75 13.20 13.75 13.20	do.	do.	do.	15 $\frac{1}{8}$	15 $\frac{1}{8}$	do.	do. elev. 50'	RAPID, with 7 passengers, 3 ton, and 7cwt., nearly equal to the VELOCITY, HAWK, and EAGLE, with 3 ton and 7 passengers each.
249	RAPID.	4 07 4 34 $\frac{1}{2}$ 5 02 5 29 5 57	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	27 $\frac{1}{2}$ 27 $\frac{1}{2}$ 27 28	8.18 8.18 8.33 8.03	419.3 411.4 452.8 453	12.00 12.00 12.22 11.79	do.	do.	light	do.	do.	do.	do. elev. 58'	
250	RAPID.	21 58 22 22 22 44 $\frac{1}{2}$ 23 07 $\frac{1}{2}$ 23 31	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	24 22 $\frac{1}{2}$ 23 23 $\frac{1}{2}$	9.38 10.00 9.78 9.57	480.5 436.4 413.5 370	13.75 14.67 14.35 14.04	do.	7 passen- gers, & 2t. 15cwt. = <i>c. q. lb.</i> 64 2 1	do.	14 $\frac{1}{8}$	14 $\frac{1}{8}$	do.	do. elev. 10'	RAPID, with 7 passengers and 2 ton 15cwt., nearly equal to the LARK, with 3 ton and 7 passengers.

TABLE VII. CONTINUED.—THE RAPID (SECOND SET).

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P.
No. of Experiment.	Boat's Name.	Instant of passing the Stake.	Stakes 110 yards apart.	Time of passing the Stake-Interval.	Miles per Hour.	Tractive Power in lbs.	Feet per Second.	Kind of Tractive Power.	Load.	Wind.	Draught.		Position of Wave.	Variation in Level.	REMARKS.
											Bow.	Stern			PLACE OF EXPERIMENT, FORTH AND CLYDE CANAL.
251	RAPID.	min. sec. 33 14½ 33 41 34 08½ 34 36 35 04½	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	sec. 26½ 27½ 27½ 28½	miles. 8·49 8·18 8·18 7·90	lbs. 406·8 390 400 417·5	feet. 12·45 12·00 12·00 11·58	Two Horses.	7 passengers, & 2t. 15 cwt. = <i>c. q. lb.</i> 64 2 1	fav. light	in. 14½	in. 14½	not obs.	dur. run. bow elev. 35'	
252	RAPID.	57 41 58 04 58 26 58 47½ 59 09½	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	23 22 21½ 22	9·78 10·23 10·47 10·23	450 420 419 406	14·35 15·00 15·35 15·00	do.	7 passengers, & 2t. 7 cwt. = <i>c. q. lb.</i> 56 2 1	none	13½	13½	do.	do. elev. 38'	RAPID, with 7 passengers and 2 ton 7cwt., nearly equal to the EAGLE, VELOCITY, and HAWK, with 2 ton and 7 passengers each.
253	RAPID.	6 58 7 23½ 7 50 8 15½ 8 42	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	25½ 26½ 25½ 26½	8·82 8·49 8·82 8·49	401 372 407 397	12·94 12·45 12·94 12·45	do.	do.	do.	do.	do.	do.	do. elev. 48'	
254	RAPID.	21 07½ 21 29½ 21 41½ 22 13 22 35	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	23 23 21½ 23	10·23 10·23 10·47 10·23	440 400 400 382·5	15·00 15·00 15·35 15·00	do.	7 passengers, & 1t. 15 cwt. = <i>c. q. lb.</i> 44 2 1	do.	12¾	12½	do.	do. elev. 8'	RAPID, with 7 passengers, 1 ton 15cwt., nearly equal to the LARK, with 2 ton and 7 passengers, and ZEPHYR, with 3 ton and 7 passengers.
255	RAPID.	30 46 31 12 31 38½ 32 05½ 32 32½	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	26 26½ 27 27	8·65 8·49 8·33 8·33	360 361·6 352·2 358·8	12·69 12·45 12·22 12·22	do.	do.	do.	do.	do.	do.	do. elev. 35'	
256	RAPID.	24 45 1 06 1 28 1 50½	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	21 21 22 22½	10·71 10·71 10·23 10·00	461 412·8 376 352	15·71 15·71 15·00 14·67	do.	7 passengers, & 1t. 7 cwt. = <i>c. q. lb.</i> 36 2 1	do.	12	11¾	do.	do. elev. 18'	RAPID, with 7 passengers, and 1 ton 7cwt., nearly equal to the VELOCITY, EAGLE, and HAWK, with 1 ton and 7 passengers each.
257	RAPID.	18 06 18 35 19 02 19 28 19 57	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	29 27 26 29	7·76 8·33 8·65 7·76	289 308 346 323·7	11·38 12·22 12·69 11·38	do.	do.	do.	do.	do.	do.	do. elev. 42'	
258	RAPID.	26 05½ 26 27 26 50 27 12 27 34	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	21½ 23 22 22	10·47 9·78 10·23 10·23	374 351 350 325	15·35 14·35 15·00 15·00	do.	7 passengers, and 15 cwt. = <i>c. q. lb.</i> 24 2 1	do.	do.	do.	do.	not obs.	RAPID, with 7 passengers and 15cwt., nearly equal to the LARK, with 1 ton and 7 passengers, and to the ZEPHYR, with 2 ton and 7 passengers.
259	RAPID.	35 35 36 04 36 30 36 57 37 25	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	29 26 27 28	7·76 8·65 8·33 8·03	302·8 308·5 306·2 302·2	11·38 12·69 12·22 11·79	do.	do.	do.	do.	do.	do.	not obs.	

