

RATES OF BOX AND POCKET CHRONOMETERS

ON TRIAL

FOR PURCHASE BY THE BOARD OF ADMIRALTY,

AT THE

ROYAL OBSERVATORY, GREENWICH,

FROM 1905 JUNE 17 TO 1906 JANUARY 6.

NAME or MAKER.	No.	No. of Days.	(1) WEEKLY RATES															
			June 17-24	June 24 to July 1	July 1-8	July 8-15	July 15-22	July 22-29	July 29 to Aug. 5	Aug. 5-12	Aug. 12-19	Aug. 19-26	Aug. 26 to Sept. 2	Sept. 2-9	Sept. 9-16	Sept. 16-23		
Kullberg.....	7583	2	- 7.8	- 7.8	- 6.6	- 7.4	- 5.1	- 5.6	- 4.9	- 9.5	-11.9	-11.1	- 8.8	- 8.3	-11.1	- 9.9	Kullberg.....	7588
Johannsen.....	5698	2	- 1.2	- 1.0	- 0.6	+ 1.5	+ 1.4	+ 1.7	+ 0.4	+ 0.9	+ 2.8	+ 2.6	+ 3.6	+ 3.9	+ 5.4	+ 6.8	Johannsen.....	5698
Johannsen.....	5870	2	+ 4.0	+ 4.3	+ 6.6	+ 6.8	+ 8.3	+ 8.1	+ 8.6	+ 4.5	+ 1.2	+ 3.1	+ 5.8	+ 7.9	+ 6.9	+10.4	Johannsen.....	5870
Lilley & Son.....	1590	2	- 0.8	- 1.6	- 4.7	- 5.0	- 6.4	- 6.7	- 6.6	- 9.1	-11.2	- 8.1	- 6.8	- 2.9	- 3.1	- 3.5	Lilley & Son.....	1590
M. F. Dent.....	32122	2	- 3.7	- 3.7	- 3.2	- 5.0	- 4.0	- 4.7	- 4.0	- 4.4	- 5.1	- 4.9	+ 0.3	+ 5.2	+ 3.7	+ 2.2	M. F. Dent.....	32122
Kullberg.....	7537	2	+ 1.8	+ 1.4	+ 2.6	+ 4.7	+ 3.9	+ 4.8	+ 3.3	+ 6.4	+ 8.4	+11.0	+10.0	+ 8.2	+ 7.0	+ 6.3	Kullberg.....	7537
Kullberg.....	7486	2	- 7.3	- 7.0	- 6.7	- 6.2	- 6.9	- 6.6	- 6.5	- 5.7	- 5.0	- 5.8	- 9.4	- 9.7	-11.4	- 9.9	Kullberg.....	7486
Lilley & Son.....	1589	2	- 9.2	- 8.6	- 7.8	- 7.1	- 7.5	- 8.4	- 8.0	- 4.2	- 4.8	- 2.1	- 2.0	- 6.4	- 6.4	- 8.2	Lilley & Son.....	1589
Asprey.....	1943	2	-15.8	-16.1	-15.4	-14.1	-14.8	-15.3	-15.0	-12.3	-16.4	-14.9	- 7.6	-13.0	-13.5	-16.3	Asprey.....	1943
Kullberg.....	7547	2	- 6.5	- 6.8	- 4.8	- 5.1	- 5.7	- 6.2	- 5.7	- 2.4	- 2.1	- 1.8	- 1.1	- 3.0	- 5.3	- 7.2	Kullberg.....	7547
E. Dent & Co.....	51688	2	+ 8.7	+10.6	+11.5	+12.1	+12.0	+13.9	+12.0	+12.2	+ 5.8	+ 5.9	+12.8	+16.4	+15.3	+13.7	E. Dent & Co.....	51688
Olivant & Botsford.....	31074	2	+ 8.7	+ 5.9	+ 6.4	+ 8.7	+ 9.1	+10.0	+ 9.4	+ 7.5	+ 0.6	+ 1.2	+ 7.6	+ 5.9	+ 7.3	+ 7.5	Olivant & Botsford.....	31074
A. W. Webb.....	5690	2	-19.1	-20.0	-20.0	-20.2	-20.9	-20.1	-26.5	-25.7	-25.7	-21.6	-22.5	-22.7	-26.1	-22.1	A. W. Webb.....	5690
E. Dent & Co.....	53887	2	- 5.0	- 6.0	- 6.8	- 7.0	- 7.2	- 7.0	- 7.5	-10.6	- 5.1	+ 1.4	+ 7.0	+ 6.8	+ 7.0	+ 7.0	E. Dent & Co.....	53887
