



RATES OF BOX AND POCKET CHRONOMETERS

ON TRIAL

FOR PURCHASE BY THE BOARD OF ADMIRALTY,

AT THE

ROYAL OBSERVATORY, GREENWICH,

BOX CHRONOMETERS—FROM 1910 JUNE 18 TO 1911 JANUARY 7.

POCKET CHRONOMETERS—FROM 1910 JULY 30 TO 1910 NOVEMBER 19.

Order of Month	NAME OF MAKER	No.	No. of Days	(1). WEEKLY RATES															
				June 18-25	June 25 to July 2	July 2-9	July 9-16	July 16-23	July 23-30	July 30 to Aug 6	Aug. 6-13	Aug. 13-20	Aug. 20-27	Aug. 27 to Sept. 3	Sept. 3-10	Sept. 10-17	Sept. 17-24		
1	V. Kullberg.....	8159	2	+ 0.8	+ 0.8	+ 0.1	- 2.2	- 1.9	- 1.6	- 2.5	- 2.8	- 2.2	- 2.0	- 1.0	- 2.6	- 3.6	- 4.1		
2	V. Kullberg.....	8235	2	+ 0.5	+ 0.7	+ 1.1	- 0.2	- 0.9	- 0.8	- 0.7	- 0.8	- 1.8	- 0.4	+ 0.4	- 2.8	- 3.1	- 4.3		
3	V. Kullberg.....	8130	2	- 0.1	- 0.5	- 1.0	- 2.1	- 2.1	- 2.6	- 2.5	- 2.6	- 2.6	- 2.6	- 0.5	- 2.0	- 2.7	- 2.7		
4	Usher & Cole.....	2053	2	+ 6.8	+ 6.8	+ 6.2	+ 6.1	+ 5.7	+ 5.8	+ 5.8	+ 5.7	+ 5.2	+ 7.1	+ 8.2	+ 5.1	+ 5.2	+ 4.0		
5	V. Kullberg.....	8009	2	+ 2.6	+ 3.1	+ 4.6	+ 6.1	+ 5.0	+ 5.0	+ 5.0	+ 5.2	+ 5.0	+ 5.2	+ 0.1	- 3.2	- 0.7	- 0.9		
6	V. Kullberg.....	8052	2	- 10.7	- 8.8	- 8.3	- 9.1	- 8.6	- 8.7	- 9.0	- 7.7	- 7.8	- 7.3	- 7.2	- 9.7	- 11.9	- 14.3		
7	S. Smith & Sons.....	8010	2	- 3.1	- 1.0	- 0.8	- 1.1	- 0.9	- 0.6	- 0.6	+ 1.9	- 1.2	+ 1.1	+ 0.5	+ 0.1	+ 1.8	+ 2.0		
8	A. Johannsen & Co.....	6488	2	- 1.2	- 1.8	- 3.6	- 5.0	- 4.3	- 3.6	- 3.2	- 0.6	+ 0.1	+ 1.6	+ 2.6	+ 0.9	- 1.9	- 3.7		
9	V. Kullberg.....	8122	2	+ 2.8	+ 3.8	+ 1.1	- 0.8	- 0.2	- 0.1	- 0.1	- 1.3	- 0.7	- 0.9	- 1.6	- 0.9	- 1.6	- 4.6		
10	V. Kullberg.....	7905	2	- 3.8	- 3.8	- 1.1	- 6.1	- 6.2	- 6.2	- 5.7	- 8.9	- 3.1	- 1.7	+ 0.2	- 2.6	- 3.6	- 3.7		
11	Webb.....	5711	2	+ 15.8	+ 16.2	+ 16.0	+ 14.7	+ 15.1	+ 14.1	+ 14.1	+ 20.0	+ 20.6	+ 20.2	+ 19.3	+ 16.8	+ 15.5	+ 15.5		
12	V. Kullberg.....	8076	2	- 2.7	- 3.6	- 4.2	- 4.6	- 3.3	- 3.5	- 3.1	- 2.7	- 2.1	- 0.1	- 0.6	- 2.1	- 2.8	- 2.8		