TABLE VII. CONTINUED.—THE RAPID (SECOND SET).

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
No. of Experiment.	Boat's Name.	Instant of passing the Stake.	Stakes 110 yards apart.	Time of passing the Stake—interval.	Miles per Hour.	Tractive Power in lbs.	Feet per Second.	Kind of Tractive Power.	Load.	Wind.	Draught.		Position of Wave.	Variation in Level.	REMARKS.
											Bow	Stern			PLACE OF EXPERIMENT, MONKLAND CANAL.
260	RAPID.	min. sec. 11 42 12 14 12 49	b c d	sec. 32 35	miles. 7.03 6.43	lbs. 320 326	feet. 10.31 9.43	Two Horses	7 passen- gers, and 1 ton, $\frac{1}{2}$ c. q. lb. 29 2 1	none	in. 11 $\frac{1}{4}$	in. 11 $\frac{1}{4}$	20 yards before the boat.	dur. run. bow elev. 1° 0'	
261	RAPID.	18 39 18 59 19 20	b c d	20 21	11.25 10.71	425 387	16.50 15.71	do.	do.	do.	do.	do.	just astern	do. do. elev. 10'	
262	RAPID.	27 13 27 33 $\frac{1}{2}$ 27 54	b c d	20 $\frac{1}{2}$ 20 $\frac{1}{2}$	10.97 10.97	391 375	16.09 16.09	do.	do.	do.	do.	do.	do.	do. do. elev. 10'	
263	RAPID.	33 34 33 59 34 22	b c d	25 23	9.00 9.78	366 349	13.20 14.35	do.	do.	do.	do.	do.	about the middle of the boat.	do. do. elev. 6'	
264	RAPID.	40 27 41 04 41 40	b c d	37 36	6.08 6.25	172 164	8.92 9.17	do.	do.	do.	do.	do.	about 12ft. from the bow.	do. do. elev. 9'	
265	RAPID.	49 53 50 25 50 59	b c d	32 34	7.03 6.62	324 345	10.31 9.71	do.	do.	do.	do.	do.	about the bows, and a heavy wave after the boat.	do. do. elev. 1° 1'	
266	RAPID.	59 17 $\frac{1}{2}$ 16 $\frac{1}{2}$ 1 19	b c d	59 62 $\frac{1}{2}$	3.81 3.60	48 36	5.59 5.28	do.	do.	do.	do.	do.		do. do. level.	
267	RAPID.	7 2 7 39 8 17	b c d	37 38	6.08 5.92	145 125	8.92 8.68	do.	do.	do.	do.	do.	about the quartr	do. do. elev. 15'	
268	RAPID.	21 10 $\frac{1}{2}$ 21 31 $\frac{1}{2}$ 21 53	b c d	21 21 $\frac{1}{2}$	10.71 10.47	406 342	15.71 15.35	do.	do.	do.	14 $\frac{1}{2}$	9 $\frac{1}{2}$	at the middle of the boat.	do. do. level.	Shifted the weights to the bow.