Johannsen.....	5604	2	+ 6.0	+ 6.3	+ 4.6	+ 4.8	+ 3.4	+ 4.9	+ 4.5	+ 1.6	+ 3.3	+ 7.2	+ 9.7	+10.7	+ 9.4	+10.2	Johannsen.....	5604
E. Dent & Co.....	53854	2	- 2.0	- 1.8	- 0.3	+ 1.3	+ 1.2	+ 1.8	+ 1.9	+ 5.1	+ 5.9	+ 9.1	+ 7.6	+ 2.2	+ 1.1	0.0	E. Dent & Co.....	53854
Johannsen.....	5822	2	+11.9	+12.1	+ 8.0	+ 8.0	+ 7.8	+ 5.4	+ 4.9	+ 2.8	- 0.9	- 0.1	+ 3.1	+10.0	+ 4.1	+ 1.9	Johannsen.....	5822
M. F. Dent.....	32569	2	+ 4.2	+ 3.8	+ 3.9	+ 4.3	+ 5.4	+ 4.8	+ 6.6	+11.7	+ 9.4	+ 9.0	+15.2	+19.6	+18.8	+17.3	M. F. Dent.....	32569
Gardner.....	54361	2	+10.1	+10.0	+ 9.9	+ 9.7	+10.8	+11.3	+11.6	+10.7	+17.9	+19.1	+22.9	+18.1	+13.8	+13.8	Gardner.....	54361
E. Dent & Co.....	53861	2	+ 8.7	+ 8.2	+10.0	+11.1	+11.0	+11.7	+ 9.5	+10.7	+ 8.3	+11.7	+13.2	+ 7.9	+ 6.8	+ 7.2	E. Dent & Co.....	53861
S. Smith & Sons.....	7998	2	+ 1.7	- 0.1	- 4.4	- 6.1	- 6.0	- 5.8	- 3.9	- 2.6	+ 0.2	+ 8.2	+ 4.1	+ 5.8	+ 2.4	+ 3.2	S. Smith & Sons.....	7998
Johannsen.....	5786	2	+ 4.4	+ 7.7	+ 8.3	+10.9	+14.9	+14.6	+10.6	+10.9	+12.3	+20.2	+24.7	+19.7	+13.9	+11.9	Johannsen.....	5786
Johannsen.....	7329	2	- 7.4	- 8.9	- 9.8	-11.1	-11.7	-12.4	-11.7	- 6.7	- 0.6	+ 5.4	+ 8.6	+ 1.7	- 0.9	- 3.5	Johannsen.....	7329
Usher & Cole.....	1506	2	+ 8.0	+ 7.7	+ 7.3	+ 7.2	+ 9.1	+ 7.1	+ 9.2	+12.2	+13.8	+27.9	+24.0	+20.0	+ 9.9	+10.0	Usher & Cole.....	1506
A. W. Webb.....	5696	2	+13.0	+16.2	+18.1	+20.1	+22.7	+25.8	+30.0	+22.9	+19.3	+19.7	+23.0	+30.5	+32.8	+34.8	A. W. Webb.....	5696
Lindqvist.....	111	2	+ 1.6	+ 0.8	+ 0.6	+ 2.3	+ 3.6	+10.2	+14.4	+17.7	+16.8	+17.7	+22.1	+26.5	+26.6	+30.1	Lindqvist.....	111
Chronometrical Thermometer.....			-635.1	-721.0	-833.0	-1130.0	-1029.9	-1108.5	-828.1	-2419.6	-2957.6	-3521.8	-2411.6	-649.1	-350.8	-119.6	Chronometrical Thermometer.....	
Mean Weekly Temperature.....			66.9	67.6	68.6	71.8	70.9	71.2	68.2	86.8	97.9	98.6	85.9	66.1	62.7	61.0	Mean Weekly Temperature.....	
Extremes of Temperature as shown by the Self-Registering Thermometer.....			65.0-68.7	65.9-70.2	67.7-70.2	70.1-73.8	69.0-73.8	69.1-73.8	68.3-70.7	82.4-93.6	98.6-102.6	92.8-107.7	82.2-89.0	69.5-68.0	64.0-65.5	61.5	Extremes of Temperature as shown by the Self-Registering Thermometer.....	

