KILN DRYING USING
A DOUBLE DUTY THERMOSTATIC
TEMPERATUR CONTROL

KILN DRYING USING A DOUBLE DUTY THERMOSTATIC TEMPERATURE CONTROL.

BY

Ray Reed Kittredge
B.S. 1914 F

April 1, 1924.

M.S. ?

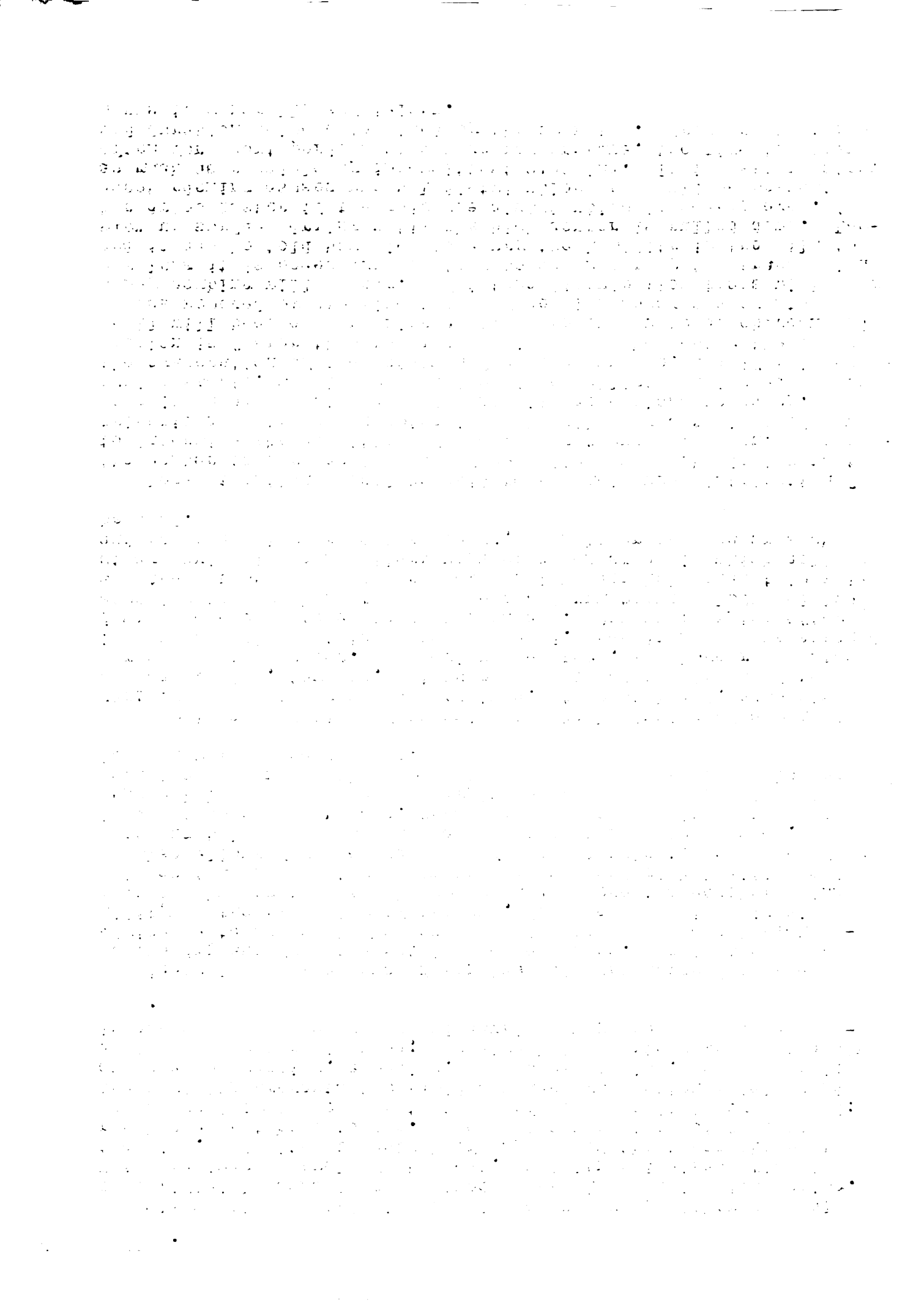
KILN DRYING.

Circulating heated air around the lumber by either natural or artificial means is the method generally used in kiln drying. This requires control of the heat, humidity and circulation in the kiln, and without control of any one of the three the best results cannot be obtained. The heat causes the moisture to transfuse from the center to the surface where it is evaporated; the humidity prevents too rapid surface evaporation which would cause casehardening, checking, and honey combing, especially if a high temperature is used; the circulation brings the heated air in contact with the lumber and carries away the evaporated moisture.

According to the laws of Physics moisture moves from the wet to the dry and from the hot to the cool area. It is therefore advisable to steam the lumber at a high temperature and high humidity at the beginning of the run, for the hot moist air will heat the lumber thru to the center and remove the casehardening quicker than when using a low temperature and high humidity and it also allows for the dropping of the wet bulb temperature after steaming below the temperature of the center of the lumber, which is a wet bulb temperature, thus getting the benefit of the two Physical laws noted for when drying starts the outside is drier than the center and the temperature of the center of the lumber is higher than the outside.

The length of time of steaming at the beginning of a run will vary from one to three hours to inch, at about 165°F, depending on the species, texture, moisture content and condition of the surface of the lumber. The drier the stock, the longer the steaming period unless it is surface checked, then it should be steamed just long enough to close up the checks. For fast drying after steaming the dry bulb temperature would run between 160° and 190° and the wet bulb temperature between 140° and 150° except in thick stock having large medullary rays or green stock in which collapse and honey combing are apt to occur, then lower temperatures should be used.

More attention should be paid to the moisture distribution from the center to surface instead of depending on casehardening tests to determine the condition of the lumber thruout the run. The distributions on the stock going into the kiln gives an idea of how long it should be steamed and what kiln conditions to carry. When drying starts, a moisture gradient is established being caused by the evaporation of the moisture from the surface, and if this evaporation is faster than the transfusion from the center the outer shell will become much drier causing the lumber to caseharden and unless removed by steaming the surface will check and eventually honey combing will appear. Moisture distribution tests will show how long it is necessary to steam to again set up the transfusion and it can be told how high to carry the humidity in the kiln to slow up surface drying until the high center is pulled down. Lumber dries faster if the moisture distribution is nearly even. As casehardening causes unequal distribution it should be prevented as much as possible by intermittent steaming. It is best to steam often for short periods at a high temperature, the time to steam and duration being determined by the operator. From one to three hours is generally sufficient.



KILN DRYING USING-HAND CONTROL.

WITHOUT WET AND DRY BULB RECORDING THERMOMETER.

When starting a kiln using hand control the spray valve is opened wide and the valve on the heating coil opened slightly. After spraying for the required length of time for conditioning the lumber, the spray valve is partly closed and the coil opened to points determined by practice that will give the approximate wet and dry bulb temperatures required. A hygrometer is then placed in the kiln back away from the door. Temperature readings are taken and the valves reset until the desired conditions are obtained. Thruout the run temperature readings are taken and valves are reset as necessary to carry the proper temperatures.

WITH WET AND DRY BULB RECORDING THERMOMETER.

The temperatures are controlled the same way, but it isn't necessary to go into the kiln to get the readings except to occasionally check up on the recorder. This is a great advantage for if the trucks are piled with long lumber and high temperatures are carried it is impossible to set a hygrometer far enough back in the kiln to get a true reading. Operating the kiln then becomes a matter of guess work.