13	Webb.....	5706	2	+ 1.4	+ 2.6	+ 4.1	+ 2.6	+ 1.4	+ 0.9	+ 0.9	+ 1.4	+ 1.4	+ 0.6	+ 1.5	+ 0.6	+ 1.4	+ 1.4		
14	Webb.....	5712	2	- 0.1	- 4.8	- 1.6	- 4.7	- 4.8	- 3.5	- 3.5	- 10.2	- 3.8	- 0.9	- 3.2	- 5.1	- 7.4	- 6.3		
15	S. Smith & Sons.....	7998	2	+ 0.7	0.6	+ 1.0	0.0	- 1.5	- 1.4	- 0.9	+ 4.1	+ 0.1	+ 3.8	+ 5.6	+ 10.8	+ 6.0	+ 6.5		
16	V. Kullberg.....	8142	2	- 2.0	+ 0.2	- 1.9	- 1.1	+ 0.4	+ 0.9	+ 1.8	- 7.4	- 8.0	- 4.8	- 2.6	- 1.7	- 3.8	- 4.6		
17	Morse.....	8077	2	+ 10.3	+ 8.8	+ 9.4	+ 10.0	+ 9.4	+ 10.5	+ 12.7	+ 8.0	+ 12.7	+ 8.0	+ 12.7	+ 8.0	+ 12.7	+ 8.0		
18	V. Kullberg.....	8196	2	- 3.1	- 1.5	- 0.8	+ 0.3	+ 1.6	+ 2.3	+ 1.2	+ 1.4	+ 0.0	+ 0.7	+ 5.2	+ 7.5	+ 7.7	+ 6.7		
19	A. Johannsen & Co.....	6478	2	+ 0.6	+ 2.1	+ 2.0	- 2.2	- 3.4	- 3.1	- 3.6	+ 4.1	+ 2.8	+ 2.0	+ 6.1	+ 6.1	+ 3.9	+ 1.6		
20	S. Dent & Co.....	5552	2	+ 0.3	+ 0.7	+ 0.1	- 0.8	- 0.8	- 0.1	+ 0.7	+ 0.3	+ 0.6	+ 4.2	+ 3.9	- 5.6	+ 3.9	+ 1.6		
21	V. Kullberg.....	8143	2	- 0.8	- 2.1	- 3.2	- 7.1	- 7.6	- 9.1	- 7.1	- 4.8	- 4.9	- 3.6	- 1.5	- 4.9	- 6.9	- 7.4		
22	A. Johannsen & Co.....	6488	2	- 1.1	- 0.8	+ 2.4	- 5.2	- 6.4	- 5.3	- 2.4	- 2.2	- 1.4	- 1.6	- 0.4	- 1.1	- 1.3	- 1.6		
23	Usher & Cole.....	2055	2	- 9.1	- 10.4	- 10.7	- 11.0	- 12.1	- 12.0	- 6.0	- 0.7	- 2.2	- 2.8	+ 1.8	+ 0.6	+ 2.4	+ 2.4		
24	Webb.....	5710	2	- 10.3	- 9.5	- 10.1	- 11.5	- 9.8	- 8.8	- 8.8	- 6.8	- 6.8	- 6.8	- 6.8	- 6.8	- 6.8	- 6.8		
25	A. Johannsen & Co.....	6477	2	+ 0.6	+ 0.7	+ 0.7	- 3.5	- 9.7	- 1.5	- 0.6	- 3.6	- 3.8	- 6.3	- 2.2	- 7.6	- 3.6	+ 0.5		
26	S. Smith & Sons.....	8012	2	- 8.3	- 8.9	- 8.0	- 9.1	- 11.5	- 9.6	- 12.7	- 8.1	- 16.8	- 8.4	- 7.7	- 10.5	- 8.3	- 7.4		
27	V. Kullberg.....	8077	2	- 3.8	- 4.5	- 7.1	- 6.5	- 6.0	- 4.9	- 5.2	- 1.2	- 1.2	- 0.3	+ 1.0	- 5.7	- 9.8	- 5.1		
28	Usher & Cole.....	2050	2	+ 12.0	+ 12.5	+ 12.6	+ 11.9	+ 12.6	+ 13.1	+ 13.5	+ 13.8	+ 13.8	+ 13.8	+ 13.8	+ 13.8	+ 13.8	+ 13.8		