The sign + indicates that the rate is gaining.

† During these weeks the Chronometers were placed in the chamber of a stove heated by 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 Chronometrical Thermometer differs from an ordinary Chronometer in the construction of the balance only, the position of the metals forming the compensating rim being reversed. By this arrangement the effect of temperature is much magnified.

IN ORDER OF TIME.															NAME OF MAKER.		No.
Sept. 23-30	Sept. 30 to Oct. 7	Oct. 7-14	Oct. 14-21	Oct. 21-28	Oct. 28 to Nov. 4 †	Nov. 4-11	Nov. 11-18	Nov. 18-25	Nov. 25 to Dec. 2	Dec. 2-9	Dec. 9-16	Dec. 16-23	Dec. 23-30	Dec. 30 to Jan. 6			
- 7.6	- 7.9	- 9.4	- 8.0	- 8.2	-11.2	-13.5	-11.4	- 7.2	- 7.2	- 7.8	- 8.5	- 6.9	- 6.9	- 6.1	Kullberg.....	7588	
+ 5.1	+ 4.1	+ 4.0	+ 4.3	+ 5.0	+ 3.8	+ 4.9	+ 8.9	+10.9	+ 8.4	+ 7.6	+ 7.0	+ 7.0	+ 7.5	+ 6.8	Johannsen.....	5698	
+ 9.6	+ 7.2	+ 7.0	+ 8.2	+ 7.6	+ 5.2	+ 7.1	+10.6	+10.3	+10.6	+ 7.4	+ 3.3	+ 2.8	- 0.8	- 0.8	Johannsen.....	5870	
- 3.3	- 5.0	- 5.3	- 4.8	- 4.9	- 5.9	- 5.2	- 1.3	+ 1.0	- 2.7	- 3.1	- 5.8	- 4.3	- 4.9	- 4.2	Lilley & Son.....	1590	
- 1.0	- 4.0	- 5.2	- 4.9	- 3.1	- 2.1	- 1.4	+ 1.9	- 0.5	- 0.1	- 3.2	- 5.8	- 4.4	- 5.8	- 6.1	M. F. Dent.....	32122	
+ 6.4	+ 2.7	+ 2.6	+ 2.9	+ 9.0	+ 8.0	+ 8.1	+ 9.2	+ 5.9	+ 3.8	+ 3.0	+ 3.0	+ 4.1	+ 4.0	+ 4.1	Kullberg.....	7537	
-11.2	-14.8	-14.8	-13.9	- 8.3	- 7.8	- 8.4	- 8.4	-13.8	-12.1	-13.2	-16.3	-14.2	-14.9	-15.1	Kullberg.....	7486	
- 7.9	- 7.6	- 9.1	- 9.5	- 7.2	- 1.2	- 2.5	- 2.5	- 5.5	- 5.8	- 6.8	- 5.5	- 7.5	- 7.8	- 10.1	Lilley & Son.....	1589	
-12.9	-15.8	-15.3	-12.0	-10.1	- 7.1	- 6.9	- 8.1	-11.5	- 8.3	- 9.1	-10.9	- 9.1	- 9.9	- 9.9	Asprey.....	1943	
- 9.2	-10.3	-11.9	-11.0	- 6.2	- 5.7	- 3.3	- 0.9	- 8.7	- 6.8	- 7.8	-10.5	-10.9	-11.4	-13.6	Kullberg.....	7547	
+13.1	+12.8	+10.2	+13.2	+16.8	+19.1	+15.3	+12.0	+ 4.7	+ 7.7	+ 7.6	+ 5.0	+ 5.7	+ 7.7	+ 7.9	E. Dent & Co.....	51688	
+ 7.9	+ 8.0	+ 7.2	+ 9.0	+11.7	+ 5.3	+ 8.4	+14.4	+13.3	+ 5.2	+ 4.7	+ 3.0	+ 3.3	+ 3.8	+ 7.9	Olivant & Botsford.....	31074	
-20.0	-18.8	-25.1	-27.7	-31.4	-25.2	-26.7	-25.6	-32.4	-33.1	-34.2	-37.5	-33.3	-33.2	-32.8	A. W. Webb.....	5690	
+ 5.1	+ 4.1	+ 3.1	+ 3.9	+ 3.2	+ 6.2	+ 6.9	- 0.1	- 0.9	+ 6.1	+ 6.6	+ 6.9	+ 7.8	+ 6.2	+ 5.1	E. Dent & Co.....	53887	
+11.3	+ 7.1	+ 7.4	+ 5.9	+11.2	+13.0	+23.3	+23.5	+23.3	+20.1	+17.9	+18.0	+17.2	+16.9	+16.9	Johannsen.....	5604	
- 1.0	- 1.9	- 2.4	- 2.8	+ 2.4	+ 7.6	+ 7.4	+ 5.8	- 4.1	- 2.2	- 3.0	- 2.8	- 2.8	- 2.2	- 3.7	E. Dent & Co.....	53854	
+ 9.0	+ 5.8	+ 2.6	+ 2.6	+ 6.1	+ 6.5	+ 5.5	+ 7.2	+ 7.2	- 0.2	- 4.1	- 6.4	- 4.8	- 4.0	- 4.8	Johannsen.....	5822	
+13.8	+11.2	+12.0	+14.1	+18.4	+18.4	+23.1	+15.9	+15.5	+12.5	+10.7	+11.5	+10.6	+ 8.9	+ 8.1	M. F. Dent.....	32569	
+13.3	+13.6	+11.8	+15.0	+21.3	+22.1	+22.4	+21.8	+12.3	+ 9.2	+ 8.7	+ 9.3	+ 9.2	+ 9.6	+ 9.6	Gardner.....	54361	
+ 7.5	+ 6.7	+ 5.8	+ 6.1	+ 9.5	+13.3	+19.0	+18.2	+ 6.7	+ 6.8	+ 6.6	+ 5.6	+ 9.4	+ 8.3	+ 9.0	E. Dent & Co.....	53861	
+ 2.2	- 0.6	- 0.1	+ 0.7	+ 7.2	+10.3	+13.8	+14.1	+16.0	+18.9	+14.6	+13.7	+11.4	+ 9.1	+ 8.0	S. Smith & Sons.....	7998	
+ 7.4	+ 4.1	- 0.8	+ 2.5	+ 6.4	+ 6.6	+ 9.0	+17.1	+15.1	+11.4	+ 7.2	+ 5.2	+ 7.6	+ 7.3	+ 1.2	Johannsen.....	5786	
- 8.4	-11.1	-12.1	-11.9	0.0	+ 1.3	+ 4.6	+ 8.2	+ 0.1	- 2.1	- 4.9	- 9.1	- 9.9	-11.5	-11.4	Kullberg.....	7329	
+17.0	+14.9	+15.9	+15.8	+18.9	+15.6	+18.6	+30.2	+30.0	+26.2	+25.0	+23.1	+23.8	+23.2	+21.9	Usher & Cole.....	1506	
+36.2	+35.9	+36.6	+39.2	+31.4	+23.8	+31.8	+32.7	+38.0	+34.9	+41.3	+43.9	+45.9	+48.1	+45.9	A. W. Webb.....	5696	
+23.2	+20.0	+21.3	+23.5	+40.2	+27.2	+32.4	+40.4	+41.0	+32.5	+31.6	+29.9	+32.2	+32.0	+28.9	Lindqvist.....	111	
+ 52.6	+309.4	+192.6	+514.4	-1509.9	-3099.7	-3121.2	-1474.5	+987.4	+432.8	+735.0	+668.2	+689.8	+723.4	+855.7	Chronometrical Thermometer.....		
59.0	57.3	57.5	54.1	75.1	94.3	92.1	74.6	48.7	52.4	51.2	51.3	50.4	49.9		Mean Weekly Temperature.....		
57.7-60.4	55.5-60.7	56.9-62.0	52.0-67.2	69.3-79.4	83.4-90.6	80.6-96.0	92.7-79.1	46.2-50.6	49.0-54.0	47.4-55.6	49.7-54.6	50.0-52.9	49.0-52.4	44.2-53.4	(Extremes of Temperature as shown by the Self-Registering Thermometer.)		
The Chronometers are placed in order of merit, their respective positions being determined by consideration of the irregularities of rate exhibited in Table III.																	
Only those Chronometers have been included in this list for which 60 did not exceed 12 seconds.																	

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

Only those Chronometers have been included in this list for which it did not exceed 12 seconds.

