Radiation Compensated Thermometer--RCT

U.S. Patent 9063003B2

Canadian Patent 2815909

These are new ways of measuring outdoor air temperatures. The primary patent is directional and uses a blackbody as a receiver for air temperature. The Directional Radiant Heat Thermometer—DRHT—is a bolometric instrument and functions under clear to partly-cloudy skies. The DRHT constantly tracks the sun's transit across the sky. The blackbody receiver is constantly shaded and imparts a highly accurate outdoor temperature. The DRHT operates in the same range of daylight as a radiometer or pyranometer; it functions as a temperature reference instrument. The current design is between 8-9 feet high depending upon the angle of the sun. Tracking speed is roughly 1 degree per minute. Max/Min/Current temperature is measured by thermistor with readings made *in situ* every 30 minutes. *In situ* temperature readings are accurate because the distance between the sensor and microprocessor thermometer's circuit board is only 10 feet in length. Remote sensing from inside a room takes a longer cable between sensor and microprocessor thermometer, changing the electrical characteristics of the sensor, requiring recalibration. However, wireless temperature transmitters are also potentially very accurate because the sensor is directly connected to the circuit board of the transmitter.

The patented secondary RCT was designed to accommodate a wireless temperature transmitter. This design is omni-directional and fixed to a stationary mount. This RCT can also accommodate a hard wired temperature sensor for *In situ* readings. One prototype constructed in 2013 has been successful in both accuracy and protection from rain and snow for over 3 years with little maintenance.

The one outstanding characteristic both designs have: the temperature sensor is directly exposed to ambient air. Conventional radiation shields in current use encase the sensor inside plastic and require natural or artificially created airflow across the sensor. Conventional shields have only superficially changed in the last 45 years. Radiation error has been an unsolvable problem for outdoor air temperature measurements, until now.

There is a third design which is unpatented and is showing great promise. It is an all-metal plate radiation shield with a blackened thermowell. All 3 of these designs could be miniaturized. The patented designs are simple, basic designs and could be easily mass-produced.

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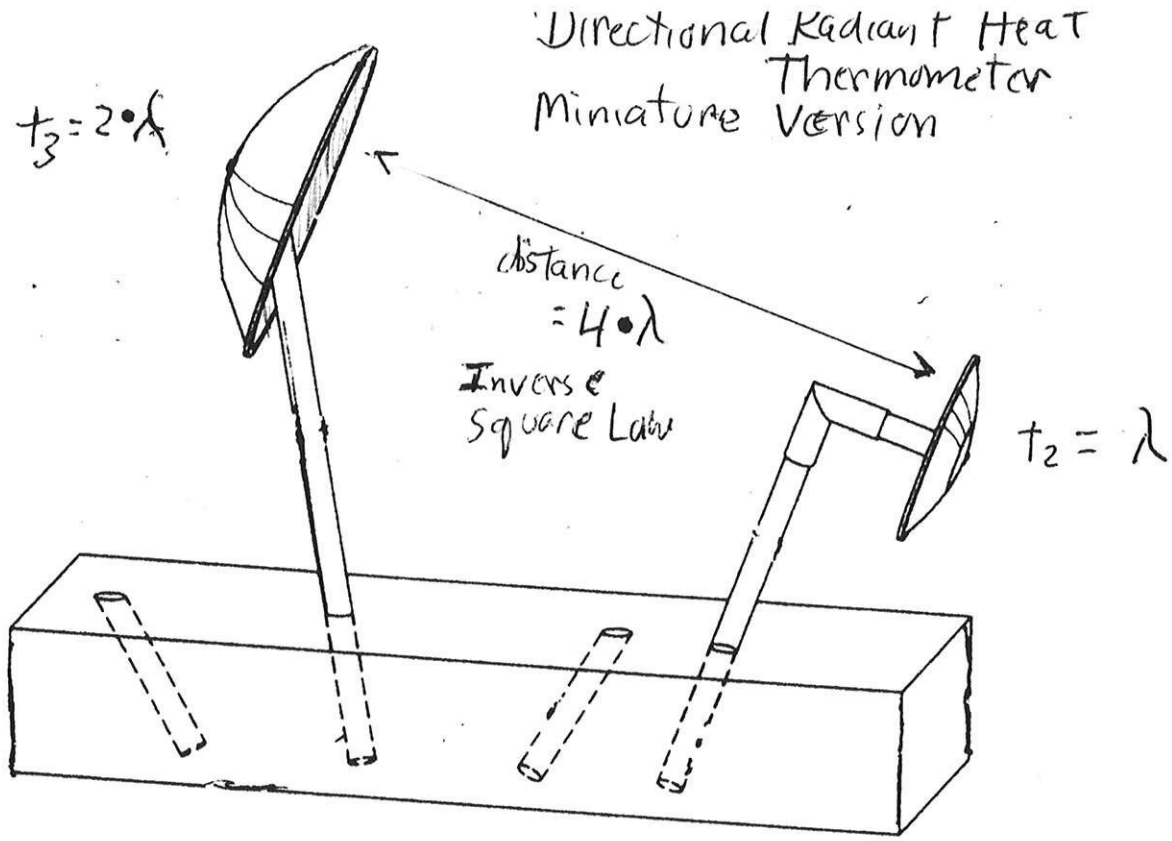
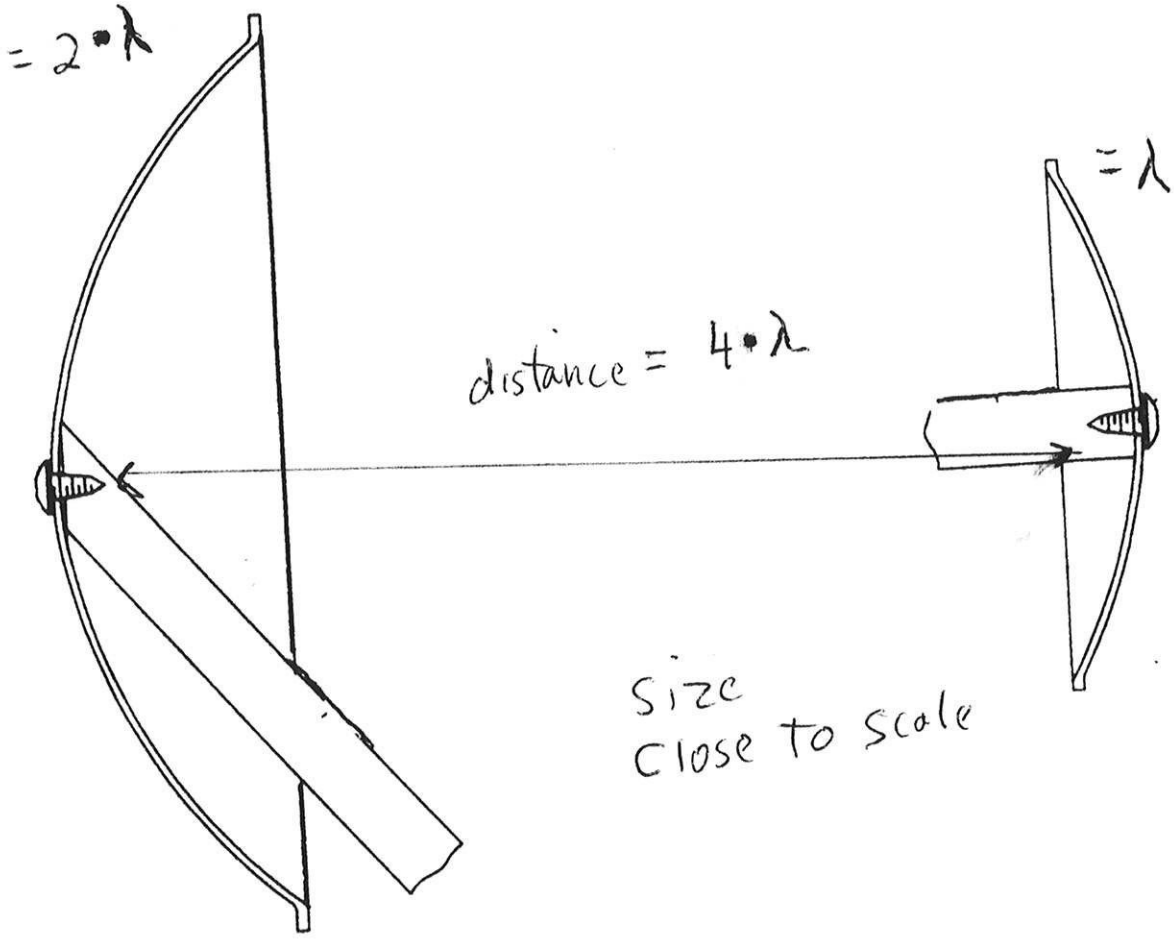
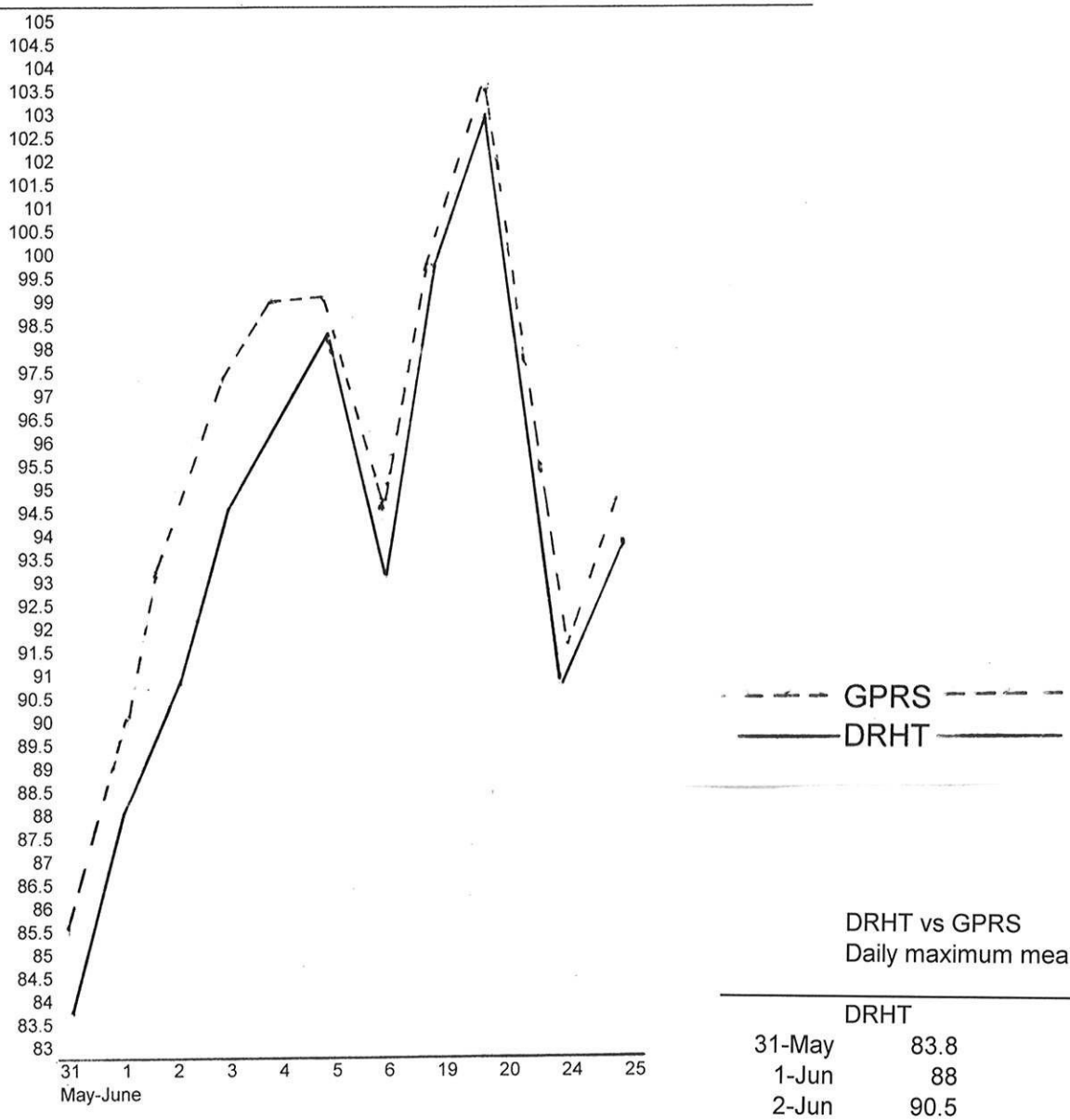