KILN DRYING USING THERMOSTATIC TEMPERATURE CONTROL.

The setting and carrying of the proper conditions in a kiln with hand control is very slow and uncertain but the operation is greatly simplified by using thermostatic control on the spray and coil in connection with a wet and dry bulb recording thermometer. The temperatures are set on a dial and are thermostatically controlled, while the temperature readings are taken from the recorder. This assures accurate control of the heat and humidity for the temperatures can be maintained within two degrees of the point set for. By having control of the circulation, heat, and humidity more severe conditions can be safely carried and faster and better drying obtained.

The bulbs from the instruments are placed at the hottest point in the kiln, halfway between the rail line and the ceiling.

In the instrument used the expansion of the liquid in the tube from the controller caused the capsular chamber to expand, opening on air valve in the air block, allowing the air to flow into the top of the valve in the steam line. This forces a rubber diaphram down and closes the steam valve. When the liquid cools the capsular chamber contracts, the valve and the air block closes releasing the pressure from the rubber diaphram and a spring around the steam opens the valve in the steam line. One valve works on the spray line controlling the wet bulb temperature and one on the coil controlling the dry bulb temperature.

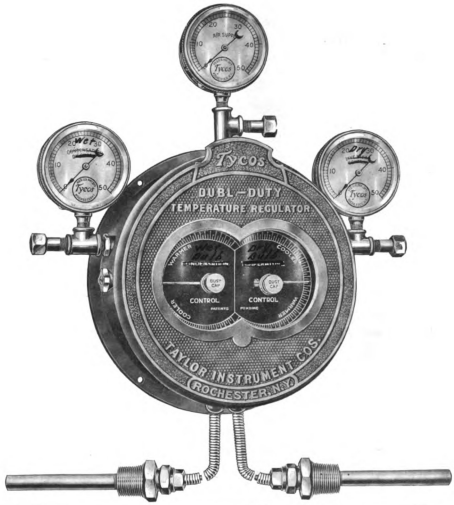
The water for the wet bulb is supplied by a tank kep at a constant level.

Several makes of air actuated instruments are on the market but the general principle is the same.

CUTS OF CONTROLLER AND RECORDER.

Tycos Dubl-Duty Temperature Regulator

Compound System

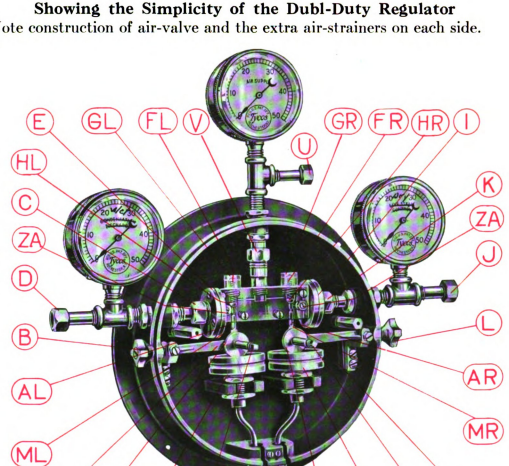


Tycos Dubl-Duty Temperature Regulator—Continued

Compound System

Showing the Simplicity of the Dubl-Duty Regulator

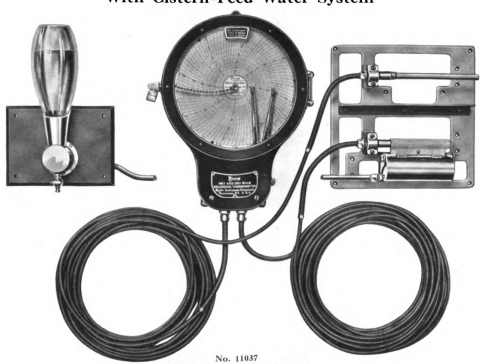
Note construction of air-valve and the extra air-strainers on each side.



"AR" —Air-valve plunger.
"AL" —Air-valve plunger.
"B" —Front-case lock-nut.
"C" —Union nut.
"D" —Air connection to condensation discharge valve.
"E" —Air strainer.
"FR" —Air-valve spring.
"FL" —Air-valve spring.
"GR" —Air-valve cap.
"GL" —Air-valve cap.
"HR" —Air valve.
"HL" —Air valve.
"I" —Air strainer.
"J" —Air connection to temperature or live-steam control valve.
"K" —Union nut.
"L" —Front-case lock-nut.
"MR"—Rocker-arm stud which engages air-valve plunger.
"ML"—Rocker-arm stud which engages air-valve plunger.
"NR" —Capsular chamber (expanding member controls the opening and closing of air-valve "HR.")
"NL" —Capsular chamber (expanding member controls the opening and closing of air-valve "HL.")
"OR" —Temperature-adjusting cam.
"OL" —Temperature-adjusting cam.
"PR" —Adjusting-key post to which pointer is attached.
"PL" —Adjusting-key post to which pointer is attached.
"QR" —Rocker arm and bracket for cam "OR."
"QL" —Rocker arm and bracket for cam "OL."
"U" —Union spud (air inlet).
"V" —Union nut.
"X" —Main air strainer (not shown).
"ZA" —Adjustable air-leak.

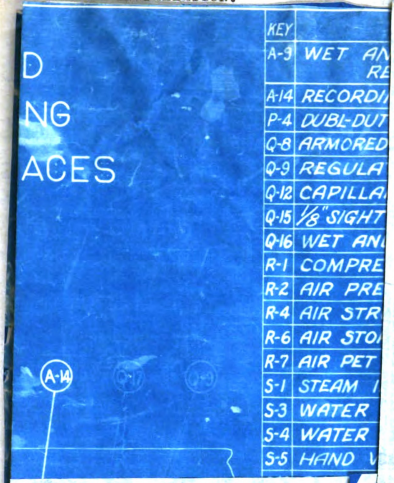
Tycos Wet-and-Dry-Bulb Recording Thermometers—Continued

With Cistern-Feed Water System



No. 11037
(About one-seventh actual size)

BLUE PRINT OF INSTALLATION.



The following charts were taken from the first experimental runs. From these and following runs the best method of running a kiln was determined. This was previously described in the article. A twenty-four hour clock was used in the recorder for it was easier to see how closely the temperatures were controlled.

KILN RECORD

CHARGE NO. 44 KILN NO. 10 TRUCKS 7

STEAM PRESSURE		STEAMING		SIZE	KIND	FEET
COIL	5 #	HRS. PRO.	15	10/4	Soft Maple	
Spray	100 #	HRS. FIN.				