NAME OF MAKER	No.	Weather of Day	(1L) WEEKLY RATES IN													
			Nov. 15-25	Dec. 30 Jan. 6	Dec. 23-30	Dec. 2-9	Dec. 16-23	Dec. 9-16	Nov. 15 to Dec. 1	Oct. 14-21	Sept. 30 Oct. 7	Oct. 7-14	Sept. 23-30	Sept. 16-23	Sept. 9-16	Sept. 2-9
Kullberg.....	7583	2	- 7.2	- 6.1	- 6.9	- 7.8	- 6.9	- 8.5	- 7.2	- 8.0	- 7.9	- 9.4	- 7.6	- 9.9	-11.1	- 8.3
Johannsen.....	5648	2	+10.9	+ 6.8	+ 7.5	+ 7.6	+ 7.0	+ 7.0	+ 8.3	+ 4.3	+ 4.1	+ 4.0	+ 5.1	+ 5.4	+ 3.9	+ 3.9
Johannsen.....	5870	2	+10.3	- 0.3	- 0.8	+ 7.4	+ 2.6	+ 3.3	+10.5	+ 8.2	+ 7.2	+ 7.0	+ 9.6	+10.4	+ 6.9	+ 7.6
Lilley & Son.....	1590	2	+ 1.0	- 4.2	- 4.9	- 3.1	- 4.3	- 5.8	- 2.7	- 4.8	- 5.0	- 5.3	- 3.3	- 3.5	- 3.1	- 2.9
M. F. Dent.....	32122	2	- 0.5	- 6.1	- 5.8	- 3.2	- 4.4	- 5.3	- 0.1	- 4.9	- 4.0	- 5.2	- 1.0	+ 2.2	+ 3.7	+ 5.2
Kullberg.....	7587	2	+ 5.9	+ 4.1	+ 4.0	+ 3.0	+ 4.1	+ 3.0	+ 3.8	+ 2.9	+ 3.7	+ 2.6	+ 6.4	+ 6.3	+ 7.0	+ 8.2
Kullberg.....	7486	2	-13.8	-15.9	-14.9	-13.2	-14.2	-13.6	-12.1	-13.9	-14.8	-14.8	-11.2	- 9.9	-11.4	- 9.7
Lilley & Son.....	1589	2	- 5.5	-10.1	- 7.8	- 6.8	- 7.5	- 8.5	- 5.8	- 9.5	- 7.6	- 8.1	- 7.9	- 8.2	- 6.4	- 5.4
Agreey.....	1948	2	-11.5	- 9.0	- 9.9	- 9.1	- 9.7	-10.9	- 8.3	-12.0	-13.8	-15.3	-12.9	-16.3	-13.5	-13.0
Kullberg.....	7547	2	- 8.7	-13.6	-11.4	- 7.8	-10.9	-10.5	- 6.8	-11.0	-10.3	-11.9	- 9.2	- 7.2	- 5.3	- 3.0
E. Dent & Co.....	51648	2	+ 4.7	+ 7.9	+ 7.7	+ 7.6	+ 5.7	+ 5.0	+ 7.7	+13.2	+12.8	+10.2	+13.1	+13.7	+15.3	+16.4
Ollivant & Botford.....	31074	2	+13.8	+7.9	+3.8	+4.7	+3.3	+3.0	+5.2	+9.0	+8.0	+7.2	+7.9	+7.5	+7.3	+5.9
A. W. Webb.....	5680	2	-32.4	-32.8	-33.2	-34.2	-33.8	-37.5	-33.1	-37.7	-38.0	-20.1	-26.1	-22.1	-20.1	-22.7
E. Dent & Co.....	53887	2	- 0.9	+ 5.1	+ 6.2	+ 6.6	+ 7.8	+ 6.9	+ 6.1	+ 3.9	+ 4.1	+ 3.1	+ 5.1	+ 7.0	+ 6.8	+ 7.0
Johannsen.....	5604	2	+23.5	+16.9	+17.2	+20.1	+18.0	+17.9	+21.3	+5.9	+7.1	+7.4	+11.3	+10.2	+9.4	+10.7
E. Dent & Co.....	53854	2	- 4.1	- 3.7	- 2.2	- 3.0	- 2.8	- 2.8	- 2.2	- 2.8	- 1.9	- 2.4	- 1.0	0.0	+ 1.1	+ 2.2
Johannsen.....	5822	2	+ 7.2	- 4.8	- 4.0	- 4.1	- 4.8	- 6.4	- 0.2	+ 2.6	+ 5.8	+ 2.6	+ 9.0	+ 1.9	+ 4.1	+10.0
M. F. Dent.....	32569	2	+15.9	+ 8.9	+10.6	+12.5	+11.5	+10.7	+15.5	+14.1	+12.1	+12.0	+13.8	+17.3	+18.8	+19.6
Gardner.....	54381	2	+21.8	+ 9.6	+ 9.2	+ 9.2	+ 9.3	+ 10.7	+13.2	+15.0	+13.6	+11.8	+13.3	+13.8	+13.8	+13.1
E. Dent & Co.....	53861	2	+ 6.7	+ 9.0	+ 8.3	+ 6.6	+ 9.4	+ 5.6	+ 6.8	+ 6.1	+ 6.7	+ 5.8	+ 7.5	+ 7.2	+ 6.8	+ 7.9
S. Smith & Sons.....	7398	2	+16.0	+ 8.0	+ 9.1	+14.6	+11.4	+13.2	+18.9	+ 0.7	- 0.6	- 0.1	+ 2.2	+ 3.2	+ 2.4	+ 5.8
Johannsen.....	7296	2	+15.1	+ 1.2	+ 7.3	+ 7.2	+ 7.6	+ 5.2	+11.4	+ 2.6	+ 4.1	- 0.8	+ 7.4	+11.9	+13.9	+13.7
Kullberg.....	7329	2	+ 0.1	-11.4	-11.5	-4.9	-9.3	-9.1	-2.1	-11.9	-11.1	-12.1	- 8.4	- 3.8	- 0.8	+ 1.7
Usher & Cole.....	1566	2	+30.0	+21.9	+23.2	+25.0	+23.8	+22.1	+26.2	+15.8	+14.9	+15.9	+17.0	+15.0	+9.9	+30.0
A. W. Webb.....	5685	2	+38.0	+51.9	+48.1	+41.3	+48.0	+43.9	+39.2	+39.2	+35.9	+36.6	+38.4	+32.8	+30.0	+30.0
Lindqvist.....	111	2	+41.0	+38.9	+32.0	+31.6	+32.2	+32.9	+32.5	+32.0	+21.3	+23.2	+30.1	+26.6	+26.5	+26.5
Chronometrical Thermometer.....			+987.4	+855.7	+782.4	+735.5	+680.8	+608.2	+532.8	+514.4	+439.4	+192.6	+52.6	-119.0	-350.8	-640.1
Mean Weekly Temperature.....			48.7	49.9	50.4	51.2	51.3	51.2	52.4	54.1	57.3	57.5	59.0	61.0	62.7	66.1
Extremes of Temperature as shown by the Self-Registering Thermometers.....			46.2-50.5	44.2-53.4	46.0-52.0	47.4-55.5	50.0-52.9	49.7-54.1	49.0-53.6	52.0-57.5	55.3-58.6	55.7-59.7	57.7-60.4	60.5-61.5	61.4-66.5	66.5-68.4
The sign + indicates that the rate is gaining.																
† During these weeks the Chronometers were placed in the chamber of a stove 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 Chronometrical Thermometer differs from an ordinary Chronometer only in the construction of the balance, the position of the metals forming the compensating ring being reversed. By this arrangement the effect of temperature is much nuggified.																