TABLE VII. CONTINUED.—THE RAPID (SECOND SET).

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
No. of Experiment.	Boat's Name.	Instant of passing the Stake.	Stakes 110 yards apart.	Time of passing the Stake-interval.	Miles per Hour.	Tractive Power in lbs.	Feet per Second.	Kind of Tractive Power.	Load.	Wind.	Draught.		Position of Wave.	Variation in Level.	REMARKS.
											Bow	Stern			
269	RAPID.	min. sec. 28 28½ 28 57 29 25	<i>b</i> <i>c</i> <i>d</i>	sec. 28½ 28	miles. 7·90 8·03	lbs. 364·7 385	feet. 11·58 11·79	Two Horses.	7 passengers, and 1 ton, = c. q. lb. 29 2 1	none	in. 14½	in. 9½	just at the bow.	dur. run. bow elev. 25'	Heavy swell.
270	RAPID.	36 59 37 24 37 48	<i>b</i> <i>c</i> <i>d</i>	25 24	9·00 9·38	318 259	13·20 13·75	do.	do.	do.	do.	do.	15 feet farther aft.	do. elev. 15'	Swell not so heavy.
271	RAPID.	50 51½ 51 22½ 51 53	<i>b</i> <i>c</i> <i>d</i>	31 30½	7·26 7·38	362·7 431	10·65 10·82	do.	do.	do.	do.	do.	about 20 yds before the boat.	do. elev. 54'	
272	RAPID.	58 38 59 11 59 44	<i>b</i> <i>c</i> <i>d</i>	33 33	6·82 6·82	313·5 346	10·00 10·00	do.	do.	do.	do.	do.	a little before the boat.	do. elev. 43'	
273	RAPID.	6 54 7 42 8 30½	<i>b</i> <i>c</i> <i>d</i>	48 48½	4·69 4·64	82 78	6·88 6·80	do.	do.	do.	do.	do.	after the boat.	do. dep. 12'	Swell very slight.
274	RAPID.	14 3 14 24 14 45	<i>b</i> <i>c</i> <i>d</i>	21 21	10·71 10·71	395 348	15·71 15·71	do.	do.	do.	do.	do.	in mid-ships.	do. dep. 5'	
275	RAPID.	23 20 23 44 24 7½	<i>b</i> <i>c</i> <i>d</i>	24 23½	9·38 9·57	322 271	13·75 14·04	do.	do.	do.	do.	do.	about 18 feet from the bow.	do. elev. 22'	
276	RAPID.	45 20 45 48 46 14½	<i>b</i> <i>c</i> <i>d</i>	28 26½	8·03 8·49	373 389·6	11·79 12·45	do.	do.	do.	9	14	at the bow.	do. elev. 1°17'	Weight shifted to stern; swell very high, rose 3 feet.
277	RAPID.	54 10 54 30½ 54 51	<i>b</i> <i>c</i> <i>d</i>	20½ 20½	10·97 10·97	375 370·6	16·09 16·09	do.	do.	do.	do.	do.	at mid-ships.	do. elev. 27'	Not so high.

TABLE VII. CONTINUED.—THE RAPID (SECOND SET).