DAYS	DATE	TIME OF READING	SPRAY	COIL	DAMP AIR	FRESH AIR	DIGREES WET BULB	PRESENT DRY BULB	PRESENT % HUM.	REQUIRED DRY BULB	REQUIRED % HUM.	FAN MOTION
1	7/15/29	A. M.										
		4 P. M.										
2	6	7 A. M.					140	132	71			
		3 P. M.					136	158	54			
3	7	7 A. M.					140	165	49			
		P. M.										
4	8	11 A. M.					140	165	49			
		P. M.										
5	9	7 A. M.					142	168	49			
		3 P. M.					141	168	47			
6	10	7 A. M.					140	170	44			
		3 P. M.					142	178	44			

M. C. M. C. M. C. M. C. M. C. M. C.

Kiln Test 7-14-29

1 6 7/8 2 7 7/8 3 7 7/8 4 5 5/8 5 5 5/8 6 5 5/8 7 5 5/8 AM 5 5/8

7:00 P.M. 10-28

MONDAY
SUNDAY
SATURDAY
FRIDAY
NOON
NIGHT
A.M.
P.M.
RE
CHAR
THER
CONTINUOUS

MONDAY
TUESDAY
WEDNESDAY
THURSDAY
FRIDAY
A.M.
P.M.
NOON
NIGHT
6
9
12
3
100
110
120
130
140
150
160
170
180
190
200
N.Y.
502

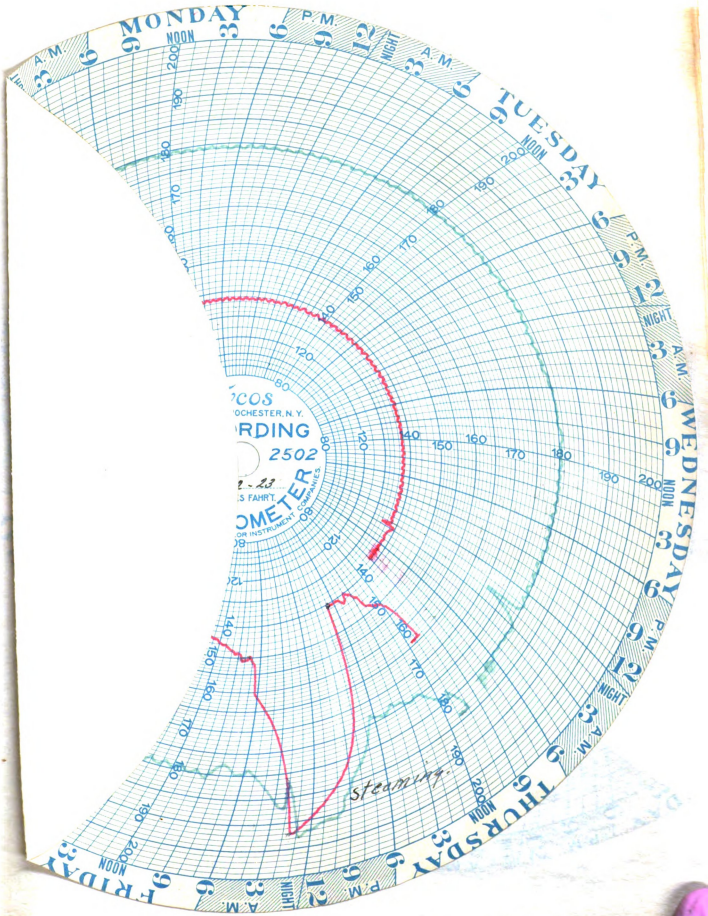
MONDAY
SUNDAY
SATURDAY
FRIDAY
A.M.
P.M.
NOON
NIGHT
REC
CHART
THERM

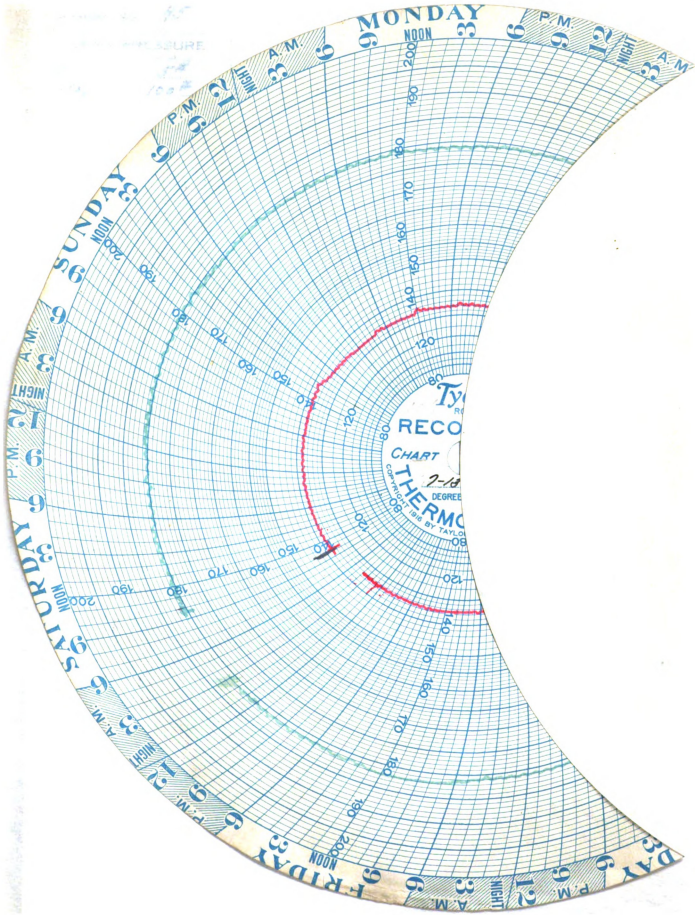
MONDAY
TUESDAY
WEDNESDAY
THURSDAY
FRID
A.M.
P.M.
NOON
NIGHT
3
6
9
12
120
130
140
150
160
170
180
190
200

MONDAY
NOON
SUNDAY
NOON
SATURDAY
NOON
FRIDAY
NOON
A.M.
P.M.
MIDNIGHT
CHART
CORPORATION

MONDAY
TUESDAY
WEDNESDAY
THURSDAY
NOON
NIGHT
A.M.
P.M.
2502

MONDAY
SUNDAY
SATURDAY
FRIDAY
NOON
NIGHT
A.M.
P.M.
120
130
140
150
160
170
180
190
200


MONDAY
TUESDAY
WEDNESDAY
THURSDAY
FRIDAY
A.M.
P.M.
NOON
NIGHT
ROCHESTER, N.Y.
2502
OMETER
Steaming


MONDAY
SUNDAY
SATURDAY
FRIDAY
NOON
NIGHT
A.M.
P.M.
RECO
CHART
THERMO

KILN RECORD

CHARGE NO. 45 KILN NO. 10 TRUCKS 7

STEAM PRESSURE		STEAMING		SIZE	KIND	FEET
COIL	5#	HRS. PRO.	2	4/4	Sap Gum	
Spray	100#	HRS. FIN.	None			

DAYS	DATE	TIME OF READING	SPRAY	COIL	DAMP AIR	FRESH AIR	DEGREES WET BULB	PRESENT DRY BULB	PRESENT % HUM.	REQUIRED DRY BULB	REQUIRED % HUM.
1	7/17/23	8 A. M.									
		4 P. M.					140	160	56		
2	18	7 A. M.					140	160	56		
		4 P. M.					140	172	41		
3	19	7 A. M.					140	175	38		
		3 P. M.					135	175	33		
4	20	7 A. M.					135	125	33		
		3 P. M.					135	175	33		
5	21	7 A. M.					135	180	29		
		P. M.									
6	22	10 A. M.					130	182	24		
		P. M.									
7		A. M									
		P. M.									
8		A. M.									
		P. M.									
9		A. M.									
		P. M.									
10		A. M.									
		P. M.									
11		A. M.									
		P. M.									
12		A. M.									
		P. M.									
13		A. M.									
		P. M.									
14		A. M.									
		P. M.									

FINAL MOIST CONT / M. C.