The sign + indicates that the rate is gaining.

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

The Chronometrical Thermometer differs from an ordinary Chronometer only in the construction of the balance, the position of the metals forming the compensating rim being reversed. By this arrangement the effect of temperature is much magnified.

ORDER OF TEMPERATURE AS DETERMINED GENERALLY BY THE CHRONOMETRICAL THERMOMETER.															NAME OF MAKER	No.
June 17-24	June 24 to July 1	July 29 to Aug. 5	July 1-8	July 15-22	July 23-29	July 29-8-15	Nov. 11-18	Oct. 21-28	Aug. 26 to Sept. 2	Aug. 6-12	Oct. 28 to Nov. 4	Nov. 4-11	Aug. 12-19	Aug. 19-26		
-7.3	-7.8	-4.9	-6.6	-5.1	-5.6	-7.4	-11.4	-8.2	-8.8	-9.5	-11.2	-13.5	-11.9	-11.1	Kullberg.....	7588
-1.2	-1.0	+1.7	-0.6	+1.4	+1.7	+1.5	+8.3	+5.0	+2.6	+0.4	+3.8	+4.9	+0.9	+2.8	Johannsen.....	5648
+4.0	+4.3	+8.6	+6.6	+8.3	+8.1	+6.8	+10.6	+7.6	+5.8	+4.5	+2.7	+7.1	+1.2	+3.1	Johannsen.....	5870
-0.8	-1.6	-6.6	-4.7	-6.4	-6.7	-5.0	-1.3	-4.9	-6.8	-9.1	-5.9	-6.2	-11.2	-8.1	Lilley & Son.....	1590
-9.7	-9.7	-4.0	-3.2	-4.0	-4.7	-5.0	+1.9	-3.1	+0.3	-4.4	-2.1	-1.4	-5.1	-4.9	M. F. Dent.....	32122
+1.3	+1.4	+3.2	+2.6	+3.9	+4.8	+4.7	+9.2	+9.0	+10.0	+6.4	+8.4	+8.1	+8.4	+11.0	Kullberg.....	7597
-7.3	-7.0	-6.5	-6.7	-6.9	-6.6	-6.2	-8.4	-8.8	-9.4	-5.7	-7.8	-8.4	-5.0	-5.8	Kullberg.....	7486
-9.2	-8.6	-8.0	-7.8	-7.5	-8.4	-7.1	-2.5	-2.7	-2.0	-4.3	-1.2	-2.5	-4.8	-2.1	Lilley & Son.....	1589
-15.5	-16.1	-15.0	-15.4	-14.8	-15.3	-14.1	-8.1	-10.1	-7.6	-12.9	-7.1	-6.9	-16.4	-14.9	Agreey.....	1948
-6.5	-6.8	-5.7	-4.8	-5.7	-6.2	-5.1	-0.9	-6.2	-1.1	-2.4	-5.7	-3.8	-2.1	-1.8	Kullberg.....	7547
+8.7	+10.6	+12.0	+11.5	+12.0	+13.9	+12.1	+12.0	+16.8	+12.8	+12.2	+19.1	+15.3	+5.8	+5.9	E. Dent & Co.....	51648
+6.7	+5.9	+3.4	+6.4	+9.1	+10.0	+8.7	+14.4	+11.7	+7.6	+7.5	+5.3	+8.4	+0.6	+1.2	Ollivant & Botford.....	31074
-19.1	-20.0	-26.5	-25.0	-30.9	-30.1	-30.2	-26.6	-31.4	-23.5	-29.6	-25.2	-26.7	-25.7	-21.6	A. W. Webb.....	5680
-5.0	-6.0	-7.0	-6.8	-7.2	-7.0	-7.0	-0.1	+3.2	+1.4	-7.5	+6.2	+6.3	-10.6	-5.1	E. Dent & Co.....	53887
+6.0	+6.3	+4.5	+4.6	+8.4	+4.9	+4.8	+3.3	+11.3	+9.7	+1.6	+13.2	+18.0	+3.8	+7.2	Johannsen.....	5604
-2.0	-1.8	+1.9	-0.3	+1.2	+1.8	+1.3	+5.8	+2.4	+7.6	+5.1	+7.6	+7.4	+5.9	+9.1	E. Dent & Co.....	53854
+11.9	+12.1	+4.9	+8.0	+7.8	+5.4	+8.0	+7.2	+6.1	+3.1	+2.8	+6.5	+5.5	-0.9	-0.1	Johannsen.....	5822
+4.2	+3.8	+6.6	+3.9	+5.4	+4.8	+4.3	+23.1	+18.4	+15.2	+11.7	+18.4	+18.3	+9.4	+9.0	M. F. Dent.....	32569
+10.1	+10.0	+11.6	+9.9	+10.6	+11.3	+9.7	+24.6	+21.3	+21.9	+17.9	+22.1	+32.7	+17.9	+19.1	Gardner.....	54381
+8.7	+8.2	+9.5	+10.0	+11.0	+11.7	+11.1	+13.2	+9.5	+13.2	+10.7	+15.3	+19.0	+8.3	+11.7	E. Dent & Co.....	53861
+1.7	-0.1	-3.9	-4.4	-6.0	-5.8	-6.1	+14.1	+7.2	+4.1	-2.6	+10.3	+13.8	+0.2	+3.2	S. Smith & Sons.....	7398
+4.4	+7.7	+11.7	+8.3	+14.9	+14.5	+10.9	+17.1	+6.4	+24.7	+10.9	+8.6	+9.0	+12.3	+20.2	Johannsen.....	7296
-7.4	-8.9	-11.7	-9.8	-11.7	-12.4	-11.1	+3.2	0.0	-6.7	+1.3	+4.6	-0.6	+5.4	Kullberg.....	7329	
+8.0	+7.7	+9.2	+7.8	+9.1	+7.1	+7.2	+30.2	+18.9	+24.0	+12.2	+15.6	+16.8	+18.3	+27.9	Usher & Cole.....	1566
+12.0	+12.2	+30.0	+18.1	+22.7	+25.8	+20.1	+32.7	+31.4	+23.0	+22.9	+28.8	+31.8	+19.3	+19.7	A. W. Webb.....	5685
+1.6	+0.8	+14.4	+0.6	+9.6	+10.2	+2.3	+40.4	+30.2	+22.1	+17.7	+2.2	+32.4	+16.8	+17.7	Lindqvist.....	111
-655.1	-731.0	-828.1	-833.0	-1039.0	-1108.5	-1190.0	-1474.0	-1509.0	-2411.5	-2418.0	-3099.7	-3121.9	-2487.3	-3521.8	Chronometrical Thermometer.....	
66.9	67.6	68.2	68.6	70.9	71.2	71.8	74.6	75.1	85.9	86.8	94.3	92.1	97.9	96.6	Mean Weekly Temperature.....	
60.6-69.7	65.9-70.2	68.8-70.7	67.7-70.2	69.0-73.9	69.1-73.6	67.7-71.3	69.7-78.1	68.8-74.2	82.2-89.3	83.4-93.6	84.3-93.4	84.3-93.4	85.2-93.0	102.3-107.8	Extremes of Temperature as shown by the Self- Registering Thermo- meters.....	
The Chronometers are placed in order of merit, their respective positions being determined by consideration of the irregularities of rate exhibited in Table III.																
Only those Chronometers have been included in this list for which <i>b</i> did not exceed 12 seconds.																