Directional Radiant Heat Thermometer
Miniature Version
$t_3 = 2 \cdot \lambda$
distance
$= 4 \cdot \lambda$
Inverse
Square Law
$t_2 = \lambda$

FIG. 4

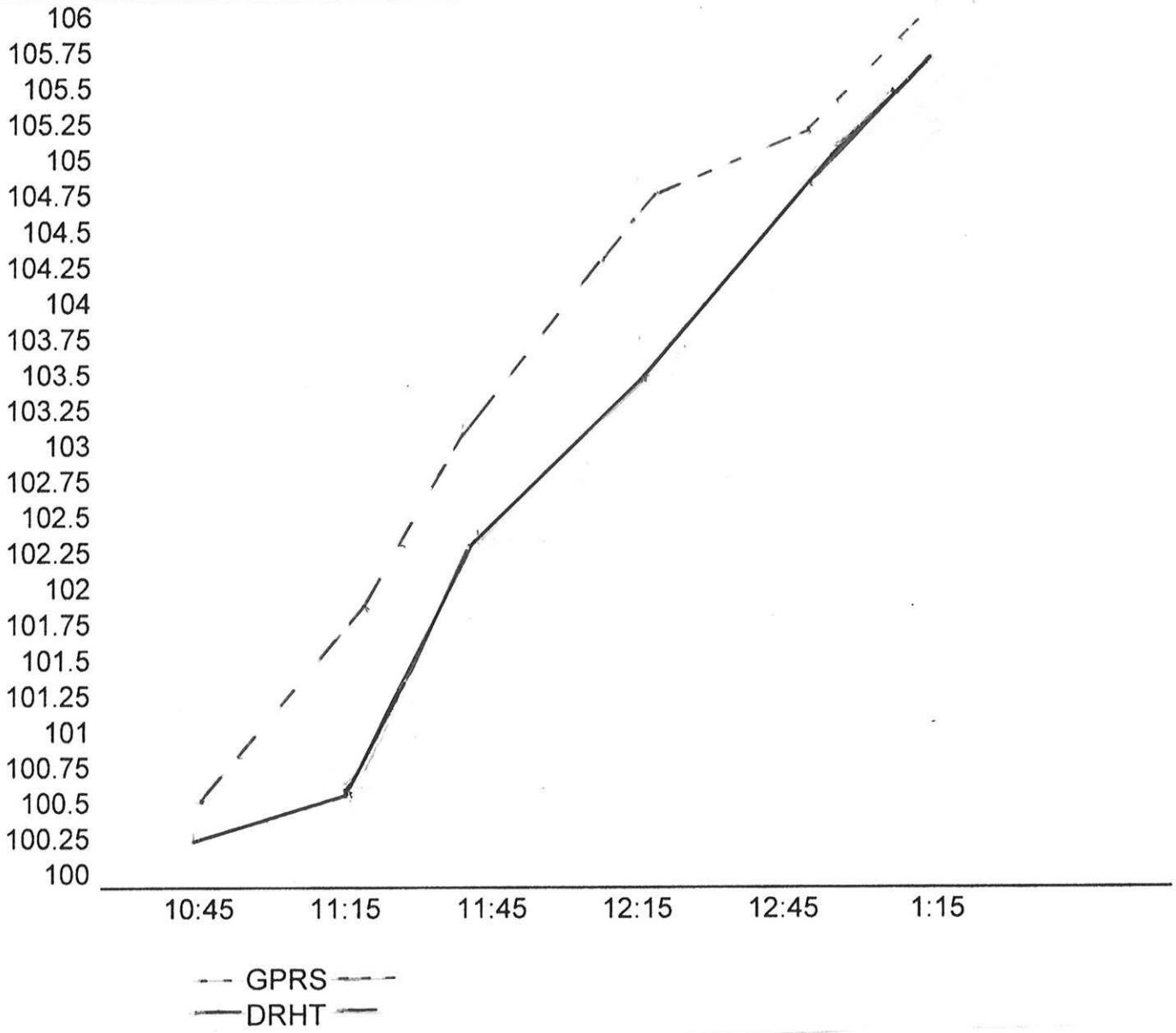

$= 2 \cdot \lambda$
$= \lambda$
distance $= 4 \cdot \lambda$
Size
Close to Scale



DRHT vs GPRS 2016
Daily maximum mean temperature

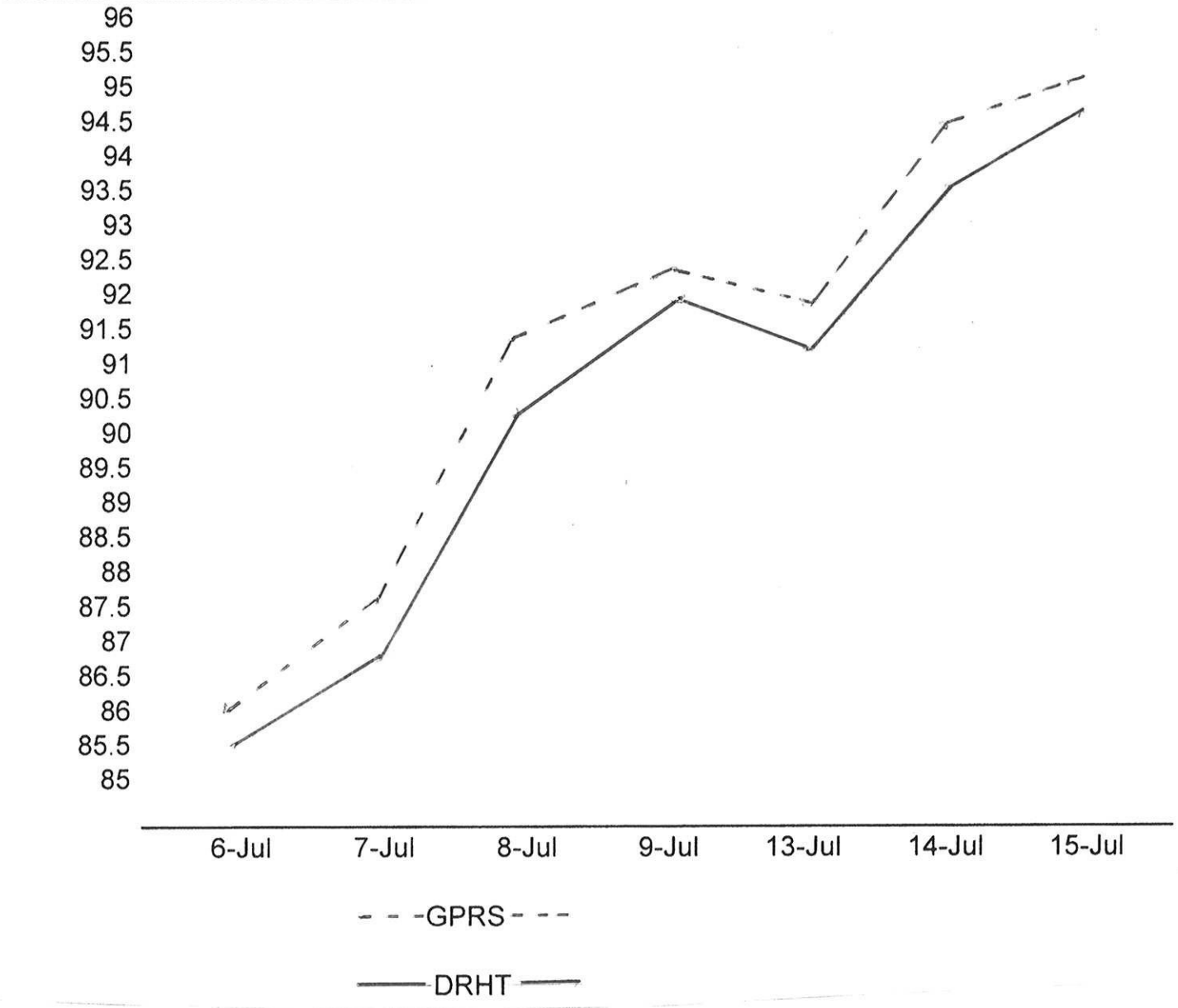
	DRHT	GPRS
31-May	83.8	85.5
1-Jun	88	90
2-Jun	90.5	93.1
3-Jun	94.6	97
4-Jun	96.6	99
5-Jun	98.2	99.2
6-Jun	93	94.4
19-Jun	99.6	100.2
20-Jun	102.8	103.5
24-Jun	90.8	91.5
25-Jun	93.6	94.7
Total	1031.5	1048.1
High X	93.8	95.3