Kiln Tests 7-23-23

1.	4.5%
2.	2.0%
3.	5.0%
4.	6.0%
5.	3.0%
6.	2.0%
7.	3.0%
Av.	3.8%

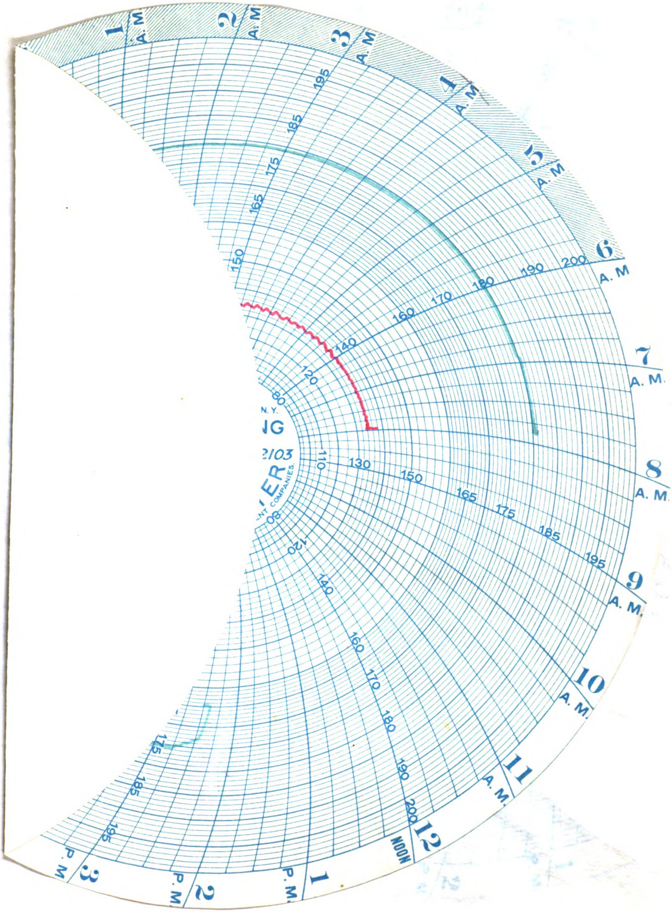
Moisture Distribution 7-23

1.	5.0	7.0	6.0
2.	2.7	3.8	3.4
3.	4.1	6.1	4.0
4.	5.5	7.0	5.6
5.	2.5	3.9	2.9
6.	1.9	3.1	2.2
7.	2.7	4.2	3.4

MONDAY
TUESDAY
WEDNESDAY
THURSDAY
FRIDAY
SATURDAY
SUNDAY
A.M.
P.M.
NOON
NIGHT
3
6
9
12
120
130
140
150
160
170
180
190
200

MONDAY
TUESDAY
WEDNESDAY
THURSDAY
NOON
NIGHT
A.M.
P.M.
Steuben

MONDAY
SUNDAY
SATURDAY
FRIDAY
NOON
NIGHT
A.M.
P.M.
Testing Kiln


1 A.M.
2 A.M.
3 A.M.
4 A.M.
5 A.M.
6 A.M.
7 A.M.
8 A.M.
9 A.M.
10 A.M.
11 A.M.
12 NOON
1 P.M.
2 P.M.
3 P.M.

A.M.
P.M.
Night
120
130
140
150
160
170
180
190
200
165
175
185
195

KILN RECORD

CHARGE NO. 46 KILN NO. 10 TRUCKS 7

STEAM PRESSURE		STEAMING		SIZE	KIND	FEET
COIL	5#	HRS. PRO.	15	10/4	Birch	
Spray	100#	HRS. FIN.	None.			

DAYS	DATE	TIME OF READING		SPRAY	COIL	DAMP AIR	FRESH AIR	DEGREES WET BULB	PRESENT DRY BULB	PRESENT % HUM.	REQUIRED DRY BULB	REQUIRED % HUM.
1	7/23/23		A. M.									
		4	P. M.									
2	24	7	A. M.					162	163	92		
		2	P. M.					140	156	64		
3	25	7	A. M.					140	156	64		
		3	P. M.					140	158	60		
4	26	8	A. M.					140	158	60		
		3	P. M.					140	158	60		
5	27	7	A. M.					140	158	60		
		3	P. M.					140	158	60		
6	28	8	A. M.					140	160	56		
			P. M.									
7	29	10	A. M.					140	162	54		
			P. M.									
8	30	7	A. M.					140	162	54		
		3	P. M.					138	168	44		
9	31	7	A. M.					138	174	37		
		3	P. M.					138	175	36		
10	8/1	7	A. M.					138	175	36		
		3	P. M.					138	176	35		
11	2	7	A. M.					138	177	34		
		3	P. M.					138	177	34		
12	3	7	A. M.					138	180	32		
		3	P. M.					138	180	32		
13	4	7	A. M.					140	180	33		
		3	P. M.					140	180	33		
14	5	7	A. M.					140	180	33		
			P. M.									

FINAL MOIST CONT

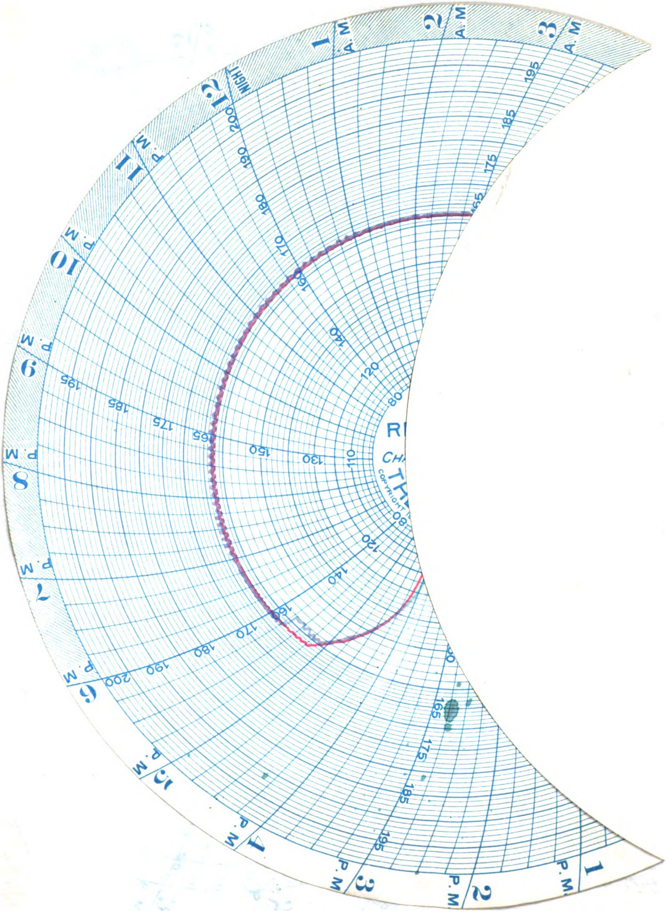
Kiln Tests 8-5-23.