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

Only those Chronometers have been included in this list for which it did not exceed 12 seconds.

NAME OF MAKER.	No.	Weather for 24 Days.	ADDRESS OF MAKER.	Construction of Escapement, Balance, and Spring, from the Description furnished by the Maker.	(III.) ABSTRACT OF	
					Least Weekly Sum.	Extremes of Temperature.
Kullberg.....	7583	2	105, Liverpool Road, London, N.	Reversed detent, Kullberg's auxiliary balance; palladium spring.	- 13-5	80-8 - 98-2
Johannsen.....	5648	2	149, Minorities, London, E.	Auxiliary compensation acting in heat; palladium spring.	- 1-2	65-0 - 68-7
Johannsen.....	5870	2	149, Minorities, London, E.	Auxiliary compensation acting in heat; palladium spring.	- 0-8	48-0 - 52-0
Lilley & Son.....	1590	2	10, London St., Fenchurch St., London, E.C.	Auxiliary acting in heat; palladium spring.	- 11-2	89-0 - 102-6
M. F. Dent.....	32122	2	33, Cockspur St., London, S.W.	Auxiliary to balance acting in heat; palladium spring.	- 6-1	44-2 - 53-4
Kullberg.....	7537	2	105, Liverpool Road, London, N.	Reversed detent, Kullberg's auxiliary balance; palladium spring.	+ 1-3	65-0 - 68-7
Kullberg.....	7486	2	105, Liverpool Road, London, N.	Reversed detent, Kullberg's auxiliary balance; palladium spring.	- 16-3	49-7 - 54-6
Lilley & Son.....	1589	2	10, London Street, Fenchurch Street, E.C.	Auxiliary acting in heat; palladium spring.	- 10-1	44-2 - 53-4
Asprey.....	1943	2	115, 116, New Bond Street, London, W.	Plain balance; bright steel spring.	- 16-4	89-0 - 102-6
Kullberg.....	7547	2	105, Liverpool Road, London, N.	Reversed detent, Kullberg's auxiliary balance; palladium spring.	- 13-6	44-2 - 53-4
E. Dent & Co.....	51648	2	61, Strand, London, W.C.	Dent's balance; palladium spring.	+ 4-7	46-2 - 50-5
Ollivant & Botsford.....	31074	2	12 & 14, St Ann Street, Manchester.	Auxiliary to balance acting in cold; steel spring.	+ 0-6	89-0 - 102-6
A. W. Webb.....	5690	2	33, Anwell Street, London, E.C.	Auxiliary compensation; steel spring.	- 37-5	49-7 - 54-6
E. Dent & Co.....	53897	2	61, Strand, London, W.C.	Palladium spring.	- 10-6	89-0 - 102-6
Johannsen.....	5604	2	149, Minorities, London, E.	Auxiliary compensation acting in heat; palladium spring.	+ 1-6	83-4 - 98-6
E. Dent & Co.....	53854	2	61, Strand, London, W.C.	Palladium spring.	- 4-1	46-2 - 50-5
Johannsen.....	5822	2	149, Minorities, London, E.	Auxiliary compensation acting in heat; palladium spring.	- 6-4	49-7 - 54-6
M. F. Dent.....	32569	2	33, Cockspur Street, London, S.W.	Auxiliary to balance acting in heat; palladium spring.	+ 3-8	65-9 - 70-2
Gardner.....	54361	2	30, Lloyd's Square, London, W.O.	Auxiliary compensation; palladium spring.	+ 8-7	49-7 - 54-6
E. Dent & Co.....	53861	2	61, Strand, London, W.C.	Steel spring.	+ 5-6	49-7 - 54-6
S. Smith & Sons.....	7398	2	9, Strand, London, W.C.	Auxiliary acting in cold; steel spring.	- 6-1	70-1 - 73-8
Johannsen.....	5786	2	149, Minorities, London, E.	Auxiliary compensation acting in heat; palladium spring.	- 0-8	55-7 - 58-9
Kullberg.....	7329	2	105, Liverpool Road, London, N.	Reversed detent, Kullberg's auxiliary balance; palladium spring.	- 12-4	69-1 - 73-8
Usher & Cole.....	1856	2	339, St John Street, London, E.C.	Auxiliary to balance acting in cold; palladium spring.	+ 7-1	69-1 - 73-8
A. W. Webb.....	5685	2	33, Anwell Street, London, E.C.	Auxiliary compensation; steel spring.	+ 12-0	65-0 - 68-7
Lindqvist.....	111	2	13, Alderney Street, Fimlico, W.	Reverse detent, nickel steel balance; bright steel spring.	+ 0-6	67-7 - 70-2

The sign + indicates that the rate is gaining.

THE PRINCIPAL CHANGES OF RATE DURING THE 29 WEEKS.