20-Jun DRHT vs GPRS High Temperatures every 30 minutes Fahrenheit



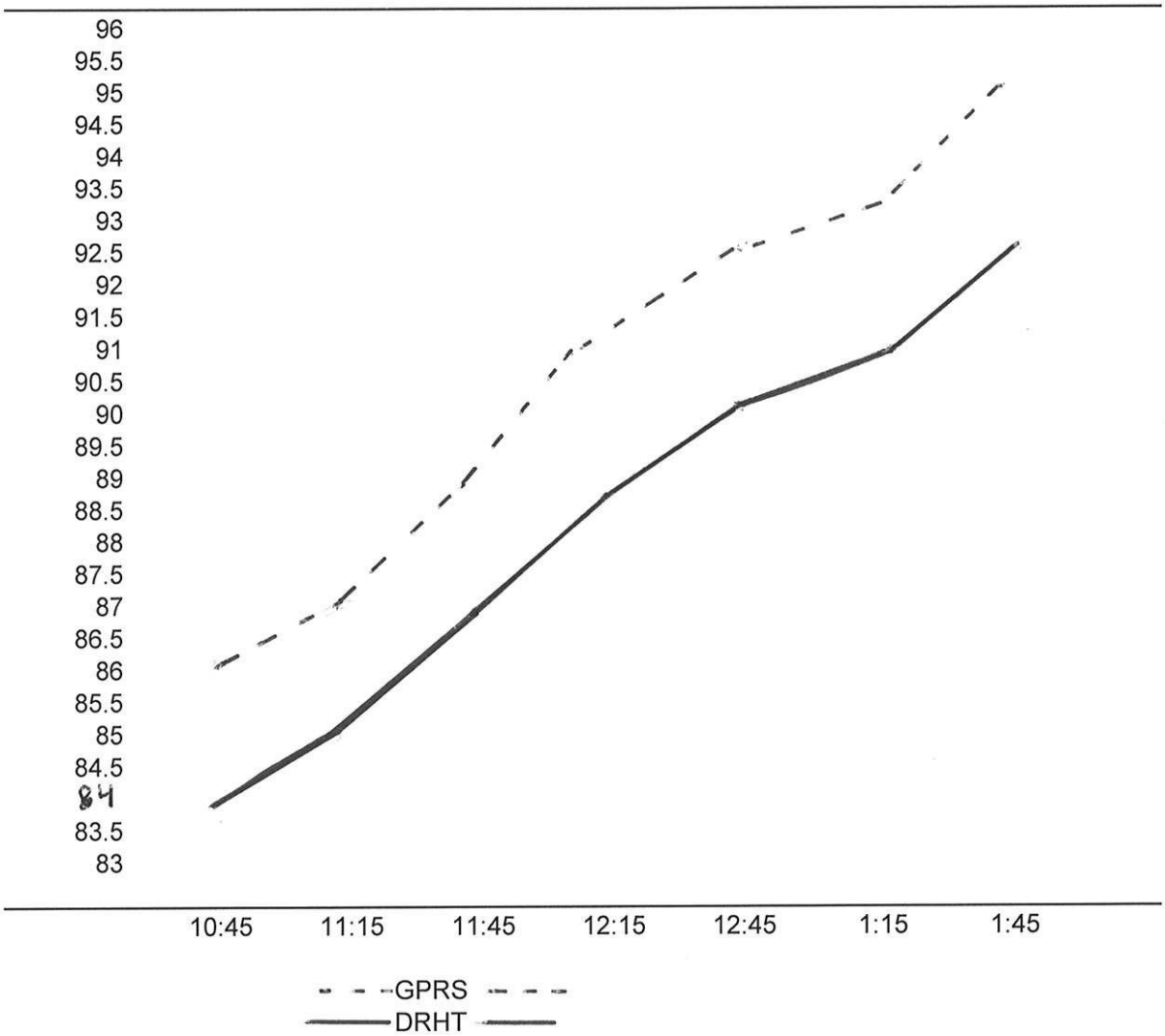
20-Jun						
10:45	100.2	98.4	98.7	100.5	99.3	99.8
	100.5	97.5	100.4	101.8	98.6	101.4
	102.3	98.9	99.1	103.1	99.3	99.3
	103.6	98.4	101.4	104.7	98.9	102.3
	104.9	101.6	102.9	105.2	101.4	103.2
	105.6	102.3	102.9	105.9	102.5	104.5
Total	617.1	597.1	605.4	621.2	600	610.5
x	102.8	99.5	100.9	103.5	100	101.7

July 2016 DRHT vs GPRS Daily High Mean Temperatures Fahrenheit

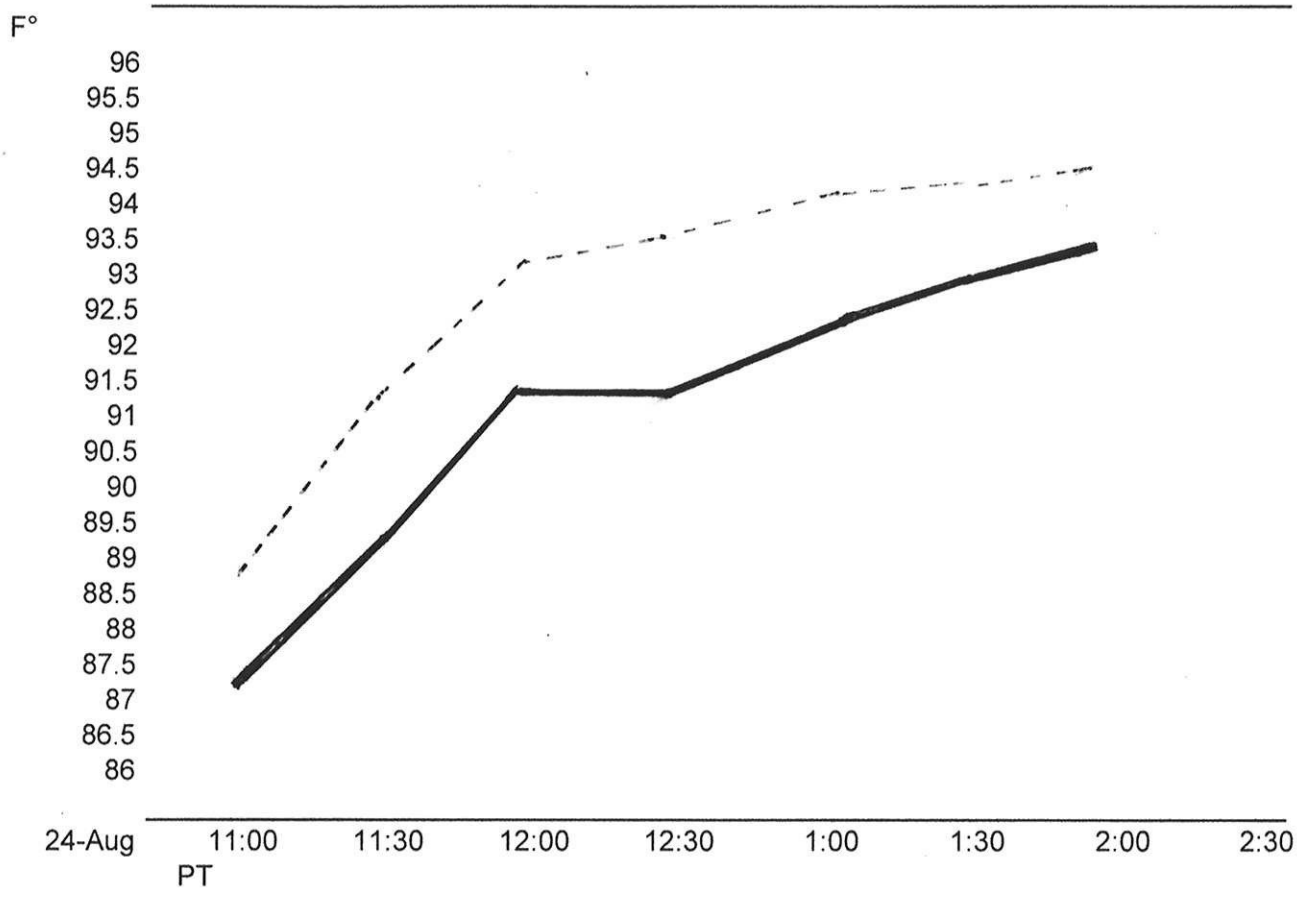


	$\bar{x}$ Max $\bar{x}$	$\bar{x}$ Max $\bar{x}$
6-Jul	85.5	86
7-Jul	86.9	87.6
8-Jul	90.4	91.4
9-Jul	92	92.3
13-Jul	91.4	92
14-Jul	93.7	94.2
15-Jul	94.4	94.8
Total	634.3	638.3
$\bar{x}$ Max $\bar{x}$ x	90.6	91.2