29	A. Johannsen & Co.....	6540	2	- 1.5	- 1.5	- 1.1	- 2.1	- 2.1	- 2.1	- 2.1	- 2.1	- 2.1	- 2.1	- 2.1	- 2.1	- 2.1	- 2.1		
30	Smalley & Sons.....	3711	2	+ 5.7	+ 7.4	+ 5.7	+ 4.8	+ 4.5	+ 3.5	+ 3.5	+ 12.4	+ 3.5	+ 6.8	- 0.9	- 1.3	- 3.8	- 6.4		
31	A. Johannsen & Co.....	6860	2	- 5.8	- 7.1	- 3.1	- 0.9	- 7.1	- 7.8	- 4.2	- 14.0	- 14.9	- 13.9	- 15.2	- 19.9	- 12.6	- 12.4		
32	Usher & Cole.....	1955	2	+ 12.1	+ 11.9	+ 11.3	+ 9.7	+ 8.3	+ 8.7	+ 7.4	+ 18.4	+ 17.2	+ 17.0	+ 18.9	+ 22.3	+ 17.5	+ 17.5		
33	S. Dent & Co.....	5551	2	+ 10.2	+ 10.6	+ 10.4	+ 14.7	+ 10.9	+ 15.1	+ 10.8	+ 22.6	+ 30.1	+ 38.9	+ 30.9	+ 27.3	+ 27.3	+ 21.8		
†	A. Johannsen & Co.....	6570	2	- 8.4	- 2.7	- 2.5	- 2.2	- 1.7	- 1.6	- 4.0	- 2.8	+ 3.0	+ 0.4	- 2.5	- 0.2	- 2.2	- 2.2		
Chronometrical Thermometer.....				- 890.2	- 487.2	- 283.0	- 289.6	- 494.6	- 503.2	- 707.2	- 2500.9	- 3870.4	- 3555.1	- 2875.4	- 318.7	- 286.6	- 216.2		
Mean Weekly Temperature.....				67.3	69.5	62.2	61.9	64.1	64.0	66.4	88.5	100.0	97.2	87.6	82.0	61.8	60.1		
Extremes of Temperature as shown by the Self-Registering Thermometer.....				65.8	61.0	61.1	60.1	62.2	60.1	65.0	88.7	95.1	89.2	85.0	80.4	60.0	58.0		
				71.5	65.2	63.4	64.0	66.6	67.5	67.4	88.5	105.1	106.8	91.0	85.1	82.1	62.4		
The Chronometers are placed in order of merit, their respective positions being determined by the consideration of the irregularities of rate exhibited in Table II.																			
† During these weeks the Chronometers were placed in the chamber of an oven heated by jets of gas, the temperature being regulated by Kullberg's automatic governor which controls the supply of gas. The gas flames are exterior to the chamber, into which none of the igneous products of combustion can enter.																			
†† The maladjusting of this Chronometer broke during the first week of the trial. A new spring was put in, but not having undergone the complete trial, the Chronometer has not been classified.																			