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
No. of Experiment.	Boat's Name.	Instant of passing the Stake.	Stakes 110 yards apart.	Time of passing the Stake-interval.	Miles per Hour.	Tractive Power in lbs.	Feet per Second.	Kind of Tractive Power.	Load.	Wind.	Draught.		Position of Wave.	Variation in Level.	REMARKS.
											Bow	Stern			
278	RAPID.	min. sec. 3 53 4 26 4 59	<i>b</i> <i>c</i> <i>d</i>	sec. 33 33	miles. 6·82 6·82	lbs. 324·6 350	feet. 10·00 10·00	Two Horses	7 passen- gers, and 1 ton, = <i>c. q. lb.</i> 29 2 1	none	in. 9	in. 14	30 yds. before the boat, broken water behind the boat..	dur. run. bow elev. 1° 18'	
279	RAPID.	12 58 13 52 14 43	<i>b</i> <i>c</i> <i>d</i>	54 51	4·17 4·41	60 58·7	6·11 6·47	do.	do.	do.	do.	do.		do. do. elev. 17'	Very little swell.
280	RAPID.	30½ 56 1 22	<i>b</i> <i>c</i> <i>d</i>	25½ 26	8·82 8·65	368 340·6	12·94 12·69	do.	do.	do.	do.	do.	at mid- ships	do. do. elev. 42'	
281	RAPID.	16 52 17 15½ 17 38	<i>b</i> <i>c</i> <i>d</i>	23½ 22½	9·57 10·00	383·5 328	14·04 14·67	do.	8 passen- gers, and 1 ton, = <i>c. q. lb.</i> 11 3 3	do.	not obs.	not obs.		not obs.	
282	RAPID.	31 55 32 15 32 35	<i>b</i> <i>c</i> <i>d</i>	20 20	11·25 11·25	366 347	16·50 16·50	do.	8 passen- gers, = <i>c. q. lb.</i> 10 3 3	do.	11	8¾		dur. run. bow level	
283	RAPID.	40 38 41 03½ 41 30	<i>b</i> <i>c</i> <i>d</i>	25½ 26½	8·82 8·49	319·7 366·5	12·94 12·45	do.	do.	do.	do.	do.		do. do. elev. 45'	
284	RAPID.	00 22½ 1 45	<i>b</i> <i>c</i> <i>d</i>	22½ 22½	10·00 10·00	301 278·6	14·67 14·67	do.	do.	do.	do.	do.		do. do. elev. 2'	Very little swell.
285	RAPID.	9 24½ 10 15 11 06½	<i>b</i> <i>c</i> <i>d</i>	50½ 51½	4·46 4·37	61 67	6·53 6·41	do.	do.	do.	do.	do.			

TABLE VIII.—NEW BOAT (14 *Experiments*).

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
No. of Experiment.	Boat's Name.	Instant of passing the Stake.	Stakes 110 yards apart.	Time of passing the Stake-interval.	Miles per Hour.	Tractive Power in lbs.	Feet per Second.	Kind of Tractive Power.	Load.	Wind.	Draught.		Position of Wave.	Variation in Level.	REMARKS.
											Bow	Stern			
286	NEW BOAT.	min. sec. 4 28 4 53 5 18 5 41 6 05	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	sec. 25 25 23 24	miles. 9·00 9·00 9·78 9·38	lbs. 206·5 185 202·8 223·5	feet. 13·20 13·20 14·35 13·75	Two Horses.	6 passengers, and 1 ton, = <i>c. q. lb.</i> 28 0 15	none	not obs.	not obs.	not obs.	not obs.	Experiments on Keels of different forms. Keel 30ft. long, 6in. deep, tapered off to a point at 4ft. from the ends. Boat 61ft. 6in. long.
287	NEW BOAT.	26 28½ 26 47½ 27 06 27 25 27 44	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	19 18½ 19 19	11·84 12·16 11·84 11·84	307 299 290·8 267·8	17·37 17·84 17·37 17·37	do.	do.	do.	do.	do.	do.	do.	Heavy rain.
288	NEW BOAT.	35 40 36 15 36 51 37 27 38 03½	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	35 36 36 36½	6·43 6·25 6·25 6·16	96·8 86·6 84 81·7	9·43 9·17 9·17 9·04	do.	do.	unf. strng	do.	do.	do.	do.	
289	NEW BOAT.	48 32½ 48 58 49 23½ 49 47½ 50 12½	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	25½ 25½ 24 25	8·82 8·82 9·38 9·00	193·8 202·5 190·7 186·6	12·94 12·94 13·75 13·20	do.	do.	do.	do.	do.	do.	do.	
290	NEW BOAT.	46 25 46 54 47 22½ 47 50 48 19½	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	29 28½ 27½ 28½	7·76 7·90 8·18 7·90	164·5 163 178·8 151·6	11·38 11·58 12·00 11·58	do.	do.	do.	in. 24	in. 21½	do.	do.	Triangular Keel 20ft. long, 7in. deep.
291	NEW BOAT.	55 45 56 10 56 33½ 57 57 58 21	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	25 23½ 23½ 24	9·00 9·57 9·57 9·38	180·6 203·7 209 191	13·20 14·04 14·04 13·75	do.	do.	do.	do.	do.	do.	do.	
292	NEW BOAT.	2 38 2 54 3 11 3 28½ 3 46½	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	16 17 17½ 18	14·06 13·24 12·86 12·50	339 346·6 318 303	20·63 19·41 18·86 18·33	do.	do.	do.	do.	do.	do.	do.	
293	NEW BOAT.	17 18½ 17 37 17 57 18 17 18 37	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	18½ 20 20 20	12·16 11·25 11·25 11·25	316·6 288 273 277·5	17·84 16·50 16·50 16·50	do.	do.	not so strng	do.	do.	do.	do.	Keel 20ft. long, 10in. deep in the middle, curved to both ends.
294	NEW BOAT.	29 40 30 05 30 29 30 54 31 18	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	25 24 25 24	9·00 9·38 9·00 9·38	203·5 192·8 192·5 196·8	13·20 13·75 13·20 13·75	do.	do.	do.	do.	do.	do.	do.	