1.	6.0%
2.	5.0%
3.	6.0%
4.	7.0%
5.	7.0%
6.	7.0%
7.	7.5%
Av.	6.5%

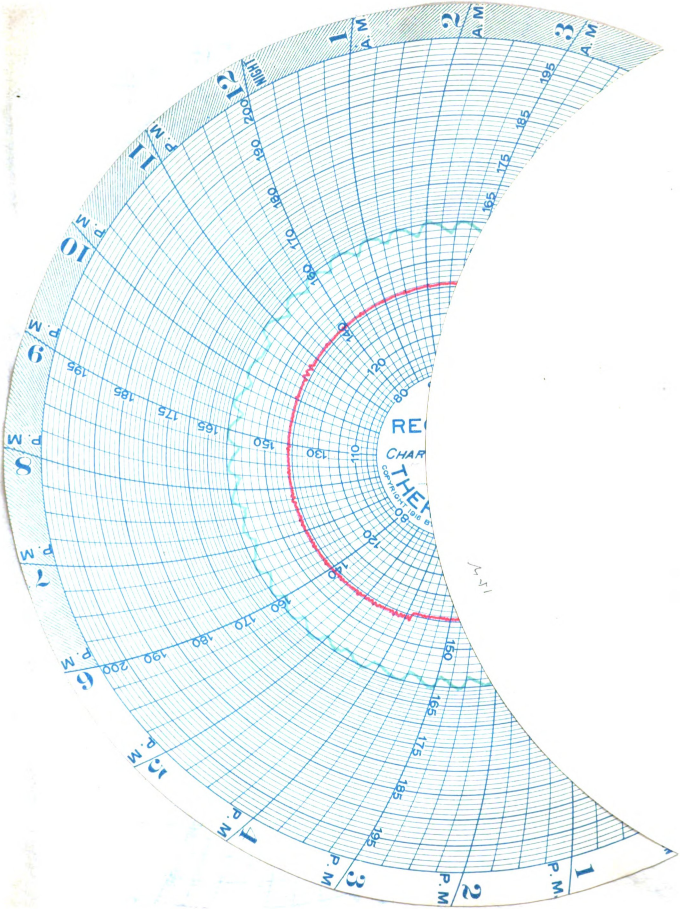
Moisture Distribution

6.3%
8.0%
6.5%
Total 6.9%

P.M. M.C. 8-4	10.46 4.2	9.18 4.4	10.91 6.1	11.25 5.1	10.35 4.2	10.91 5.3	7.95 5.1	4.9
P.M. M.C. 8-3	10.48 4.4	9.20 4.6	11.02 7.2	11.36 6.1	10.38 7.5	11.28 8.8	7.82 5.5	5.9


12 NIGHT
1 A.M
2 A.M
3 A.M
11 P.M
10 P.M
9 P.M
8 P.M
7 P.M
6 P.M
5 P.M
4 P.M
3 P.M
2 P.M
1 P.M

R.N.Y.
NG
2103
METER
INSTRUMENT COMPANY
1 A. M.
2 A. M.
3 A. M.
4 A. M.
5 A. M.
6 A. M.
7 A. M.
8 A. M.
9 A. M.
10 A. M.
11 A. M.
12 NOON
1 P. M.
2 P. M.
3 P. M.
150
160
170
180
190
200
110
120
130
140
150
165
175
185
195


NIGHT
A.M.
P.M.
REC
CHAR
THER
COPYRIGHT 1916 BY

R.N.Y.
NG
2103
STER
RUBBER COMPANIES
Air 454
1 A.M.
2 A.M.
3 A.M.
4 A.M.
5 A.M.
6 A.M.
7 A.M.
8 A.M.
9 A.M.
10 A.M.
11 A.M.
12 NOON
1 P.M.
2 P.M.
3 P.M.

A.M.
P.M.
MIDNIGHT
Steam Air

R.N.Y.
ING
2103
METER
INSTRUMENT COMPANIES
MIDNIGHT
NOON
1 A.M.
2 A.M.
3 A.M.
4 A.M.
5 A.M.
6 A.M.
7 A.M.
8 A.M.
9 A.M.
10 A.M.
11 A.M.
12 NOON
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2 P.M.
3 P.M.
4 P.M.
5 P.M.
6 P.M.
7 P.M.
8 P.M.
9 P.M.
10 P.M.
11 P.M.
12 MIDN

A.M.
P.M.
NIGHT
120
130
140
150
160
170
180
185
190
195
200
205
210

1 A.M.
2 A.M.
3 A.M.
4 A.M.
5 A.M.
6 A.M.
7 A.M.
8 A.M.
9 A.M.
10 A.M.
11 A.M.
12 NOON
1 P.M.
2 P.M.
3 P.M.
TER, N.Y.
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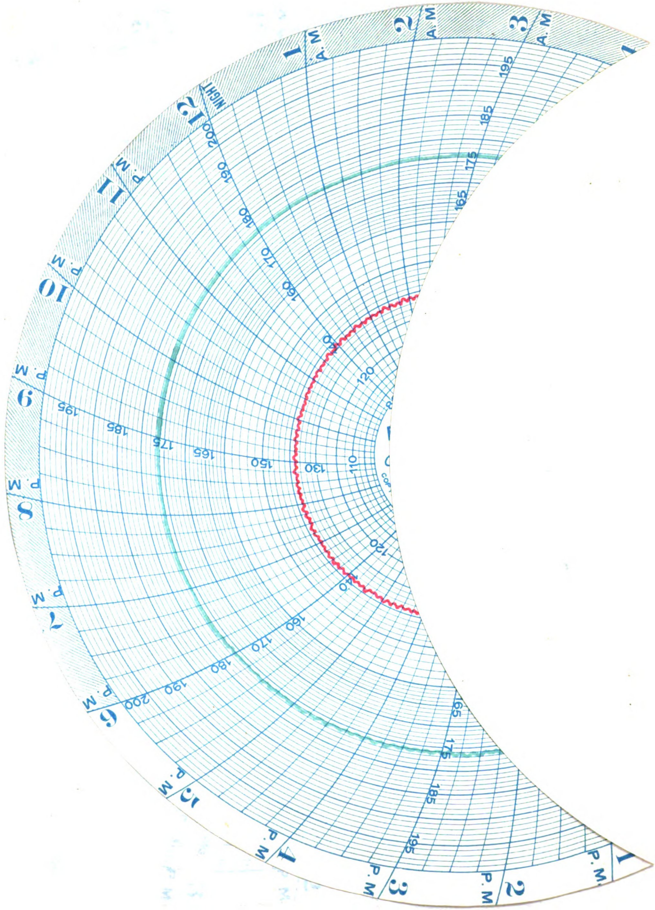
2103
METER
INSTRUMENT COMPANIES



12 NIGHT
1 A.M
2 A.M
3 A.M
11 P.M
10 P.M
9 P.M
8 P.M
7 P.M
6 P.M
5 P.M
4 P.M
3 P.M
2 P.M
1 P.M

A. M.
P. M.
NOON
F.N.Y.
NG
2103
METER
INSTRUMENT COMPANIES
Test

A.M.
P.M.
NOON
NIGHT
steam in!

steam in?