Mean Temperature.	Greatest Weekly Sum.	Extremes of Temperature.	Mean Temperature.	Difference between the Greatest and Least.	Greatest Difference between one Week and the next.	Mean Temperatures for three two Weeks.	Trial No. a + 29.	NAME OF MAKER.	No.
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)		
92-1	- 4-9	83-6 - 70-7	68-2	8-6	4-6	68-2 - 88-8	17-8	Kullberg.....	7583
66-9	+ 10-9	46-2 - 50-5	48-7	12-1	3-4	92-1 - 74-6	18-9	Johannsen.....	5648
50-4	+ 10-6	69-7 - 78-1	74-6	11-4	4-1	68-2 - 98-9	19-6	Johannsen.....	5870
97-9	+ 1-0	46-2 - 50-5	48-7	12-2	3-9	51-2 - 68-1	20-0	Lilley & Son.....	1590
49-9	+ 5-2	63-5 - 68-6	66-1	11-8	5-2	92-1 - 74-6	21-7	M. F. Dent.....	32122
66-9	+ 11-0	92-8 - 103-7	98-6	9-7	6-1	54-1 - 75-1	21-9	Kullberg.....	7537
51-2	- 5-0	89-0 - 102-6	97-9	11-3	5-6	54-1 - 75-1	22-5	Kullberg.....	7486
49-9	- 1-2	88-4 - 98-4	94-3	8-9	6-8	54-1 - 75-1	23-5	Lilley & Son.....	1589
97-9	- 6-9	80-8 - 98-2	92-1	9-5	7-3	98-6 - 85-9	24-1	Asprey.....	1943
49-9	- 0-9	69-1 - 78-1	74-6	12-7	7-8	74-6 - 48-7	28-3	Kullberg.....	7547
48-7	+ 19-1	88-4 - 98-4	94-3	14-4	7-3	74-6 - 48-7	29-0	E. Dent & Co.....	51648
97-9	+ 14-4	69-7 - 78-1	74-6	13-8	9-1	48-7 - 53-4	30-0	Ollivant & Botsford.....	31074
51-2	- 18-8	55-3 - 58-6	57-3	18-7	6-8	74-6 - 48-7	32-8	A. W. Webb.....	5690
97-9	+ 7-8	50-0 - 52-9	51-3	18-4	7-0	92-1 - 74-6	32-4	E. Dent & Co.....	53897
86-8	+ 23-5	46-2 - 50-5	48-7	21-9	5-4	54-1 - 75-1	32-7	Johannsen.....	5604
48-7	+ 9-1	92-8 - 103-7	98-6	13-2	9-9	74-6 - 48-7	33-0	E. Dent & Co.....	53854
51-2	+ 12-1	65-9 - 70-2	67-6	18-5	7-4	48-7 - 53-4	33-8	Johannsen.....	5822
67-6	+ 23-1	69-7 - 78-1	74-6	19-3	7-2	74-6 - 48-7	33-7	M. F. Dent.....	32569
51-2	+ 24-6	69-7 - 78-1	74-6	15-9	9-5	48-7 - 53-4	34-9	Gardner.....	54361
51-2	+ 19-0	80-8 - 98-2	92-1	13-4	11-5	74-6 - 48-7	35-4	E. Dent & Co.....	53861
71-8	+ 18-9	49-0 - 54-0	52-4	25-0	6-5	54-1 - 75-1	38-0	S. Smith & Sons.....	7398
57-5	+ 24-7	82-2 - 89-3	85-9	25-5	8-1	92-1 - 74-6	41-7	Johannsen.....	5786
71-2	+ 8-6	82-2 - 89-3	85-9	21-0	11-9	54-1 - 75-1	44-8	Kullberg.....	7329
71-2	+ 30-2	69-7 - 78-1	74-6	23-1	11-6	92-1 - 74-6	46-3	Usher & Cole.....	1856
66-9	+ 51-9	44-2 - 53-4	49-9	39-9	7-8	54-1 - 75-1	50-5	A. W. Webb.....	5685
68-6	+ 41-0	46-2 - 50-5	48-7	40-4	8-5	48-7 - 53-4	57-4	Lindqvist.....	111

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 Trial No. a + 29 is taken as a measure of the irregularities of rate.

Only those Chronometers have been included in this list for which δ did not exceed 12 seconds.

(1) WEEKLY RATES IN ORDER OF TIME.

(1) WEEKLY RATES IN ORDER OF TIME.																								
Order of Merit.	June 17-24	June 24 to July 1	July 1-8	July 8-15	July 15-22	July 22-29	July 29 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	Sept. 24-30	Sept. 30 to Oct. 7	Oct. 7-14	Oct. 14-21	Oct. 21-28	Oct. 28 to Nov. 4	Nov. 4-11	Nov. 11-18	Nov. 18-25	
	Pocket Chronometer Horizontal. Dial up.																				Chron. Vertical, Pendulum up.	Chron. Vertical, Pendulum up.	Chron. Vertical, Pendulum up.	Chron. Vertical, Pendulum up.
1	-126	-164	-177	-204	-180	-189	-175	-254	-331	-317	-243	-300	-310	-310	-338	-311	-333	-287	-350	-406	-387	-390	-387	
2	82	71	61	85	82	91	82	-176	-238	-232	-112	-114	-119	-103	-79	-37	-101	-66	-76	-103	-114	-100	-107	
3	-146	-118	-102	80	80	98	67	-132	-144	89	+12	+40	+68	+30	+89	+41	+24	+03	+78	+117	+119	+129	+102	
4	+140	+177	+193	+308	+250	+284	+319	+294	+230	+331	+504	+551	+539	+556	+554	+547	+544	+531	+535	+667	+497	+639	+732	
5	-179	-345	-424	-333	-241	-308	-279	-291	-331	-339	-302	-385	-403	-411	-409	-400	-451	-364	-374	-583	-534	-579	-592	
6	-103	-112	97	-126	-105	-125	89	-172	-276	-544	-330	66	65	64	-103	93	-104	83	-249	-128	-119	-110	-119	
7	23	-10	+01	+35	+109	+79	+111	+283	+307	+330	+301	+130	+142	+56	-119	-120	-160	-114	-158	+138	+124	23	+179	
8	+93	+199	+63	+37	91	68	60	-167	-238	-126	+87	+218	+13	07	+13	33	-109	-172	-120	+597	+604	+1191	+795	
9	+108	+99	+40	+06	86	+13	+77	+305	+325	+190	+238	+75	+190	+236	+188	+111	+11	23	+25	46	52	161	159	
10	60	81	69	89	+17	33	+13	+10	+78	+117	+179	-229	66	+27	08	+164	+80	-214	-303	+492	+306	+420	+439	
11	+193	+90	+91	+98	+101	+67	01	+338	+390	+354	+233	-113	-187	-161	-309	-216	-305	-218	+113	86	40	42	54	
12	98	97	-172	-281	-420	-314	-260	-669	-403	-518	-461	-147	-328	-225	-10	-165	+03	-198	-609	-268	-230	259	-327	
13	+292	+452	+484	+241	+198	+90	+192	-105	-236	-230	75	+566	+319	+309	+506	+323	+464	+333	+259	-287	179	208	-112	
14	+110	+114	+42	+83	+126	+105	+181	+324	+283	+241	+380	+280	+53	+148	+31	+05	-49	+34	+270	+140	+187	+70	+65	
	659	676	686	718	709	712	682	868	979	986	859	861	627	610	550	573	575	541	862	812		810		
	650	659	677	701	690	691	636	834	890	928	822	686	604	605	577	593	557	520	722	720		764		
	687	702	702	738	738	738	707	936	1026	1037	893	686	649	615	604	586	589	572	831	840		839		