TABLE VIII. CONTINUED.—NEW BOAT.

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
No. of Experiment.	Boat's Name.	Instant of passing the Stake.	Stakes 110 yards apart.	Time of passing the Stake-interval.	Miles per Hour.	Tractive Power in lbs.	Feet per Second.	Kind of Tractive Power.	Load.	Wind.	Draught.		Position of Wave.	Variation in Level.	REMARKS.
											Bow	Stern			
295	NEW BOAT.	min. sec. 39 15 $\frac{1}{2}$ 40 08 41 01 41 55 42 49	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	sec. 52 $\frac{1}{2}$ 53 54 54	miles. 4.29 4.25 4.17 4.17	lbs. 50 49 47.7 48	feet. 6.29 6.23 6.11 6.11	Two Horses.	6 passengers, and 1 ton, = <i>c. g. lb.</i> 28 0 15	unf. not so strong	in. 24	in. 21 $\frac{1}{8}$	not obs.	not obs.	Very little swell.
296	NEW BOAT.	20 48 21 07 21 27 21 46 $\frac{1}{2}$ 22 06	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	19 20 19 $\frac{1}{2}$ 19 $\frac{1}{2}$	11.84 11.25 11.54 11.54	298 276 261 267	17.37 16.50 16.92 16.92	do.	do.	do.	23	21 $\frac{3}{8}$	do.	do.	Keel 10 feet long, 14 in. deep in the middle, being the segment of a circle, the middle of which was 27 feet from the middle of boat forward.
297	NEW BOAT.	27 33 $\frac{1}{2}$ 27 57 28 21 28 44 29 07	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	23 $\frac{1}{2}$ 24 23 23	9.57 9.38 9.78 9.78	207 214 221 200.7	14.04 13.75 14.35 14.35	do.	do.	do.	do.	do.	do.	do.	
298	NEW BOAT.	37 11 37 51 $\frac{1}{2}$ 38 28 39 06 $\frac{1}{2}$ 39 45	<i>b</i> <i>c</i> <i>d</i> <i>e</i> <i>f</i>	40 $\frac{1}{2}$ 36 $\frac{1}{2}$ 38 $\frac{1}{2}$ 38 $\frac{1}{2}$	5.56 6.16 5.84 5.84	73 88 71.8 78.5	8.15 9.04 8.57 8.57	do.	do.	do.	do.	do.	do.	do.	

TABLE IX.—THE SWIFT (FIRST SET—11 *Experiments*).