1 A. M.
2 A. M.
3 A. M.
4 A. M.
5 A. M.
6 A. M.
7 A. M.
8 A. M.
9 A. M.
10 A. M.
11 A. M.
12 NOON
1 P. M.
2 P. M.
3 P. M.
120
130
140
150
160
165
170
175
180
185
190
195
200

KILN RECORD

CHARGE NO. 47 KILN NO. 10 TRUCKS 7

STEAM PRESSURE		STEAMING		SIZE	KIND	FEET
COIL	5#	HRS. PRO.	2	4/4	Sap Gum	
Spray	100#	HRS. FIN.	None			

DAYS	DATE	TIME OF READING	SPRAY	COIL	DAMP AIR	FRESH AIR	DEGREES WET BULB	PRESENT DRY BULB	PRESENT % HUM.	REQUIRED DRY BULB	REQUIRED % HUM.
1	8/6/23	10 A. M.									
		4 P. M.					165	180	67		
2	7	7 A. M.					165	180	67		
		3 P. M.					155	180	51		
3	8	7 A. M.					150	182	43		
		3 P. M.					145	180	38		
4	9	7 A. M.					140	179	34		
		3 P. M.									
5	10	7 A. M.					140	179	34		
		3 P. M.					140	178	35		
6	11	7 A. M.					140	183	31		
		P. M.									
7		A. M.									
		P. M.									
8		A. M.									
		P. M.									
9		A. M.									
		P. M.									
10		A. M.									
		P. M.									
11		A. M.									
		P. M.									
12		A. M.									
		P. M.									
13		A. M.									
		P. M.									
14		A. M.									

FINAL MOIST CONT

M.C. M.C. M.C. M.C. M.C. M.C. M.C. M.C. M.C. M.C. M.C. M.C. M.C.

Kiln Tests 8-11-23

1.	5.0%
2.	4.0%
3.	3.0%
4.	3.0%
5.	4.0%
6.	4.0%
7.	4.0%
Av.	3.9%

Moisture distribution 7-11-23

4.0
6.2
5.1
Total 5.2%

1 P.M.
2 P.M.
3 P.M.
1 P.M.
12 P.M.
6 P.M.
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2 A.M.
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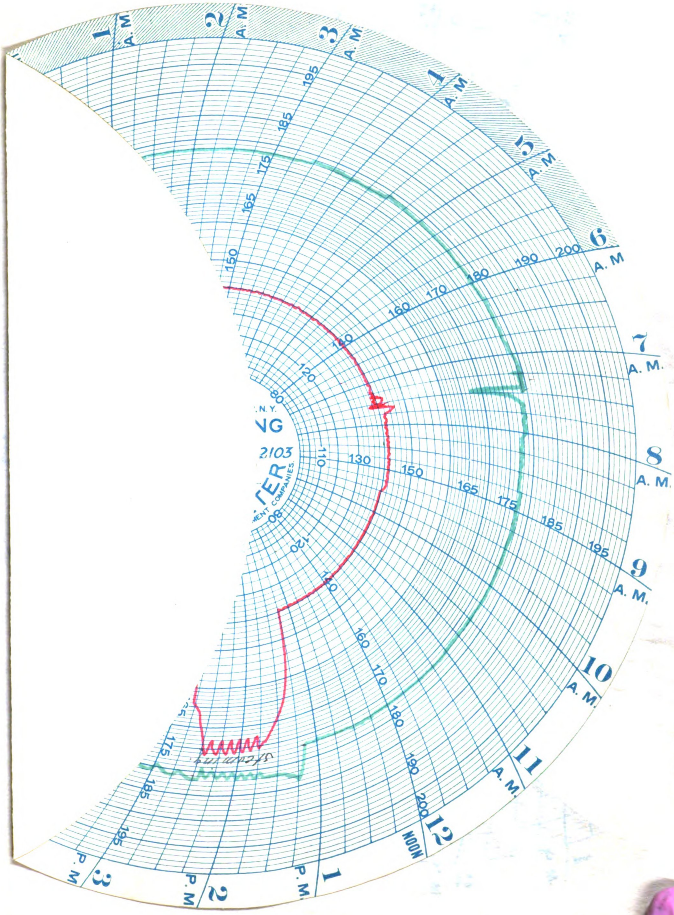
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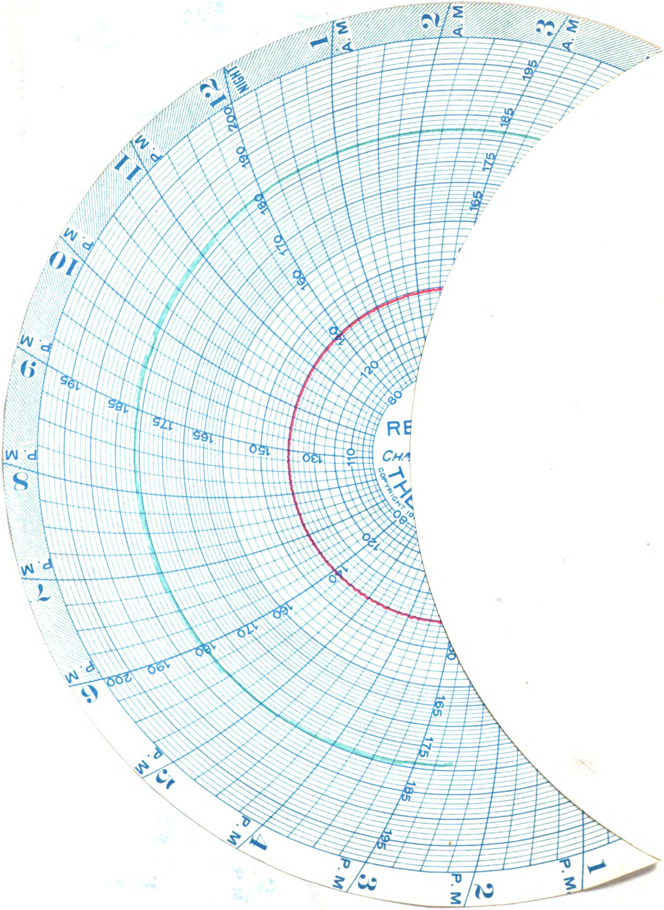
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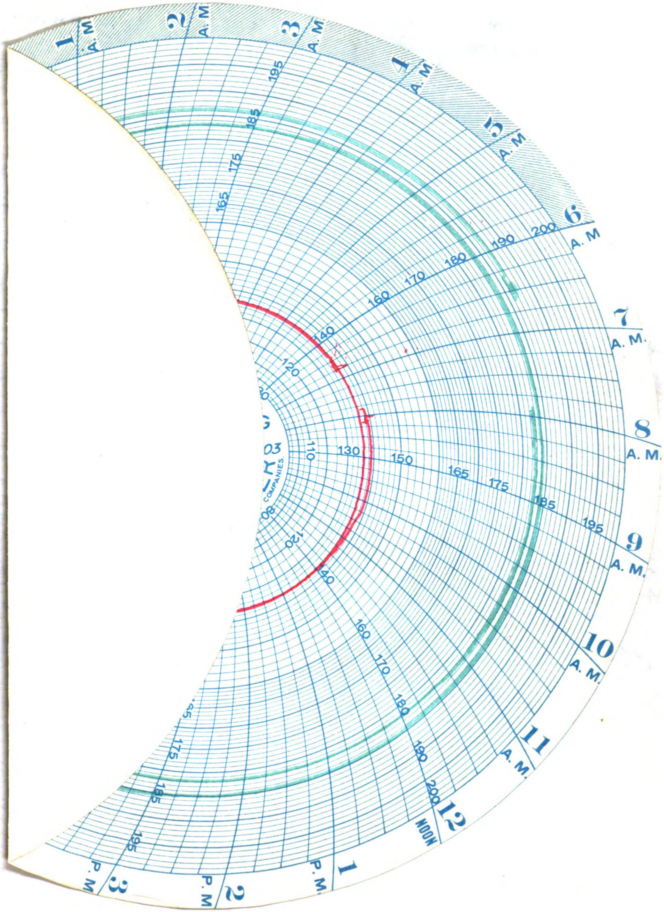