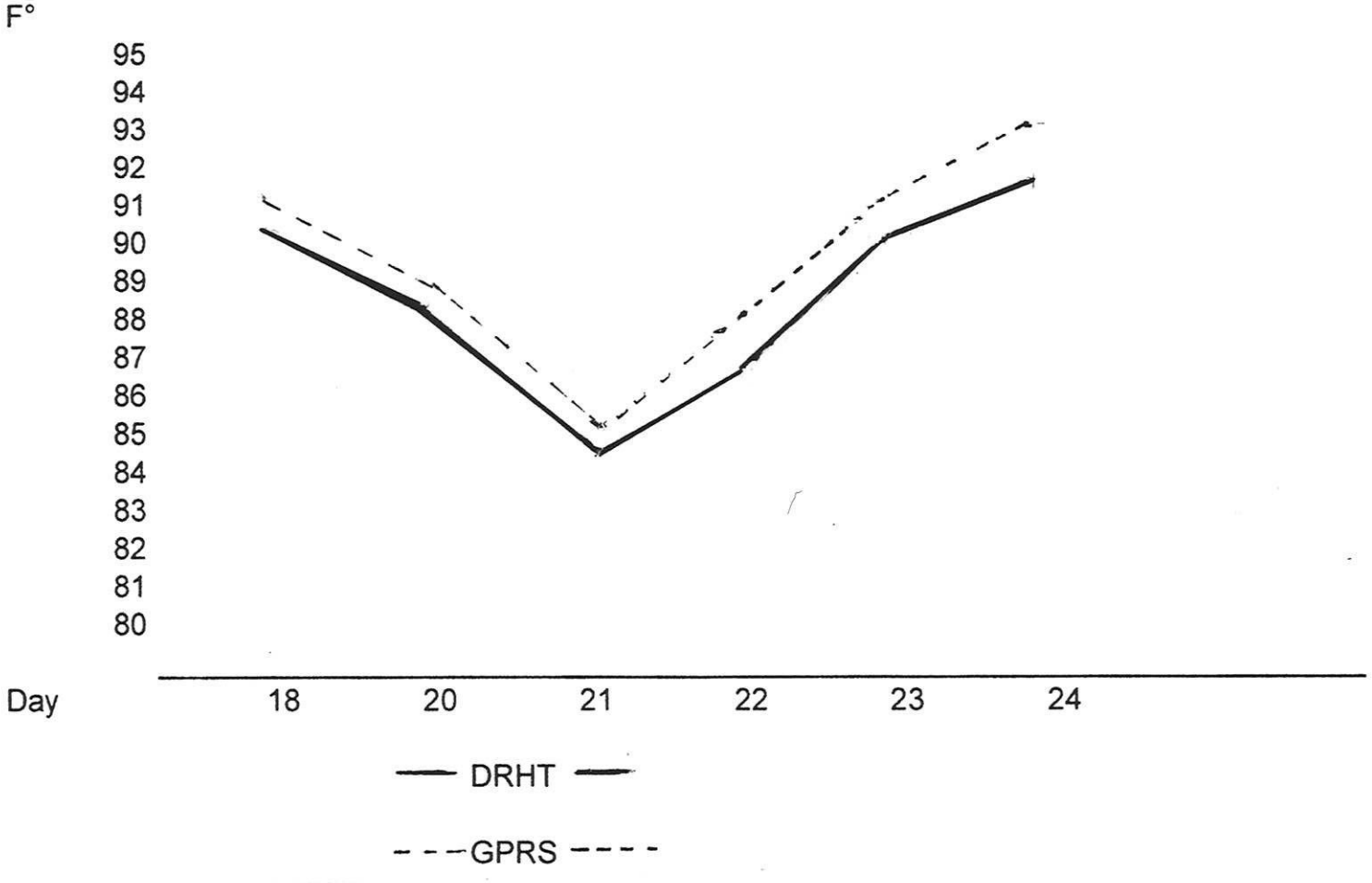
16-Aug DRHT vs GPRS High Temperature Every 30 minutes Fahrenheit



16-Aug	DRHT			GPRS		
	Max	Min	Current	Max	Min	Current
10:45	83.8	83.1	83.4	86.1	84.2	84.7
11:15	84.9	82.7	84.9	87	83.8	85.6
11:45	86.7	84.2	86	88.7	85.4	87.6
12:15	88.7	85.4	88.1	91	86.9	89.9
12:45	90.1	87.8	88.5	92.4	89.9	90.5
1:15	91	88.5	90.1	93.2	89.9	93
1:45	92.8	90.1	91.5	95	91	92.6
Total	618	601.8	612.5	633.4	611.1	623.9
$\bar{x}$ High	88.3	86	87.5	90.5	87.3	89.1

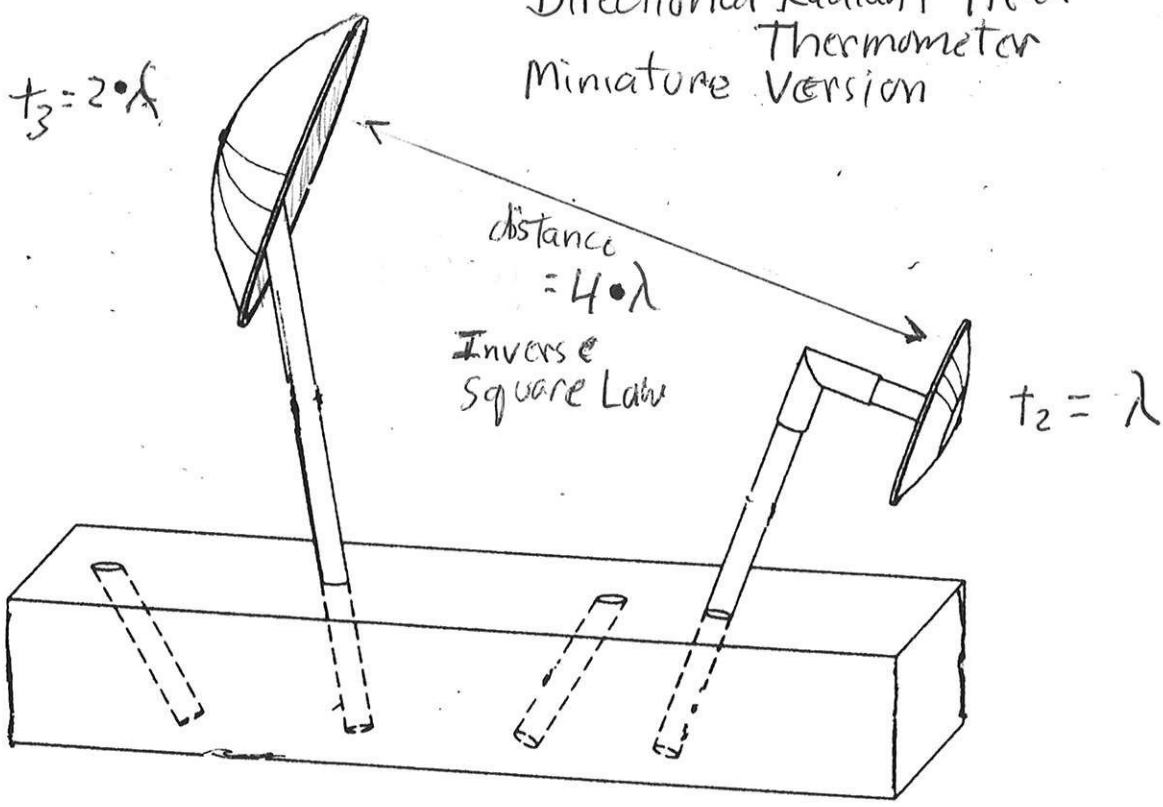


24							
11:00	87.2	83.8	87.2		88.8	88.8	88.8
	89.2	86.9	87.9		91.2	87.9	89.7
	91.5	86.7	90.3		93.2	87.6	91.2
	91.4	87.8	91		93.5	88.8	92.4
	92.6	89.7	90.5		94.1	91	92.3
	93	89.2	92.4		94.4	90.5	94.1
	93.3	89.4	91.7		94.6	90.1	92.4
Total	638.2	613.5	631		649.8	624.7	640.9
$\bar{x}$	91.2	87.6	90.1		93	89.2	92.8



August	Max	Min	Current	Max	Min	Current
18	90.3	88.1	89.6	91.3	88.6	90.3
20	88.2	85.8	87.5	88.9	85.8	88.2
21	84.7	82.3	83.2	85.3	82.8	83.9
22	86.8	83.8	85.5	88	85.1	87
23	90	84	87	91	85.6	88
24	91.2	87.6	90.1	93	89.2	92.8
Total $\bar{x}$	531.2	511.6	522.9	537.5	517.1	530.2
Mean $\bar{x}$	88.5	85.3	87.1	89.6	86.2	88.4