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
No. of Experiment.	Boat's Name.	Instant of passing the Stake.	Stakes 110 yards apart.	Time of passing the Stake—interval.	Miles per Hour.	Tractive Power in lbs.	Feet per Second.	Kind of Tractive Power.	Load.	Wind.	Draught.		Position of Wave.	Variation in Level.	REMARKS.
		min. sec.		sec.	miles.	lbs.	feet.				Bow	Stern			PLACE OF EXPERIMENT, GLASGOW AND PAISLEY CANAL
299	SWIFT.	21 25 21 49 22 13	<i>b</i> <i>c</i> <i>d</i>	24 24 24	9.38 9.38	233.3 230.6	13.75 13.75	Two Horses.	7 passengers, and 3 ton, = c. q. lb. 69 2 1	light	in. 13½	in. 13¾		dur. run. bow elev. 4'	
300	SWIFT.	33 30½ 33 46½ 34 04	<i>b</i> <i>c</i> <i>d</i>	16 17½	14.06 12.86	521.7 475	20.63 18.86	do.	do.	do.	do.	do.	17ft. from stern on larboard side.	do. do. elev. 6'	Boat one-third the width of the canal from the towing-path.
301	SWIFT.	39 59 1 19	<i>b</i> <i>c</i> <i>d</i>	20 20	11.25 11.25	358 344	16.50 16.50	do.	do.	do.	do.	do.	more frwd than last experiment.	do. do. elev. 8'	
302	SWIFT.	51 14½ 51 39 52 03	<i>b</i> <i>c</i> <i>d</i>	24½ 24	9.18 9.38	250 221	13.47 13.75	do.	do.	do.	do.	do.	at mid-ships.	do. do. elev. 5'	Horses did not go steady.
303	SWIFT.	4 40 5 04 5 30	<i>b</i> <i>c</i> <i>d</i>	24 26	9.38 8.65	272 222	13.75 12.69	do.	do.	do.	do.	do.		do. do. dep. 5'	
304	SWIFT.	13 36 14 01 14 27½	<i>b</i> <i>c</i> <i>d</i>	25 26½	9.00 8.49	268 161	13.20 12.45	do.	do.	do.	do.	do.	about ¼ from bow.	do. do. elev. 29'	Not a good experiment.
305	SWIFT.	21 47 22 20 22 53	<i>b</i> <i>c</i> <i>d</i>	33 33	6.82 6.82	360 371	10.00 10.00	do.	do.	do.	do.	do.	40 yards ahead of boat.	do. do. elev. 1°7'	
306	SWIFT.	29 56 30 37 31 17½	<i>b</i> <i>c</i> <i>d</i>	41 41½	5.49 5.42	268.8 347.7	8.05 7.95	do.	do.	do.	do.	do.		do. do. elev. 58'	
307	SWIFT.	38 50½ 39 37½ 40 25	<i>b</i> <i>c</i> <i>d</i>	47 47½	4.79 4.76	91.2 76.6	7.02 6.95	do.	do.	do.	do.	do.		do. do. elev. 3'	

TABLE IX. CONTINUED.—THE SWIFT (FIRST SET).

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
No. of Experiment.	Boat's Name.	Instant of passing the Stake.	Stakes 110 yards apart.	Time of passing the Stake-interval.	Miles per Hour.	Tractive Power in lbs.	Feet per Second.	Kind of Tractive Power.	Load.	Wind.	Draught.		Position of Wave.	Variation in Level.	REMARKS.
											Bow	Stern			
308	SWIFT.	min. sec. 44 $\frac{1}{2}$	<i>b</i>	sec. 28	miles. 8.03	lbs. 266.6	feet. 11.79	Two Horses.	7 passengers, and 3 ton, = <i>c. q. lb.</i> 69 2 1	light	in. 13 $\frac{1}{2}$	in. 13 $\frac{3}{4}$			dur. run. bow elev. 1°20'
		1 12 $\frac{1}{2}$	<i>c</i>	26 $\frac{1}{2}$	8.49	358.8	12.45								
		1 39	<i>d</i>												
309	SWIFT.	52 15	<i>b</i>	34	6.62	341.8	9.71	do.	9 passengers, and 2t.15ct. = <i>c. q. lb.</i> 67 0 25	do.					
		52 49	<i>c</i>	34	6.62	335.5	9.71								
		53 23	<i>d</i>												

TABLE X.—ZEPHYR AND RAPID LASHED TOGETHER (2 Experiments).

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
No. of Experiment.	Boat's Name.	Instant of passing the Stake.	Stakes 110 yards apart.	Time of passing the Stake-interval.	Miles per Hour.	Tractive Power in lbs.	Feet per Second.	Kind of Tractive Power.	Load.	Wind.	Draught.		Position of Wave.	Variation in Level.	REMARKS.
											Bow	Stern			
310	ZEPHYR AND RAPID lashed together.	min. sec. 53 20	<i>b</i>	sec. 34	miles. 6.62	lbs. 297.5	feet. 9.71	Two Horses.	7 passengers, = <i>c. q. lb.</i> 9 2 1	not obs.	in. 7	in. 6	not obs.	not obs.	
		53 54	<i>c</i>	34	6.62	264.4	9.71								
		54 28	<i>d</i>	35 $\frac{1}{2}$	6.34	231	9.30								
		55 03 $\frac{1}{2}$	<i>e</i>	36 $\frac{1}{2}$	6.16	201.5	9.04								
		55 40	<i>f</i>												
311	ZEPHYR AND RAPID lashed together.	21 46	<i>b</i>	21	10.71		15.71	Three Horses.	do.	do.	do.	do.	do.	do.	In this experiment the pull went above the range of the Dynamometer in the first two stake-intervals.
		22 07	<i>c</i>	21	10.71		15.71								
		22 28	<i>d</i>	24 $\frac{1}{2}$	9.18	472	13.47								
		22 52 $\frac{1}{2}$	<i>e</i>	24 $\frac{1}{2}$	9.18	521.8	13.47								
		23 17	<i>f</i>												

TABLE XI.—THE SWIFT (SECOND SET).