1 A.M.
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KILN RECORD

CHARGE NO. 48 KILN NO. 10 TRUCKS 7

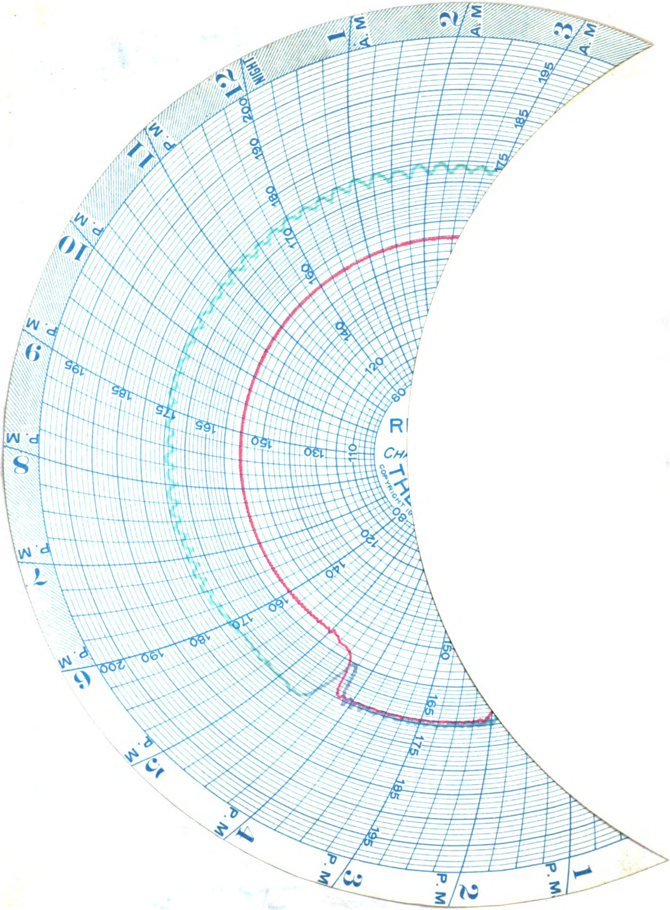
STEAM PRESSURE		STEAMING		SIZE	KIND	FEET
COIL	5#	HRS. PRO.	5	10/4	Soft Maple	
Spray	100#	HRS. FIN.	None			

DAYS	DATE	TIME OF READING		SPRAY	COIL	DAMP AIR	FRESH AIR	DEGREES WET BULB	PRESENT DRY BULB	PRESENT % HUM.	REQUIRED DRY BULB	REQUIRED % HUM.	FINAL MOIST. CONT.
1	8/13/23	11 32	M.										
		3	P. M.					170	170	100			
2	14	7	A. M.					155	174	60			M. C.
		3	P. M.					150	170	56			
3	15	7	A. M.					150	174	51			M. C.
		3	P. M.					150	174	51			
4	16	7	A. M.					150	175	50			M. C.
		3	P. M.					144	174	44			
5	17	7	A. M.					145	175	44			M. C.
		3	P. M.					145	175	44			
6	18	7	A. M.					145	175	44			M. C.
		3	P. M.					135	175	33			
7	19	7	A. M.										SAM M.C. 8-21: 4.5, 7.7, 4.1, 5.5
		3	P. M.										
8	20	7	A. M.					135	175	33			M. C.
		3	P. M.					135	183	26			
9	21	7	A. M.					135	183	26			SAM M.C. 8-20: 6.7, 16.4, 6.8, 9.9
		3	P. M.					135	183	26			
10	22	7	A. M.					136	184	26			M. C.
			P. M.										
11			A. M.										SAM M.C. 8-17: 13.1, 14.1, 10.7, 12.6
			P. M.										
12			A. M.										M. C.
			P. M.										
13			A. M.										SAM M.C. 8-16: 13.6, 14.6, 12.7, 13.6
			P. M.										
14			A. M.										M. C.
			P. M.										
			A. M.										SAM M.C. 8-15: 18.8, 21.3, 17.7, 19.2

Kiln Tests 8-22-23

1. 5.0%
2. 6.0%
3. 6.0%
4. 5.0%
5. 7.0%
6. 6.0%
7. 7.0%

Av. 6.0%


12
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COPYRIGHT

12 NIGHT
1 A. M
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3 A. M
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9 A. M.
10 A. M.
11 A. M.
12 NOON
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A. M.
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MIDNIGHT
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A. M.
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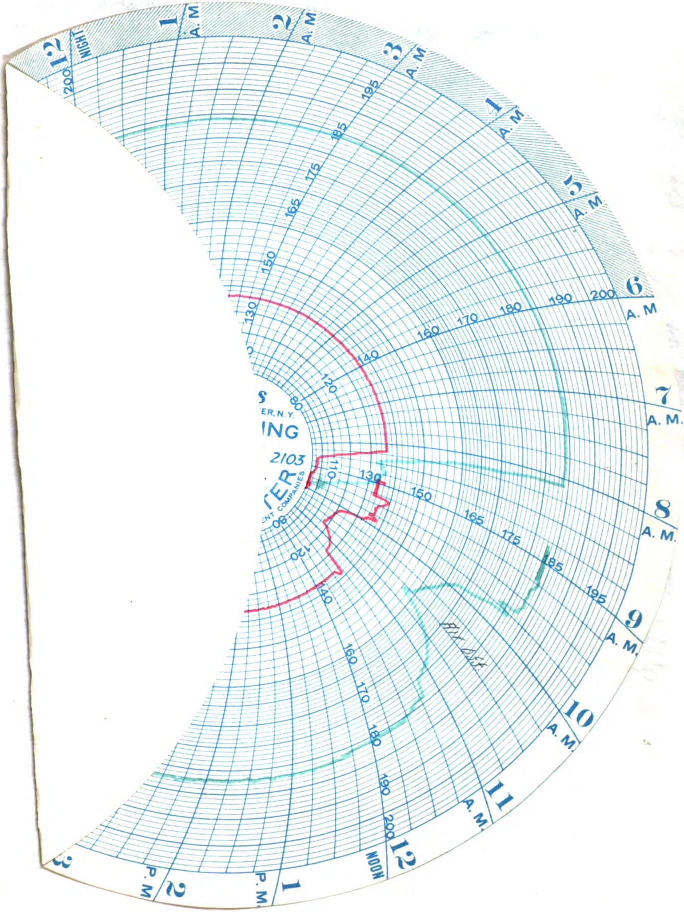
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1 A.M
2 A.M
3 A.M
4 A.M
5 A.M
6 A.M
7 A.M.
8 A.M.
9 A.M.
10 A.M.
11 A.M.
12 NOON
1 P.M.
2 P.M.
3
2103