OAKTON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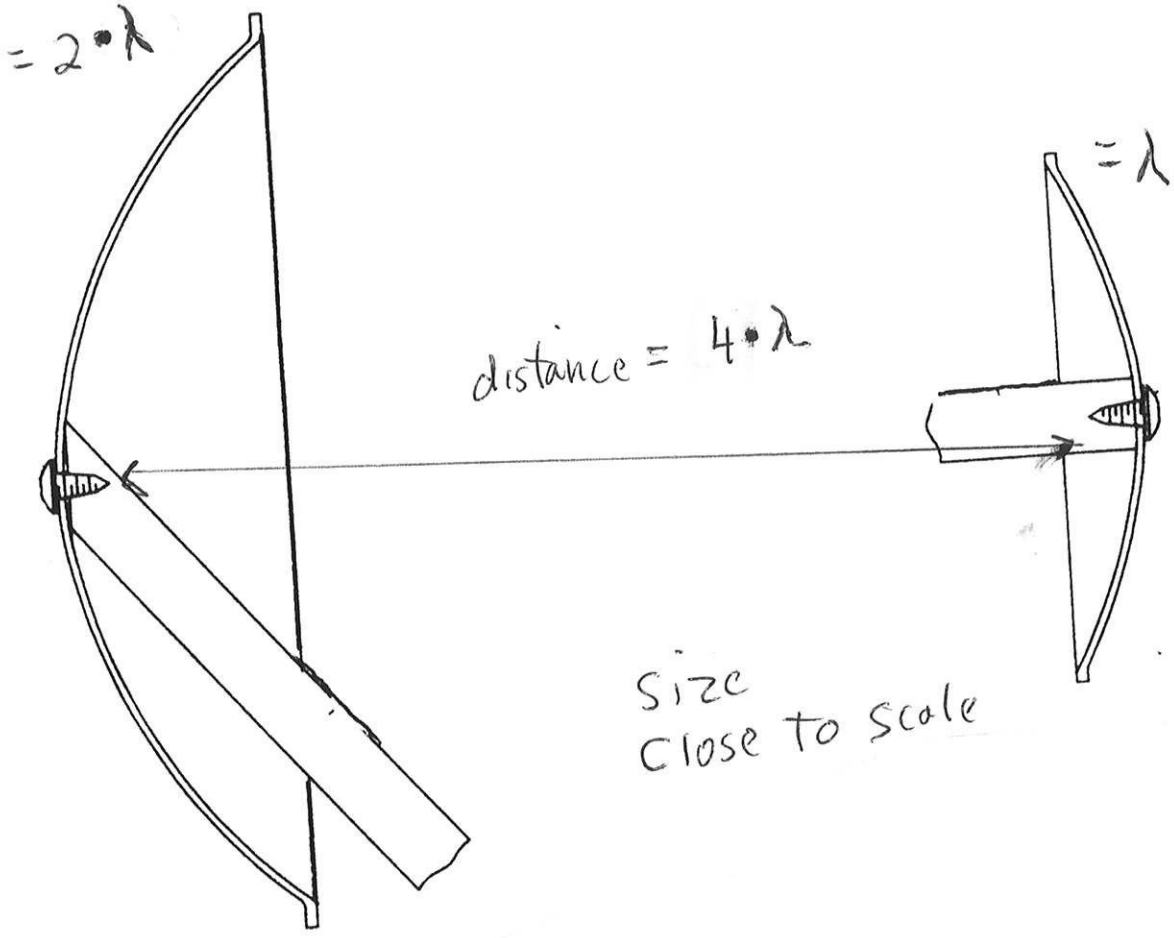
$= 2 \cdot \lambda$
$= \lambda$
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size
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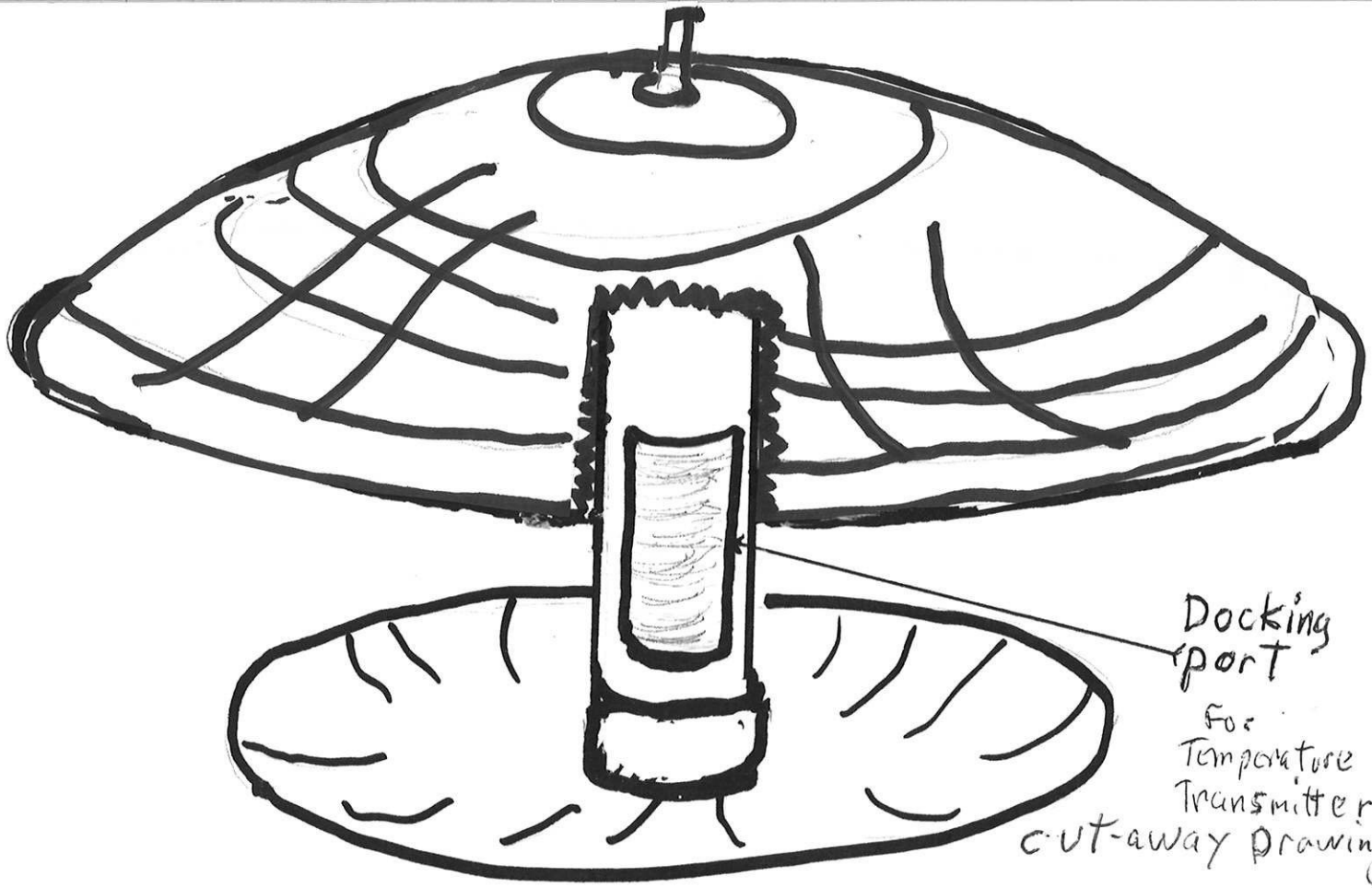
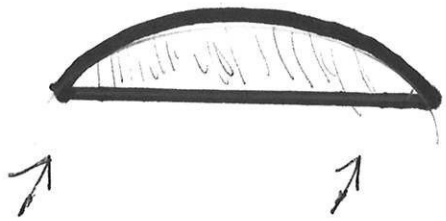
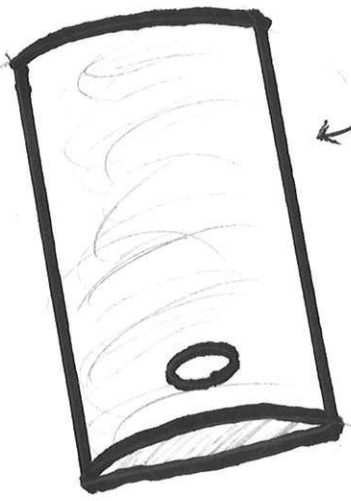