The Chronometers are placed in order of merit, their respective positions being determined by the consideration of the irregularities of rate exhibited in Table II.

The sign + indicates that the rate is gaining.

† During these weeks the Chronometers were placed in the chamber of an oven heated by jets of gas, the temperature being regulated by Kullberg's automatic governor which controls the supply of gas. The gas flames are exterior to the chamber, into which none of the injurious products of combustion can enter.

†† The mainspring of this Chronometer broke during the first week of the trial. A new spring was put in, but not having undergone the complete trial, the Chronometer has not been classified.

IN ORDER OF TIME.															NAME OF MAKER		No.
Sept. 24 to Oct. 1	Oct. 1-8	Oct. 8-15	Oct. 15-22	Oct. 22-29 †	Oct. 29 to Nov. 5	Nov. 5-12 †	Nov. 12-19	Nov. 19-26	Nov. 26 to Dec. 3	Dec. 3-10	Dec. 10-17	Dec. 17-24	Dec. 24-31	Dec. 31 to Jan. 7			
+0.8	-0.5	-0.8	-0.8	-0.6	-0.9	-0.7	-0.8	-0.8	-0.8	-0.8	-0.8	-0.8	-0.8	-0.8	V. Kullberg.....	8159	
-1.4	-1.5	-2.0	-2.1	-1.9	-2.0	-1.5	-1.1	-4.3	-1.9	-0.3	-1.7	-0.6	-5.1	-4.4	V. Kullberg.....	8235	
-1.6	-2.0	-2.4	-2.4	-2.0	-2.3	-1.9	-1.1	-4.3	-1.9	-0.3	-1.7	-0.6	-5.1	-4.4	V. Kullberg.....	8130	
+0.8	+3.2	+6.0	+4.9	+8.0	+10.4	+8.1	-1.9	-1.1	-0.8	-2.9	-2.9	-2.9	-4.3	-4.3	V. Kullberg.....	2053	
+0.2	+1.1	+0.7	+6.0	+2.0	-1.6	+0.6	-0.1	-0.8	-0.8	-4.2	-4.2	-4.2	-6.5	-4.9	V. Kullberg.....	8009	
-14.1	-14.8	-15.2	-15.7	-11.6	-7.7	-7.0	-8.0	-9.0	-11.8	-11.5	-11.6	-13.9	-13.0	-12.2	V. Kullberg.....	8052	
+0.8	+1.1	+2.6	+6.1	+2.6	+3.6	+6.6	+7.7	+8.8	+7.9	+4.9	+4.2	+5.0	+4.9	+9.1	S. Smith & Sons.....	8010	
-2.5	-3.0	-4.3	-4.8	-1.5	-0.8	1.8	2.4	+1.0	-2.8	-5.1	-5.1	-6.7	-2.2	-5.9	A. Johannsen & Co.....	6488	
+0.8	+0.9	-6.9	-6.1	-1.2	-0.2	-2.3	-2.1	-0.2	-2.9	-4.2	-4.0	-4.9	-1.1	-5.1	V. Kullberg.....	8122	
-7.7	-7.1	-7.0	-6.2	-10.1	-8.0	-1.9	-3.0	-2.3	-8.8	-8.8	-9.8	-9.9	-11.2	-12.6	V. Kullberg.....	7905	
+15.4	+14.6	+14.8	+15.1	+16.6	+20.5	+19.6	+17.6	+17.7	+16.2	+14.6	+14.4	+11.0	+11.2	+12.9	Webb.....	5711	
+8.0	+7.6	+8.1	+8.8	+4.2	+1.4	+4.3	+3.8	+7.9	+8.9	+10.5	+8.9	+8.9	+8.9	+8.9	V. Kullberg.....	8076	
+8.0	+7.6	+8.1	+8.8	+4.2	+1.4	+4.3	+3.8	+7.9	+8.9	+10.5	+8.9	+8.9	+8.9	+8.9	Webb.....	5712	
+3.8	+1.9	+1.1	+1.0	+2.6	+3.9	+7.9	+10.5	+11.9	+8.2	+8.6	+4.3	+2.6	+4.2	+1.6	S. Smith & Sons.....	7998	