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

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

During the periods Aug. 5 to Sept. 2 and Oct. 21 to Nov. 18, the Pocket 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.

(2) ABSTRACT OF PRINCIPAL CHANGES OF RATE.

(3) ABSTRACT OF PRINCIPAL CHANGES OF RATE.																	
Nov. 11-18	Nov. 18-25	Nov. 25 to Dec. 2	Dec. 2-9	Dec. 9-16	Dec. 16-23	Dec. 23-30	Dec. 30 to Jan. 6	Pocket Chronometer, Horizontal. Dial up.	Difference between present and former rate, Dial up.	Difference between present and former rate, one week and the next week, Dial up.	Difference of Weekly Rates.	Total Number.	NAME OF MAKER.	No.	ADDRESS OF MAKER.		
																Predicted rate, Dial up.	Predicted rate, Dial up.
a.	b.	c.	d.	e.						a.	b.	c.	d.	e.			
-34 6	-38 0	-32 9	-37 9	-36 0	-37 4	-	-34 0	-30 7	25 9	8 6	-4 9	-3 9	-4 2	46 4	Newsome & Co.,	16707 The Butts, Coventry.	
-11 9	-6 9	-10 1	-7 8	-0 8	-3 8	-4 8	-	-	23 6	12 0	-0 7	-1 6	-0 2	48 2	Kullberg.....	7429 105 Liverpool Road, London, N.	
+ 7 1	+28 9	+21 1	+20 0	+ 8 0	- 8 6	- 7 2	+ 7 7	-	4 14	22 7	+3 3	+4 4	+ 5 4	98 2	Kullberg.....	7429 105 Liverpool Road, London, N.	
+28 9	+0 0	+25 2	+5 5	+5 7	+5 6	+ 5 7	+0 6	-	54 9	17 3	-8 8	-11 4	- 2 7	96 3	Lindqvist.....	110 13 Alderney Street, Fimlico, W.	
-29 0	-31 0	-55 0	-49 9	-51 9	-42 6	-39 7	-38 9	-	37 1	24 0	-25 7	-20 2	- 24 7	105 5	Newsome & Co.,	150708 The Butts, Coventry.	
-19 1	-4 2	-11 2	-9 9	-13 9	-8 5	- 7 7	- 8 0	-	50 2	26 8	+ 9 6	+10 1	+11 0	112 1	J. Player & Son.	38498 Butts Lane, Coventry.	
+25 5	-16 9	-31 1	-38 2	-37 5	-34 5	-38 5	-33 8	-	71 5	42 4	+11 0	+ 7 6	- 7 2	104 3	Lindqvist.....	109 13 Alderney Street, Fimlico, W.	
+ 29	-20 0	-16 6	-21 8	-30 9	-13 7	-23 0	-26 0	-	52 7	22 9	+74 2	+6 0	+117 7	106 1	Chandler.....	57076 4 Victoria Terrace, Leamington.	
+29 5	-12 3	-21 6	-19 2	-30 3	-26 1	-26 7	-29 7	-	67 8	41 8	-26 3	-21 2	-32 1	178 5	Thorneloe.....	57048 13-17 Stanton Street, Coventry.	
-19 5	-41 6	-43 9	-44 6	-43 9	-35 5	-34 4	-26 8	-	62 5	40 6	+71 5	+55 5	+ 66 9	200 3	L. Hall.....	1738 17 Mercer Row, Louth, Lincolnshire.	
+ 69	-40 0	-49 5	-60 9	-58 5	-69 8	-62	-42	-	103 2	49 9	-16 1	-13 1	- 13 3	215 5	J. Player & Son.	38499 Butts Lane, Coventry.	
-69 0	+ 0 4	+11 0	+21 2	+ 2 4	+ 5 6	+ 1 5	+ 3 8	-	50 2	69 4	+35 5	+37 0	+ 39 1	269 6	M. F. Dent.....	32586 33 Cockspur Street, London, S.W.	
+68	+38 9	+50 2	+47 4	+40 3	+39 6	+31 4	+24 2	-	89 4	64 1	-64 9	-62 2	- 65 7	273 4	M. F. Dent.....	32585 33 Cockspur Street, London, S.W.	
+31 6	-39 7	-43 5	-56 6	-102 4	-180 1	-219 0	-36 2	-	20 7	123 8	-19 1	-10 7	- 22 4	519 7	Yeomans.....	38330 48 Spon Street, Coventry.	
75 4	45 7	52 4	52 2	51 2	51 3	56 4	49 9		Mean Weekly Temperature.								
72 8	46 0	49 0	47 4	49 7	50 0	48 0	44 2		{ Extreme of Temperature as shown by the Self-Registering Thermometers.								The sign + indicates a gaining rate.
81 6	50 5	54 0	55 5	54 6	52 9	52 0	53 4										