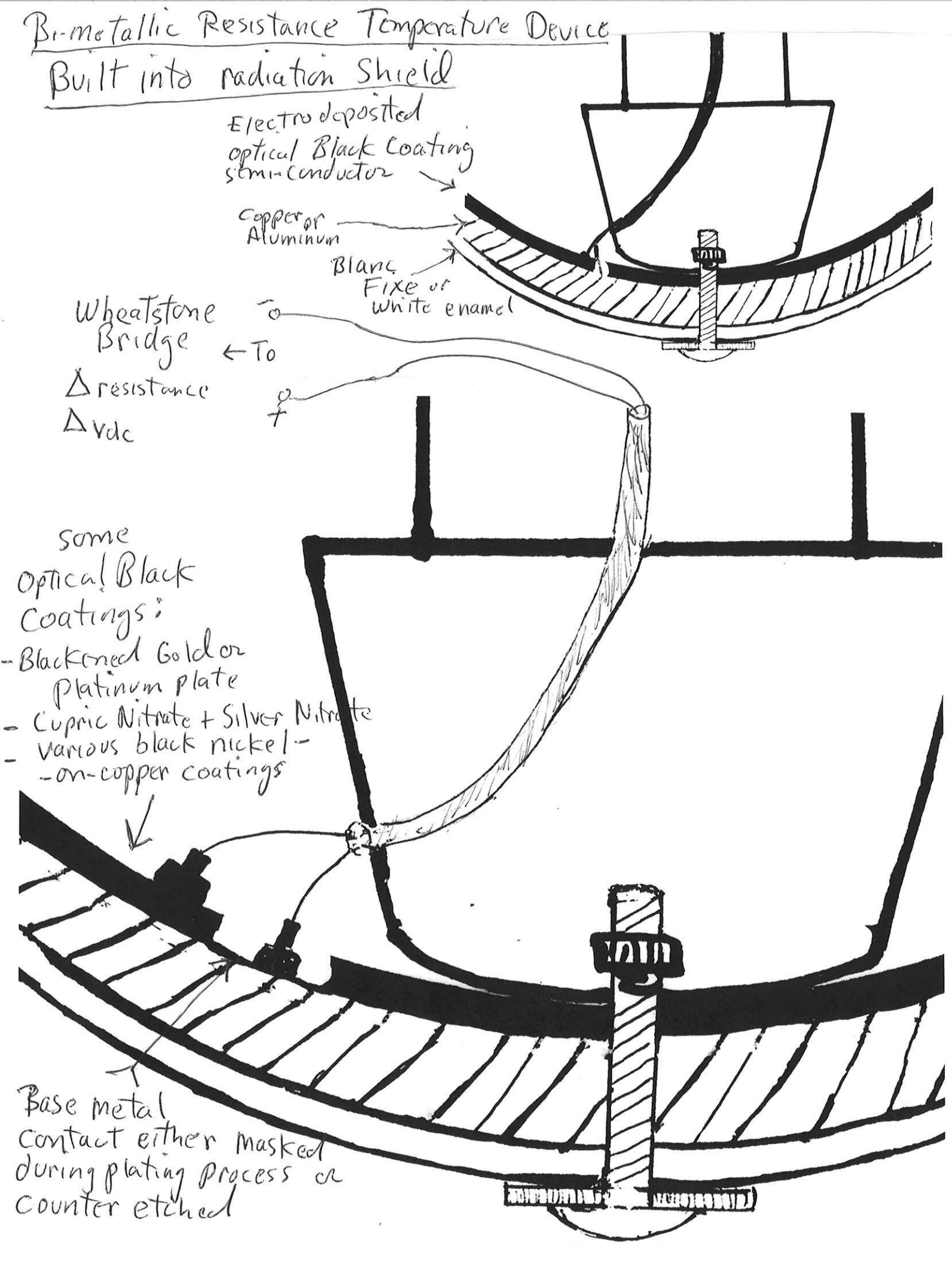
cut-away drawing





Temperature Transmitter

Bi-metallic Resistance Temperature Device
Built into radiation Shield



2 TYPES OF PHYSICAL SORPTION / BLACKBODY INTERACTION

Sorption type	*ABSORPTION*	*ADSORPTION*
State:	**endothermic Hot Light**	**exothermic Cold Light**
Indicator:	**color temperature**	**boundary layer**
Manifestation:	**emittance**	**emission**
Material:	**ceramic**	**metal**
Example:	**heat tiles**	**DRHT**

***Sorption*:(general term) process of absorption, adsorption; the taking up of one substance at the surface of another.** chemiosorption, persorption, desorption meniscus, thermowell, viscoelastic flow welling.

***Sorption Isotherm:* equilibrium of the sorption of a material (more general at a surface boundary) at constant temperature.**

***Adsorption:* the taking of one material at the surface of another.**

***Adsorption Isotherm:* the relationship between the amount of substance adsorbed and its pressure or concentration at a constant temperature.**

***Emit:* to give or send out matter or energy**

***Emissive:* having the power or tendency to emit matter or energy; to emit**

***Emissivity:* the ratio of the radiation emitted by a surface to the radiation emitted by a blackbody at the same temperature; the ratio of emissive power of a surface at a given temperature to that of a blackbody at the same temperature.**

A hot blackbody is the result of direct surface contact with heat (boiler brick, heat tiles). The "cold" blackbody of the DRHT is shaded and occludes both direct and horizontal irradiance. Albedo as well. It is, in fact, a reverse telescope; it deflects everything but ambient air temperature.

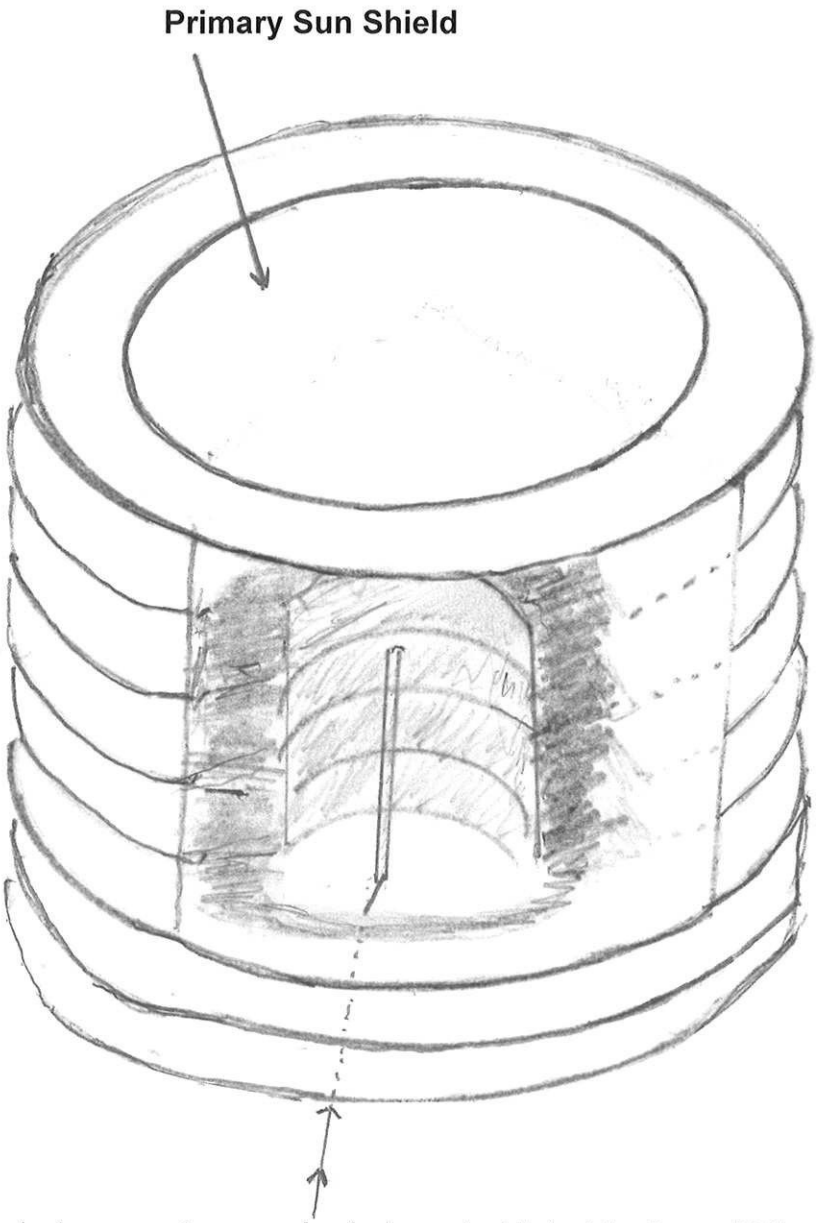
Both magnetism and adsorption have domains.

2013 HIGH OUTDOOR TEMPERATURE
Radiation Compensated Therm

Prescott, AZ el 5040
Plate Radiation Shields

June	House	12" Shop	GPRS	W.L.
1	96	92.4	93.3	91.5
2	93.4	93	94.6	96.1
3	94.4	93	92.8	92.2
4	92.4	91.5	91.9	92.2
5	97.3	96.2	95.5	93
6	101.4	99.1	99.6	99.6
7	102	98.9	98.7	100.4
8	99.5	98.6	98.9	101.6
9	100.5	98.7	98.9	100.2
10	96.9	96.9	97.5	97.2
11	96.4	95.7	95.9	97.1
12	102	100.1	100.5	101.7
13	95.5	94	94.2	95.1
14	95	93.3	93.7	95.9
15	93.2	94.6	93.5	94
16	95.7	94.2	94.4	95.4
17	95.3	93.5	94.8	94.2
18	95.3	93.7	94.6	94.5
19	0	91.4	91.4	91.5
20	0	91.2	91.5	91.2
21	0	93.7	92.4	92.7
22	0	91.9	92.3	92.2
23	0	90.9	91.5	91.9
24	0	87.7	87.6	87.5
25	0	92.8	92.6	92.4
26	0	96	96	96.7
27	0	101.1	101.1	100.3
28	111.2	111.2	111.2	108
29	107.5	107.2	105.9	105.5
30	0	107.6	105.9	107.4
TOTAL	1960.9	2880.1	2882.7	2889.2
Month	98	96	96.1	96.3

Aluminum Fabricated Plate Radiation Shield
With Blackened Thermowell



Remote temperature probe is inserted into blackened Thermo well (Cutaway)

Omni-directional shield design radiates heat outwardly. Conventional plastic shields rely on airflow (and insulate) instead of the "outflow" of metal radiation fins. Temperature moves from hot-to-cold.

Drawing not to scale

2 TYPES OF PHYSICAL SORPTION / BLACKBODY INTERACTION

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Both magnetism and adsorption have domains.

[0009] The technology described herein is referred to as a Radiation Compensated Thermometer, which uses the natural thermoelectric emissive characteristics of metal, because metal has more in common with the universe than plastic. This is also a step towards greater integration of sensor and shield.

SUMMARY

[0010] Accordingly, it is an advantage to provide a radiation compensated thermometer that uses a pair of spaced-apart curved radiation shields, in which the upper shield is sufficiently large to provide shade for the lower shield, and in which both shields have a substantially reflective outer surface and a substantially non-reflective inner surface, and a temperature sensor is positioned within a "dead space" near the inner surface of the lower shield, where the air temperature is lower.