-8.2	-7.7	-7.7	-1.4	-6.3	-4.9	-3.0	-1.7	-2.1	-4.0	-1.9	-2.2	-3.7	-4.1	-9.3	V. Kullberg.....	8142	
-8.2	-7.7	-7.7	-1.4	-6.3	-4.9	-3.0	-1.7	-2.1	-4.0	-1.9	-2.2	-3.7	-4.1	-9.3	V. Kullberg.....	8196	
+5.2	+6.1	+7.2	+1.0	+4.6	+12.2	+10.0	+10.7	+14.8	+14.8	+12.3	+12.3	+12.3	+12.3	+12.3	A. Johannsen & Co.....	6478	
+5.2	+6.1	+7.2	+1.0	+4.6	+12.2	+10.0	+10.7	+14.8	+14.8	+12.3	+12.3	+12.3	+12.3	+12.3	A. Johannsen & Co.....	5552	
-7.8	-8.0	-8.8	-8.3	-10.0	-8.4	-4.6	-4.8	-12.8	-13.5	-10.6	-8.9	-11.1	-13.8	-14.2	V. Kullberg.....	8143	
-2.4	-1.2	-2.8	-4.0	-0.8	-0.3	+1.1	+1.8	-1.7	+0.6	-1.8	-4.0	-8.7	-12.2	-4.3	A. Johannsen & Co.....	6488	
-2.1	-4.3	-5.9	-0.3	-1.7	-1.1	8.1	6.8	+3.8	-0.3	-2.3	-1.9	0.0	-0.1	-2.0	Usher & Cole.....	2055	
-11.0	-11.9	-12.1	-11.9	-7.1	-2.6	-2.4	-11.0	-6.8	-6.8	-7.0	-8.9	-7.0	-8.9	-11.1	Webb.....	5710	
-5.2	-6.0	-4.3	-4.0	-0.8	-0.4	+1.1	+1.8	+3.0	+1.3	-3.4	-7.0	-4.0	-1.2	-1.2	A. Johannsen & Co.....	6477	
-12.2	-12.6	-14.1	-13.0	-16.0	-14.0	-10.3	-7.6	-6.4	-13.4	-13.7	-12.2	-12.5	-13.0	-13.0	S. Smith & Sons.....	8012	
-5.6	-5.8	-7.1	-10.8	-6.4	-1.2	+2.1	+1.8	-7.0	-12.1	-13.1	-13.7	-13.0	-14.3	-13.9	V. Kullberg.....	8077	
+15.9	+17.7	+16.5	+18.0	+16.1	+14.1	+10.1	+8.0	+6.8	+3.8	-0.3	-2.3	-1.9	-0.0	-2.0	Usher & Cole.....	2050	
+8.4	+11.9	+9.8	+3.9	+2.5	-7.0	-6.8	-1.6	-1.6	-15.8	-18.4	-16.2	-15.8	-14.8	-13.9	A. Johannsen & Co.....	6540	
+9.7	+10.8	+9.7	-7.2	-5.8	-2.7	-6.4	-7.1	-8.6	-6.6	-6.1	-5.6	-2.3	-1.8	-1.8	Smalley & Sons.....	3711	
-8.1	-11.9	-17.6	-20.4	-18.2	-16.5	-13.6	-14.2	-17.5	-22.0	-17.0	-20.8	-23.3	-24.0	-21.9	A. Johannsen & Co.....	6380	
+9.7	+10.8	+9.7	-7.2	-5.8	-2.7	-6.4	-7.1	-8.6	-6.6	-6.1	-5.6	-2.3	-1.8	-1.8	Usher & Cole.....	1955	
+13.9	+15.9	+13.9	-20.0	+16.0	+24.4	+28.0	+28.2	+39.4	+31.0	+21.0	+19.1	+19.8	+24.6	+31.9	A. Johannsen & Co.....	5221	
+1.9	0.0	-0.7	-2.1	-2.0	-2.8	-2.1	-4.0	-3.4	0.0	-1.7	-0.8	-4.6	-5.2	-5.1	A. Johannsen & Co.....	6570	
-488.6	-484.0	-483.1	-489.6	-1308.0	-2238.6	-2061.7	-1108.9	+459.8	+409.7	+204.3	+85.0	+184.9	+515.2	+411.0	Chromothermal Thermometer.		
60.6	63.2	61.1	58.7	70.4	91.5	60.5	75.5	48.6	49.8	53.9	56.2	55.5	51.9	49.7	Mean Weekly Temperature.		
60.0	61.5	57.5	57.0	74.0	86.1	88.8	73.2	47.3	48.4	51.0	54.1	53.7	49.0	47.9	Extremes of Temperature as shown by the Self-Register- ing Thermometer.		
68.8	67.2	68.4	61.7	81.0	98.1	98.6	78.0	51.5	51.8	56.1	57.8	59.0	56.5	53.5			