ACTUAL TRACTIVE POWER OBSERVED IN WORKING THE SWIFT EIGHT MILES ALONG THE GLASGOW AND PAISLEY CANAL, AT THE ORDINARY PASSENGER-SPEED, OR NINE MILES PER HOUR.

Tractive Power in lbs.	REMARKS.	Tractive Power in lbs.	REMARKS.	Tractive Power in lbs.	REMARKS.	Tractive Power in lbs.	REMARKS.
170	Load—Eleven passengers and 2 ton. 15cwt., equal to 69 cwt. 3 qr. 20 lb. from Half-way House to Glasgow, and one passenger additional from the Culvert to Glasgow.	225		350		240	pass Bridge.
400		215		240		310	
400		210		300		260	
280		225		305		235	
260		195		270		245	
265	pass Mile-stone.	220	pass Bridge.	235		240	pass Course—Place where the Experiments were made.
240		285		230		230	
230		270		235		215	
240		230		240		215	
230		220		235		240	
220		235	pass Mile-stone.	225		210	
210		230		225		200	
205		235		240		235	
210		245		230		200	
215		270		260		120	
215		260		250	Barge passes.	120	pass Aqueduct.
210		230		275		150	
220		205		250		150	
245		215		230		130	
235		235		230		120	
265	turn corner.	235		210	pass Mile-stone.	100	
245		300		215		110	
205		360		235		110	
220		350		235		110	
200		300		225		100	
200	stop and take in a passenger. Load, therefore, about 71cwt. go on again.	240	pass Narrow Bridge.	215		90	
195		290		215		100	
190		320		215			
390		300		230			
425		270		240			
380		320	A Boat passed.	235			Port Eglinton.
230		250		270			
220		340		260			
			pass Bridge. Bad turn.				

TABLE XII.—THE ZEPHYR (SECOND SET).

ACTUAL TRACTIVE POWER OBSERVED IN WORKING THE ZEPHYR EIGHT MILES ALONG THE FORTH AND CLYDE CANAL,
AT THE ORDINARY PASSENGER-SPEED, OR NINE MILES PER HOUR.

Tractive Power in lbs.	REMARKS.	Tractive Power in lbs.	REMARKS.	Tractive Power in lbs.	REMARKS.	Tractive Power in lbs.	REMARKS.
395		370		405		315	
395	Load—Nine passengers and 3 ton, equal to 72 cwt. Ogr. 25lb.	375		395		305	
395		350		340		300	
400		250		190	stopped by a Vessel at Bridge.	310	
415		240		70		295	
445		285	turn.	0		300	turn.
555		320		0		325	
460		325		0		325	
190	pass Bridge.	350		0	pass Bridge.	325	
20	take off Rope.	420		170		340	
20		425		330		300	
20		420		380		310	pass Culvert.
300		260	pass Bridge.	385		270	turn.
310		0		385		310	
310		0		390		370	
100	pass Barge.	0	pass Mile-stone.	380		355	
0		440		385		385	
0		445		370		360	
0		395		370		280	
80		385		370	pass Mile-stone.	265	turn.
300		365		335		245	
355		380		330		300	
395		380		270		370	
420		385		160	pass Stockingfield Bridge.	360	
425		360		150	stop.	310	
425		350		0		320	pass Mile-stone.
410		355		0		345	
405		330		0	start again.	360	
405		325		130		390	
405		350		310		390	
575		320		355		390	
355		345		355		400	
355		340		345		400	
345		290	turn.	340		400	
320		200		315		370	Lamb-hill Bridge.
320		230		320		140	
330		250					

PLANS

- A. { EAGLE
HAWK
B. VELOCITY
C. RAPID
D. ZEPHYR
E. LARK

SECTIONS

- B. VELOCITY
C. RAPID
A' { EAGLE
HAWK

ELEVATION

- A' { EAGLE
HAWK

a. towing line.