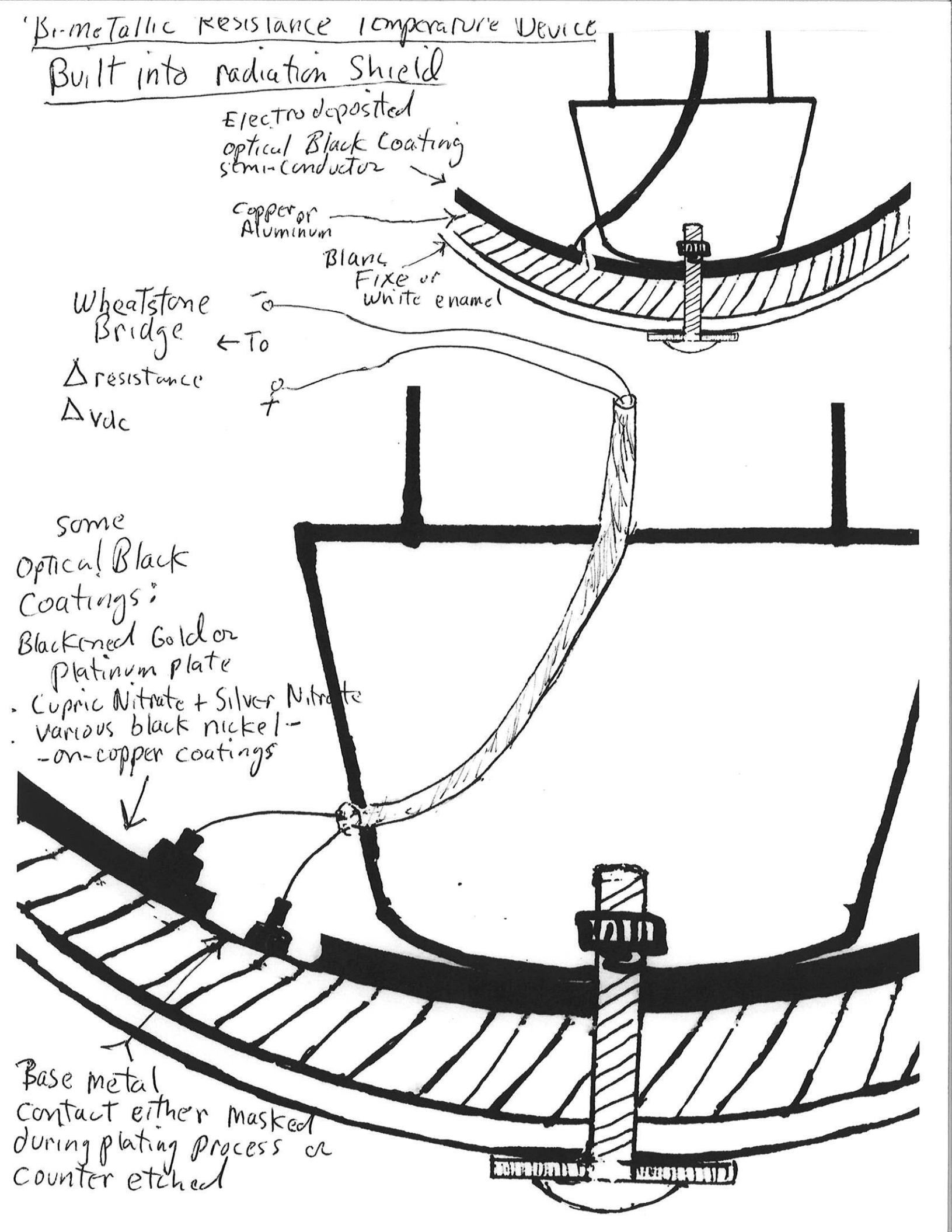
[0011] It is another advantage to provide a radiation compensated thermometer that uses a pair of spaced-apart curved radiation shields, in which the upper shield is sufficiently large to provide shade for the lower shield, and in which both shields have a substantially reflective outer surface and a substantially non-reflective inner surface; the two shields are mounted to a pole that is pivotable in two directions so that it can be aimed at the sun, as the sun transits the sky.

[0012] It is yet another advantage to provide a miniaturized radiation compensated thermometer that uses a pair of spaced-apart curved radiation shields, in which the upper shield is sufficiently large to provide shade for the lower shield, and in which both shields have a substantially reflective outer surface and a substantially non-reflective inner surface; the two shields are mounted to a base that is connected to an equatorial mount, so that the two shields can track the sun, as the sun transits the sky.

[0013] It is still another advantage to provide an omni-directional radiation compensated thermometer that uses a pair of spaced-apart curved radiation shields, in which the upper shield is sufficiently large to provide shade for the lower shield, and in

Bi-Metallic Resistance Temperature Device

Built into radiation Shield



2016 DRHT vs GPRS
Fahrenheit

		DRHT			GPRS	
May 31	Max	Min	Current	Max	Min	Current
11:15	81.5	78.6	80.6	84.1	80	83.4
	82.5	79.5	81.3	84.7	81.5	82.4
	83.4	78.4	83.4	85.4	79.5	85.2
	84.9	79.8	84.3	85.6	80	84.9
	86.7	82.2	84	87.8	83.6	84.7
Total	419	398.5	413.6	427.6	404.6	420.6
x	83.8	79.7	82.7	85.5	80.9	84.1
1-Jun						
11:45	85.2	81.8	85.1	87.2	83.1	86.5
	88.1	84	86.3	89.4	86	87.8
	89.2	86	87.9	91.4	87.4	88.8
	89.7	86.1	88.7	91.9	87	91.2
Total	352.2	337.9	348	359.9	343.5	354.3
x	88	84.5	87	90	85.9	88.6
2-Jun						
11:10	89.2	86.5	87.8	91.4	87.8	90.3
	89.2	85.8	88.7	92.1	88.5	91.7
	89.9	86.9	87.4	92.4	88.1	90.3
	90.1	86.3	89.6	92.8	88.7	90.5
	91.7	88.1	89.9	94.6	90.8	92.3
	92.8	87	91.4	95.3	89.6	94.1
Total	542.9	520.6	534.8	558.6	533.5	549.2
x	90.5	86.8	89.1	93.1	88.9	91.5
3-Jun						
11:15	93.3	89.4	91.9	95.1	90.3	93.9
	93.5	89.9	91.5	96.8	92.1	93.2
	95.3	90.3	94.2	96.9	93.2	96
	96.4	93	96	99.2	94.8	97.8
Total	378.5	362.6	373.6	388	370.4	380.9
x	94.6	90.6	93.4	97	92.6	95.2

2016 DRHT vs GPRS
Fahrenheit

		DRHT				
4-Jun	Max	Min	Current	Max	Min	Current
11:15	94.4	92.3	93.9	97.8	95.3	97.1
	95.5	92.3	94.2	97.5	95.3	96
	96.2	93.2	95.7	98	95.5	97.3
	98.2	93.5	97.8	101.4	95.7	98.9
	98.6	93.5	98.6	100.4	96.6	99.3
Total	482.9	464.8	480.2	495.1	478.4	488.6
x	96.6	93	96	99	95.7	97.7
5-Jun						
11:15	96.4	93.7	94.2	97.3	94.8	95.7
	98.2	93	97.3	99.8	94.4	98.4
	98.2	93	98	98.7	96.2	97.7
	98.4	96.2	96.9	99.3	96.6	97.5
	99.6	95.9	97.8	100.4	96.4	98.4
	98.6	97.3	98	99.6	97.5	97.8
Total	589.4	569.1	582.2	595.1	575.9	585.5
x	98.2	94.8	97	99.2	96	97.6
6-Jun						
11:10	91.4	88.7	89.9	93	89.6	91
	91.8	89.4	90.5	93.3	90.5	92.1
	93	89.6	93	95	91	95
	94.4	90.1	92.6	95.3	91.4	94.4
	94.2	91	92.3	95.3	91.7	94.1
Total	464.8	448.8	458.3	471.9	454.2	466.6
x	93	89.8	91.7	94.4	90.8	93.3

	Max x			
31-May	83.8		85.5	
1-Jun	88		90	
2-Jun	90.5		93.1	
3-Jun	94.6		97	
4-Jun	96.6		99	
5-Jun	98.2		99.2	
6-Jun	93		94.4	
Total	644.7		658.2	
	Mean x	92.1	Mean x	94

2016 DRHT vs GPRS 30 minute intervals
Fahrenheit

	DRHT			GPRS		
19-Jun	Max	Min	Current	Max	Min	Current
11:30	97.7	94.1	96.6	98.4	95.1	98
	97.7	94.1	96.4	98.6	96.4	97.8
	100.2	95.5	98	100.7	96.8	97.8
	100.4	96	98.7	100.9	96.9	99.5
	102.2	98.6	101.8	102.5	98.6	102.5
Total	498.2	478.3	491.5	501.1	483.8	495.6
x	99.6	95.7	98.3	100.2	96.8	99.1
20-Jun						
10:45	100.2	98.4	98.7	100.5	99.3	99.8
	100.5	97.5	100.4	101.8	98.6	101.4
	102.3	98.9	99.1	103.1	99.3	99.3
	103.6	98.4	101.4	104.7	98.9	102.3
	104.9	101.6	102.9	105.2	101.4	103.2
	105.6	102.3	102.9	105.9	102.5	104.5
Total	617.1	597.1	605.4	621.2	600	610.5
x	102.8	99.5	100.9	103.5	100	101.7
24-Jun						
10:40	89	86.7	86.9	89.4	87.2	87.4
	90.3	86.9	89.2	92.1	87.6	89.7
	92.1	88.3	90.6	92.1	89.2	90.3
	91.2	89.6	89.7	91.5	89.6	89.9
	91.5	89.4	91.5	92.3	89.7	91.7
Total	454.1	440.9	447.9	457.4	443.3	449
x	90.8	88.2	89.6	91.5	88.6	89.8
25-Jun						
11:05	89.4	87.8	88.7	92.1	89	92.1
	92.4	87.9	91.4	93	89.6	92.4
	93.9	89.6	93.2	95.5	90.8	94.8
	94.8	92.3	94.2	95.9	92.6	93.7
	97.3	93.5	93.7	96.8	92.3	93.2
Total	467.8	451.1	461.2	473.3	454.3	466.2
x	93.6	90.3	92.2	94.7	90.9	93.2