RATES OF BOX CHRONOMETERS ON TRIAL FOR PURCHASE BY THE ADMIRALTY,

	NAME OF MAKER.	No.	Whether 2 or 8 Days.	ADDRESS OF MAKER.	Construction of Escapement, Balance, and Spring, from a Description furnished by the Maker.	(II.) ABSTRACT OF	
						Least Weekly Sum.	Extremes of Temperature.
1	V. Kullberg	8159	2	105 Liverpool Road, London, N.	Kullberg's auxiliary balance; palladium spring.	— 6.3	53.7 — 59.0
2	V. Kullberg	8225	2	105 Liverpool Road, London, N.	Kullberg's auxiliary balance; palladium spring.	— 4.4	47.9 — 52.5
3	V. Kullberg	8120	2	105 Liverpool Road, London, N.	Kullberg's auxiliary balance; palladium spring.	— 5.6	95.1 — 105.1
4	Usher & Co.	2053	2	339 St. John Street, Clerkenwell, E.C.	Auxiliary to balance acting in cold; palladium spring.	+ 3.2	61.5 — 67.2
5	V. Kullberg	8009	2	105 Liverpool Road, London, N.	Kullberg's auxiliary balance; palladium spring.	— 6.5	53.7 — 59.0
6	V. Kullberg	8052	2	105 Liverpool Road, London, N.	Kullberg's auxiliary balance; palladium spring.	— 15.7	57.0 — 61.7
7	S. Smith & Sons.....	8010	2	9 Strand, London, W.C.	Auxiliary to balance acting in cold; palladium spring.	— 3.1	65.3 — 71.5
8	A. Johannsen & Co...	6483	2	149 Minories, London, E.	Auxiliary to balance acting in heat; palladium spring.	— 6.9	57.0 — 61.7
9	V. Kullberg	8122	2	105 Liverpool Road, London, N.	Kullberg's auxiliary balance; palladium spring.	— 6.1	57.0 — 61.7
10	V. Kullberg	7905	2	105 Liverpool Road, London, N.	Kullberg's auxiliary balance; palladium spring.	— 12.5	47.9 — 52.5
11	Webb	5711	2	69 Charlton Road, Blackheath, S.E.	Auxiliary to balance; bright steel spring.	+ 11.0	53.7 — 59.0
12	V. Kullberg	8076	2	105 Liverpool Road, London, N.	Kullberg's auxiliary balance; palladium spring.	— 6.1	47.9 — 52.5
13	Webb	5706	2	69 Charlton Road, Blackheath, S.E.	Auxiliary to balance; bright steel spring.	— 1.4	95.1 — 105.1
14	Webb	5712	2	69 Charlton Road, Blackheath, S.E.	Auxiliary to balance; bright steel spring.	— 10.2	83.7 — 88.5
15	S. Smith & Sons.....	7998	2	9 Strand, London, W.C.	Auxiliary to balance acting in cold; palladium spring.	— 1.5	62.2 — 66.6
16	V. Kullberg.....	8142	2	105 Liverpool Road, London, N.	Kullberg's auxiliary balance; palladium spring.	— 8.0	95.1 — 105.1
17	Mercer	8306	2	14 and 16 Prospect Road, St. Albans.	Auxiliary to balance; palladium spring.	— 15.3	86.1 — 96.8
18	V. Kullberg	8196	2	105 Liverpool Road, London, N.	Kullberg's auxiliary balance; palladium spring.	— 3.1	65.3 — 71.5
19	A. Johannsen & Co...	6478	2	149 Minories, London, E.	Auxiliary to balance acting in heat; palladium spring.	— 3.4	62.2 — 66.6
20	E. Dent & Co.....	55522	2	61 Strand, London, W.C.	Plain compensation balance; palladium spring.	— 0.8	60.1 — 64.0 62.2 — 66.6
21	V. Kullberg	8143	2	105 Liverpool Road, London, N.	Kullberg's auxiliary balance; palladium spring.	— 14.2	47.9 — 52.5
22	A. Johannsen & Co...	6486	2	149 Minories, London, E.	Auxiliary to balance acting in heat; palladium spring.	— 12.2	49.0 — 56.5
23	Usher & Cole.....	2055	2	339 St. John Street, Clerkenwell, E.C.	Auxiliary to balance acting in cold; palladium spring.	— 12.1	60.1 — 67.5
24	Webb	5710	2	69 Charlton Road, Blackheath, S.E.	Auxiliary to balance; bright steel spring.	— 13.2	58.0 — 62.4
25	A. Johannsen & Co...	6477	2	149 Minories, London, E.	Auxiliary to balance acting in heat; palladium spring.	— 9.7	62.2 — 66.6
26	S. Smith & Sons	8012	2	9 Strand, London, W.C.	Auxiliary to balance acting in cold; palladium spring.	— 18.4	48.4 — 51.8
27	V. Kullberg	8077	2	105 Liverpool Road, London, N.	Kullberg's auxiliary balance; palladium spring.	— 14.3	49.0 — 56.5
28	Usher & Cole.....	2060	2	339 St. John Street, Clerkenwell, E.C.	Auxiliary to balance acting in cold; palladium spring.	+ 11.9	60.1 — 64.0
29	A. Johannsen & Co...	6540	2	149 Minories, London, E.	Auxiliary to balance acting in heat; palladium spring.	— 3.1	60.1 — 64.0
30	Smalley & Sons.....	3711	2	St. John's, New Brunswick.	Smalley's auxiliary balance; steel spring.	— 11.9	61.5 — 67.2
31	A. Johannsen & Co...	6360	2	149 Minories, London, E.	Auxiliary to balance acting in heat; palladium spring.	— 24.0	49.0 — 56.5
32	Usher & Cole.....	1955	2	339 St. John Street, Clerkenwell, E.C.	Auxiliary to balance acting in cold; palladium spring.	+ 7.4	65.0 — 67.4
33	E. Dent & Co.....	55251	2	61 Strand, London, W.C.	Plain compensation balance; palladium spring.	+ 13.8	65.0 — 67.4
††	A. Johannsen & Co...	6570	2	149 Minories, London, E.	Auxiliary to balance acting in heat; palladium spring.	— 8.4	61.1 — 63.4