	Max x	Max x
19-Jun	99.6	100.2
20-Jun	102.8	103.5
24-Jun	90.8	91.5
25-Jun	93.6	94.7
Total	386.8	389.9
Max xx	96.7	97.5

2016 DRHT vs GPRS 30 minute intervals
Fahrenheit

	DRHT			GPRS		
6-Jul	Max	Min	Current	Max	Min	Current
11:00	83.3	81.3	82	84.4	82	83.1
	83.8	81.6	83.1	84.3	82.5	83.6
	86.5	82.7	83.3	86.9	83.1	85.1
	86.5	82.5	85.4	86.9	83.1	85.6
	86	83.6	85.8	86.1	84.2	86
	86.9	84.3	85.8	87.2	84.3	86.1
Total	513	496	505.4	515.8	499.2	509.5
x	85.5	82.7	84.2	86	83.2	85
7-Jul						
11:00	84.5	82.5	84.5	85.8	83.1	85.4
	85.6	82.7	83.6	86.5	83.6	85.1
	86.7	85.4	84.9	87.2	84.2	86.7
	88.1	84.5	86.5	88.7	85.6	87.2
	88.1	85.1	86.3	88.5	85.6	87.8
	88.3	86	87.8	88.8	86.9	89.2
Total	521.3	506.2	513.6	525.5	509	521.4
x	86.9	84.4	85.6	87.6	84.8	86.9
8-Jul						
11:00	87.6	85.2	87	88.7	86	88.1
	89.2	86.1	87.2	89.4	87	87.6
	90.5	86.9	89.4	91.4	87.8	90.5
	91.7	87	89.7	92.8	87.9	90.8
	91	88.1	88.3	91.5	89	89.9
	91.7	88.7	89.6	93	89.2	90.5
	91.4	89.7	90.1	93.2	90.5	93
Total	633.1	611.7	621.3	640	617.4	630.4
x	90.4	87.4	88.7	91.4	88.2	90.1
9-Jul						
11:00	91	87.6	91	91.5	87.9	91.4
	91.2	87.6	89.9	91.7	88.5	91.5
	92.1	89.2	91.1	92.4	89.6	92.1
	92.4	89.9	90.8	92.8	90.1	92.1
	93.3	89.7	91.4	93.2	90.3	91.9
	92.1	89.6	91.4	92.3	90.3	91.9
Total	552.1	533.6	545.6	553.9	536.7	550.9
x	92	88.9	90.9	92.3	89.4	91.8

2016 DRHT vs GPRS 30 minute intervals
Fahrenheit

	DRHT			GPRS		
13-Jul	Max	Min	Current	Max	Min	Cuirrent
10:45	87.8	86.1	86	88.8	87	88.1
	90.3	87	89.4	90.1	87.4	90.1
	90.8	87.2	90.5	91.2	87.4	90.8
	92.6	89.2	90.8	93.7	89.9	91.5
	92.4	89.6	91	93.2	90.3	90.8
	92.6	89.6	92.4	93.5	89.7	91.9
	92.8	91.5	91.5	93.2	92.3	92.8
	92.1	89.7	91.7	92.4	90.3	92.3
Total	731.4	709.9	723.3	736.1	714.3	728.3
x	91.4	88.7	90.4	92	89.3	91
14-Jul						
10:45	91.4	87.9	88.8	92.1	88.8	90.6
	92.8	89	92.8	93.2	90.3	92.6
	93.2	91.2	91.5	93.5	91.2	92.3
	93.7	91.2	91.9	94.1	91.4	93.2
	94.8	91.2	93.5	94.8	91.9	93.7
	94.6	91	93.3	95.5	91.7	93.9
	95.5	93.2	93.2	96.4	92.6	92.8
Total	656	634.7	645	659.6	637.9	649.1
x	93.7	90.6	92	94.2	91.1	92.7
15-Jul						
10:30	91.9	89.2	89.9	92.8	89.6	89.6
	93	89	91.9	94.2	89.6	92.1
	93.5	90.8	92.8	93.9	91.4	93.7
	94.8	91.2	92.3	94.8	92.1	93
	94.8	91.4	93.2	94.8	91.4	93.3
	95.9	92.6	95.9	96.2	93	95.9
	96.8	95.3	96	97.1	93.5	96
Total	660.7	639.5	652	663.8	640.6	653.6
x	94.4	91.4	93.1	94.8	91.5	93.3

	Max x	Max x
6-Jul	85.5	86
7-Jul	86.9	87.6
8-Jul	90.4	91.4
9-Jul	92	92.3
13-Jul	91.4	92
14-Jul	93.7	94.2
15-Jul	94.4	94.8
Total	634.3	638.3
Max x x	90.6	91.2

2015 DRHT vs GPRS
Fahrenteit

August		DRHT			GPRS		
18	Max	Min	Current	Max	Min	Current
11:30	87	85.2	86.5	87.6	87.1	87.4
12:00	89	86.3	88.3	90.8	87	89.6
12:30	89.9	88.1	89.2	91.7	88.5	90.3
1:00	90.5	88.8	89.2	91.7	89	89
1:30	91.4	88.3	91.4	92.3	88.1	92.3
2:00	92.3	89.9	90.3	92.4	89.9	90.3
2:30	92.3	90.3	92.1	93	90.5	93
Total	632.4	616.9	627	639.5	620.1	631.9
x	90.3	88.1	89.6	91.3	88.6	90.3
20	Max	Min	Current	Max	Min	Current
11:30	86.5	83.8	84.9	87	82	86
12:00	86.5	84	85.2	87.2	84.9	86.3
12:00	87.4	84.7	86.5	87.8	85.8	86.9
12:30	89	85.8	89	89.9	86.7	89.9
1:00	89.6	89.6	89.2	90.3	87.4	89.6
1:30	90.3	87.2	90.1	91.2	87.8	90.6
Total	529.3	515.1	524.9	533.4	514.6	529.3
x	88.2	85.8	87.5	88.9	85.8	88.2
21						
11:00	82.5	80	81.5	83.1	80.4	81.3
	82.9	80.4	82.2	83.4	81.1	83.4
	84	81.8	82.9	84.7	82.7	83.8
	86.5	82.5	84.2	87.8	83.8	85.1
	86.1	85.4	83.4	86.3	84.3	84.7
	86.1	83.6	84.9	86.7	84.3	85.4
Total	508.1	493.7	499.1	512	496.6	503.7
x	84.7	82.3	83.2	85.3	82.8	83.9

2015 DRHT vs GPRS
Fahrenheit

August		DRHT			GPRS		
22	Max	Min	Current	Max	Min	Current
11:00	83.4	81.1	83.3	84.9	82	84.9
11:30	84.3	81.5	83.6	86	82.5	85.1
12:00	85.8	83.3	84.7	86.9	84.5	86.1
12:30	88.1	83.8	86.9	88.8	85.4	87.4
1:00	87.6	84.9	86	89.2	86.9	87.9
1:30	87.9	85.8	87.2	89.6	86.9	89.2
2:00	89	86.1	87.2	91	87.6	88.5
Total	606.1	586.5	598.9	616.4	595.8	609.1
x	86.6	83.8	85.5	88	85.1	87
23						
11:00	86.5	83.4	86.3	88.3	85.2	88.3
	87.9	84.7	87.2	89.4	86.1	87.8
	92.4	86.1	91.9	92.8	87.4	92.4
	93.2	82.5	82.7	93	83.6	83.8
Total	360	336.7	348.1	363.5	342.3	352.3
x	90	84	87	91	85.6	88
24						
11:00	87.2	83.8	87.2	88.8	88.8	88.8
	89.2	86.9	87.9	91.2	87.9	89.7
	91.5	86.7	90.3	93.2	87.6	91.2
	91.4	87.8	91	93.5	88.8	92.4
	92.6	89.7	90.5	94.1	91	92.3
	93	89.2	92.4	94.4	90.5	94.1
	93.3	89.4	91.7	94.6	90.1	92.4
Total	638.2	613.5	631	649.8	624.7	640.9
x	91.2	87.6	90.1	93	89.2	92.8

August	Max	Min	Current	Max	Min	Current
18	90.3	88.1	89.6	91.3	88.6	90.3
20	88.2	85.8	87.5	88.9	85.8	88.2
21	84.7	82.3	83.2	85.3	82.8	83.9
22	86.8	83.8	85.5	88	85.1	87
23	90	84	87	91	85.6	88
24	91.2	87.6	90.1	93	89.2	92.8
Total x	531.2	511.6	522.9	537.5	517.1	530.2
Mean x	88.5	85.3	87.1	89.6	86.2	88.4

(12) **United States Patent**
Bergstein

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(45) **Date of Patent: Jun. 23, 2015**

(54) **RADIATION COMPENSATED THERMOMETER**

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(57) **ABSTRACT**

A radiant compensated thermometer, which uses a pair of parabolic-shaped radiation shields that are spaced-apart from one another. An upper shield is positioned to intercept the sunlight from impacting on a lower shield; both shields have an outer substantially reflective surface and an inner substantially non-reflective surface. A temperature sensor is positioned in a "dead space" near the inner surface of the lower shield, which is cooler than the other areas of the device.

20 Claims, 11 Drawing Sheets