The Chronometers are placed in order of merit, their respective positions being determined by consideration of the irregularities of rate exhibited in the Table above.

The sign + indicates a gaining rate.

†† The mainspring of this Chronometer broke during the first week of the trial. A new spring was put in, but not having undergone the complete trial, the Chronometer has not been classified.

THE PRINCIPAL CHANGES OF RATE DURING THE 29 WEEKS.

Mean Temperature.	Greatest Weekly Sum.	Extremes of Temperature.	Mean Temperature.	Difference between Greatest and Least. (a)	Greatest Difference between one Week and the next. (b)	Mean Temperature for these two Weeks.	Trial No. $a + 2b$.	NAME OF MAKER.	No.
55.5	+ 0.3	61.0 — 65.2	63.5	6.6	2.3	62.2 — 61.9	11.2	V. Kullberg	8159
49.7	+ 1.1	61.1 — 63.4	62.2	5.5	3.2	{ 87.6 — 62.0 75.5 — 48.6 }	11.9	V. Kullberg	8225
100.0	— 0.1	65.3 — 71.5	67.8	5.5	3.4	86.5 — 100.0	12.3	V. Kullberg	8120
63.2	+ 11.4	54.1 — 57.8	56.2	8.2	3.1	{ 87.6 — 62.0 58.7 — 76.4 }	14.4	Usher & Cole	2053
55.5	+ 0.5	87.8 — 93.6	89.5	7.0	4.0	58.7 — 76.4	15.0	V. Kullberg	8009
58.7	— 7.0	87.8 — 93.6	89.5	8.7	4.1	58.7 — 76.4	16.9	V. Kullberg	8052
67.3	+ 9.1	47.9 — 52.5	49.7	12.2	3.4	87.6 — 62.0	19.0	S. Smith & Sons	8010
58.7	+ 2.6	{ 85.0 — 91.0 73.2 — 78.0 }	87.6	9.5	5.4	58.7 — 76.4	20.3	A. Johannsen & Co.	6483
58.7	+ 4.7	85.0 — 91.0	87.6	10.8	4.9	58.7 — 76.4	20.6	V. Kullberg	8122
49.7	+ 0.2	85.0 — 91.0	87.6	12.8	4.0	75.5 — 48.6	20.8	V. Kullberg	7905
55.5	+ 20.6	95.1 — 105.1	100.0	9.6	5.9	66.4 — 86.5	21.4	Webb	5711
49.7	+ 4.0	73.2 — 78.0	75.5	10.1	6.1	75.5 — 48.6	22.3	V. Kullberg	8076
100.0	+ 10.5	54.1 — 57.8	56.2	11.9	5.6	58.7 — 76.4	23.1	Webb	5706
86.5	— 0.9	89.2 — 106.8	97.2	9.3	7.1	76.4 — 91.5	23.5	Webb	5712
64.1	+ 11.9	47.3 — 51.5	48.6	13.4	5.7	97.2 — 87.6	24.8	S. Smith & Sons	7998
100.0	+ 1.8	65.0 — 67.4	66.4	9.8	9.2	66.4 — 86.5	28.2	V. Kullberg	8142
91.5	— 2.2	60.4 — 65.1	62.0	13.1	7.8	87.6 — 62.0	28.7	Mercer	8306
67.3	+ 17.0	47.3 — 51.5	48.6	20.1	4.5	97.2 — 87.6	29.1	V. Kullberg	8196
64.1	+ 12.3	47.9 — 52.5	49.7	15.7	6.7	64.0 — 66.4	29.1	A. Johannsen & Co.	6478
{ 61.9 64.1 }	+ 15.4	73.2 — 78.0	75.5	16.2	6.6	76.4 — 91.5	29.4	E. Dent & Co.	55522
49.7	— 0.8	65.3 — 71.5	67.3	13.4	8.0	75.5 — 48.6	29.4	V. Kullberg	8143
51.9	+ 2.4	61.1 — 63.4	62.2	14.6	7.9	51.9 — 49.7	30.4	A. Johannsen & Co.	6486
64.0	+ 6.8	73.2 — 78.0	75.5	13.9	6.0	66.4 — 86.5	30.9	Usher & Cole	2055
60.1	+ 0.6	87.8 — 93.6	89.5	13.8	8.6	75.5 — 48.6	31.0	Webb	5710
64.1	+ 6.0	61.0 — 65.2	63.5	15.7	8.6	66.4 — 86.5	32.9	A. Johannsen & Co.	6477
49.8	— 6.4	47.3 — 51.5	48.6	12.0	12.0	48.6 — 49.8	36.0	S. Smith & Sons	8012
51.9	+ 2.1	87.8 — 93.6	89.5	16.4	10.4	58.7 — 76.4	37.2	V. Kullberg	8077
61.9	+ 30.1	73.2 — 78.0	75.5	18.2	10.9	75.5 — 48.6	40.0	Usher & Cole	2060
61.9	+ 19.1	54.1 — 57.8	56.2	22.2	9.5	75.5 — 48.6	41.2	A. Johannsen & Co.	6540
63.2	+ 12.4	83.7 — 88.5	86.5	24.3	8.9	86.5 — 100.0	42.1	Smalley & Sons	3711
51.9	— 0.9	60.1 — 64.0	61.9	23.1	9.8	66.4 — 86.5	42.7	A. Johannsen & Co.	6360
66.4	+ 30.6	47.3 — 51.5	48.6	23.2	11.0	66.4 — 86.5	45.2	Usher & Cole	1955
66.4	+ 39.4	47.3 — 51.5	48.6	25.6	11.2	75.5 — 48.6	48.0	E. Dent & Co.	55251
62.2	+ 1.9	60.0 — 66.8	62.5	10.3	5.7	62.2 — 61.9	21.7	A. Johannsen & Co.	6570

The Trial No. $a + 2b$ is taken as a measure of the irregularities of rate.Only those Chronometers have been included in this list for which b did not exceed 12 seconds.

RATES OF POCKET CHRONOMETERS ON TRIAL FOR PURCHASE BY THE ADMIRALTY,

(1) WEEKLY RATES IN

Order of Merit	NAME OF MAKER.	No.	ADDRESS OF MAKER.	July 30 to Aug. 6	Aug. 6—13	Aug. 13—20	Aug. 20—27	Aug. 27 to Sept. 3	Sept. 3—10	Sept. 10—17	Sept. 17—21	Sept. 21—24	Sept. 24—27	Sept. 27 to Oct. 1
				Pocket Chronometer Horizontal. Dial up.							Chron. Vertical. Pendant up. †	Chron. Vertical. Pendant right. *	Chron. Vertical. Pendant left. *	Chron. Vertical. Pendant up. †
1	J. White & Sons.....	37553	Earlsdom, Coventry.	-15.8	-18.3	-15.5	-15.3	-18.5	-23.5	-25.1	-26.1	-23.3	-19.1	-18.0
2	J. Player & Son	33498	57 Allesley Old Road, Coventry.	+ 2.2	+ 4.1	0.0	+ 1.9	+ 1.3	- 0.9	- 7.5	-16.6	-15.9	-13.5	-14.0
3	Kullberg.....	7456	105 Liverpool Road, London, N.	+12.8	+ 7.3	+ 5.8	+11.3	+ 9.7	- 0.1	- 4.9	- 3.9	- 2.3	+ 4.2	- 6.5
4	Kullberg.....	7428	105 Liverpool Road, London, N.	+ 9.9	+10.2	+11.2	+13.1	+12.1	+12.0	+10.1	- 3.2	+ 1.2	- 0.9	+ 1.8
5	Kullberg	7460	105 Liverpool Road, London, N.	+ 8.9	+10.0	+ 9.6	+11.8	+11.1	+10.9	+19.7	+63.4	+48.1	+ 9.1	+37.1
6	Kullberg.....	7457	105 Liverpool Road, London, N.	- 1.4	+ 0.9	- 1.9	- 3.8	- 5.9	- 6.7	- 8.9	-32.4	-40.4	-50.4	-58.1
7	Carley & Clemence...	51620	30 Ely Place, Holborn, E.C.	+ 2.3	- 1.3	+ 0.5	+ 1.8	+ 2.8	+ 4.4	+14.7	-39.2	-23.1	-33.6	-42.4
Mean Weekly Temperature.				66°4	65°3	67°1	67°2	65°0	62°0	88°3	91°6		89°5	
Extremes of Temperature as shown by the Self-Registering Thermometer.				65.0	63.1	66.0	66.3	62.9	60.4	85.0	89.6		80.0	
				67.4	67.7	69.0	69.1	66.5	65.1	89.4	93.6		91.7	

* The weekly rates have been computed from the rates for three days.

† The weekly rates have been computed from the rates for four days.

During the period Sept. 10 to Oct. 8, the Pocket Chronometers were placed in an oven heated by jets of gas, the temperature being regulated by Kullberg's automatic governor which controls the supply of gas. The gas flames are exterior to the chamber, into which none of the injurious products of combustion can enter.

ORDER OF TIME.

(2) ABSTRACT OF THE PRINCIPAL
CHANGES OF RATE.

191260AMM
7

Oct. —8	Oct. 8—15	Oct. 15—22	Oct. 22—29	Oct. 29 to Nov. 5	Nov. 5—12	Nov. 12—19	Difference between greatest and least Weekly Rate. Dial up. <i>a.</i>	Greatest difference between one week and the next. Dial up. <i>b.</i>	Difference of Weekly Rates.			<i>a</i> +2 <i>b</i>	Trial Number. $a + 2b + \frac{1}{2}(c + \frac{d+e}{3})$	N A M E O F M A K E R.	No.	Order of Merit.
Pocket Chronometer Horizontal. Dial up.							<i>c.</i>	<i>d.</i>	<i>e.</i>							
—31·5	—24·8	—19·4	—15·6	—20·5	—25·8	—25·7	16·2	6·7	+ 6·2	+ 5·0	+ 9·2	29·6	35·1	J. White & Sons.....	37553	1
— 4·8	— 1·0	— 5·1	— 7·1	— 4·8	— 8·1	—14·2	18·3	6·6	— 9·1	— 9·7	— 7·3	31·5	38·9	J. Player & Son.....	33498	2
— 5·1	— 2·4	+ 8·1	+10·5	+16·6	+ 7·6	+16·8	21·7	10·5	— 0·2	+ 2·7	+ 9·2	42·7	44·8	Kullberg.....	7456	3
+12·9	+21·6	+24·1	+25·5	+28·6	+28·6	+29·1	19·2	8·7	—12·2	—10·3	—12·4	36·6	46·5	Kullberg.....	7428	4
+20·9	+14·2	+17·9	+13·9	+22·2	+24·0	+22·9	15·1	8·8	+30·0	+27·8	—11·2	32·7	54·2	Kullberg.....	7460	5
—16·7	— 3·4	— 7·6	—10·9	—10·6	—11·6	— 9·5	17·6	13·3	—32·5	—27·6	—37·6	44·2	71·4	Kullberg.....	7457	6
+16·9	+ 5·8	+ 4·6	+ 6·4	+ 8·1	+ 9·5	+ 8·5	18·2	11·1	—56·6	—38·9	—49·4	40·4	83·4	Carley & Clemence....	51620	7
88°·5	61°·1	58°·7	58°·2	55°·6	51°·9	51°·9	Mean Weekly Temperature.					The sign + indicates a gaining rate.				
82·0	57·5	57·0	56·9	52·6	50·2	47·0	Extremes of Temperature as shown by the Self-Registering Thermometer.									
91·5	63·4	61·7	61·3	58·4	53·9	55·0										

The quantities a, b, c, d, e , in the formulæ $a + 2b + \frac{1}{2}(c + \frac{d+e}{3})$ are taken numerically without regard to sign.