KILN RECORD

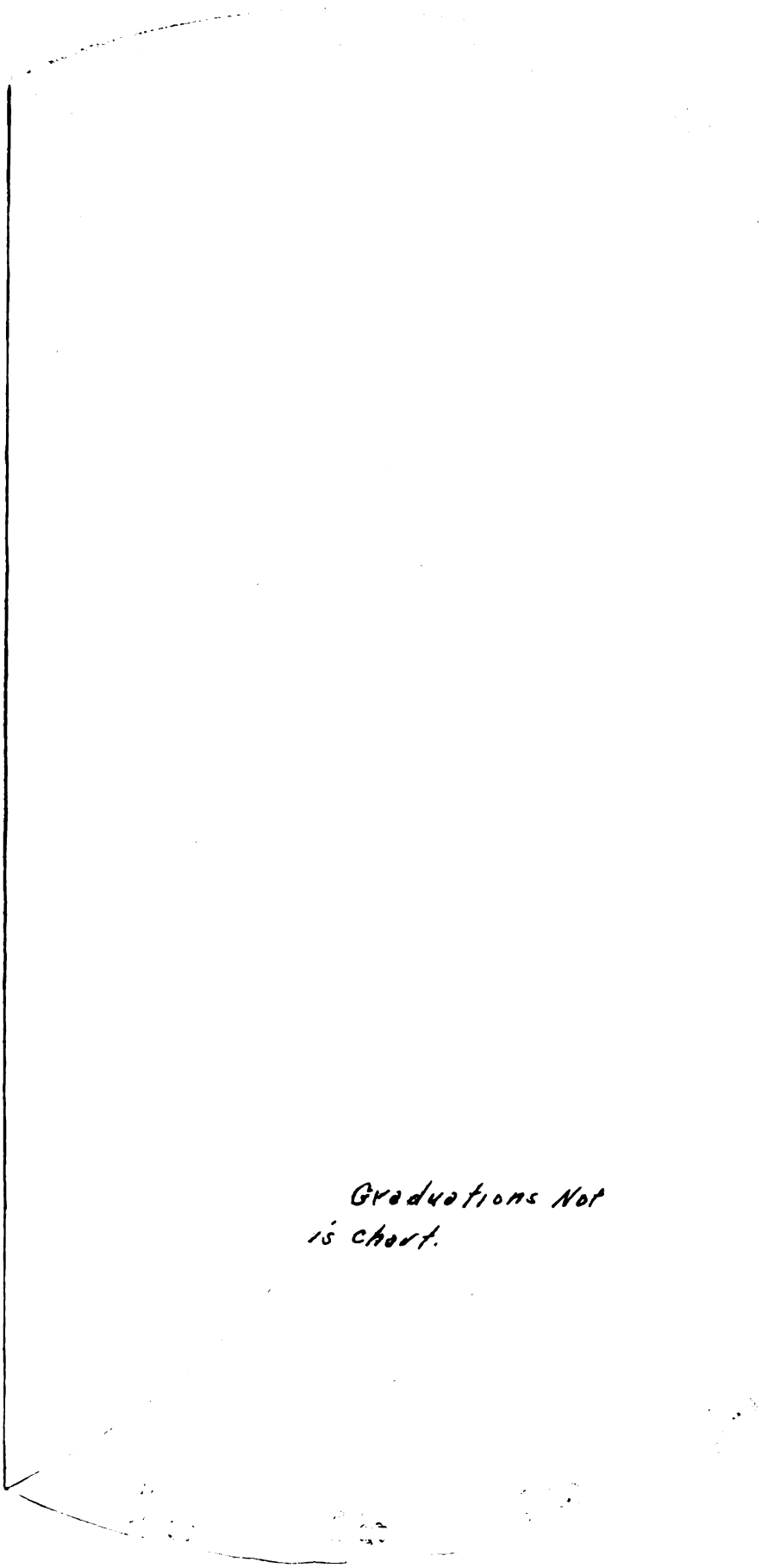
CHARGE NO. 49 KILN NO. 10 TRUCKS 7

STEAM PRESSURE		STEAMING		SIZE	KIND	FEET
COIL	5#	HRS. PRO.	6	12/4	Soft Maple	
Spray	100#	HRS. FIN.	None			

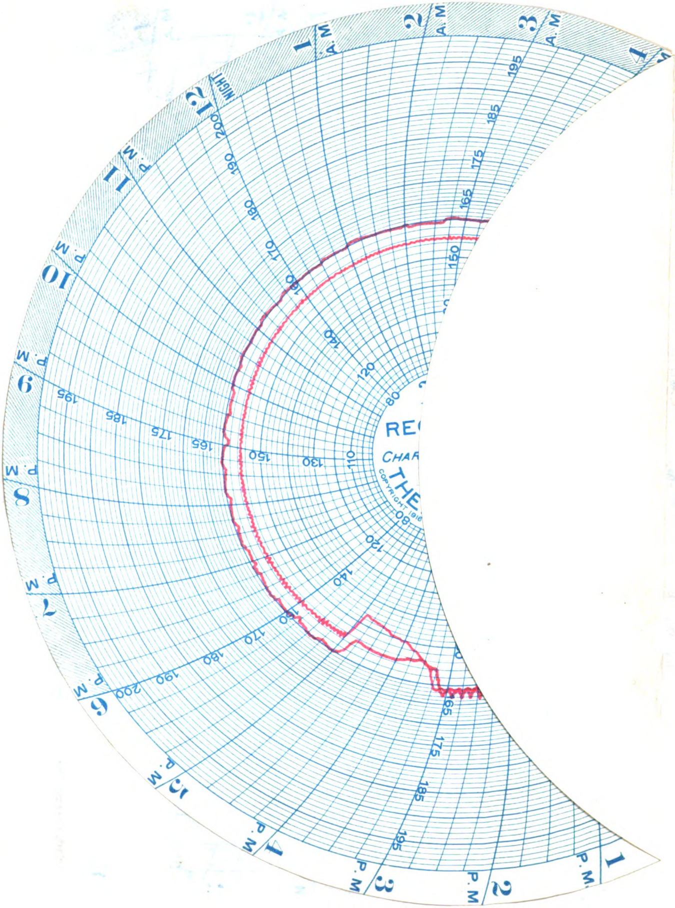
DAYS	DATE	TIME OF READING	SPRAY	COIL	DAMP AIR	FRESH AIR	DEGREE WET BULB	PRESENT DRY BULB	PRESENT % HUM.	REQUIRED DRY BULB	REQUIRED % HUM.	FINAL MOIST CONT.	M.C.
1	8/23	9:30 A. M.										Mill Tests for	
	24	5:00 P. M.					158	160	87				1. 5.0 %
2		7 A. M.					142	157	65				2. 6.0 %
		3 P. M.					142	186	67				3. 5.0 %
3	25	7 A. M.					142	158	64				4. 5.0 %
		3 P. M.					142	158	64				5. 7.0 %
4	26	7 A. M.					142	160	60				6. 6.0 %
		3 P. M.					142	160	60				7. 6.0 %
5	27	7 A. M.					142	160	60				Av. 5.7%
		3 P. M.					140	163	53				
6	28	7 A. M.					139	164	49				
		3 P. M.					139	165	48				
7	29	7 A. M.					139	170	45				
		3 P. M.					142	173	42				
8	30	7 A. M.					142	175	40				
		3 P. M.					142	175	40				
9	31	7 A. M.					132	174	31				
		3 P. M.					140	181	32				
10	9/1/23	7 A. M.					141	184	32				
		3 P. M.					140	181	33				
11	2	7 A. M.					134	182	26				
		3 P. M.					134	185	24				
12	3	7 A. M.					134	188	21				
		3 P. M.					134	188	21				
13	4	7 A. M.					138	184	30				
		P. M.											
14		A. M.											
		P. M.											

Moisture Distribution

6.2 %
7.6 %
6.1 %
Total 6.6 %



Graduations Not
is chart.



1 A. M.
2 A. M.
3 A. M.
4 A. M.
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7 A. M.
8 A. M.
9 A. M.
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12 NOON
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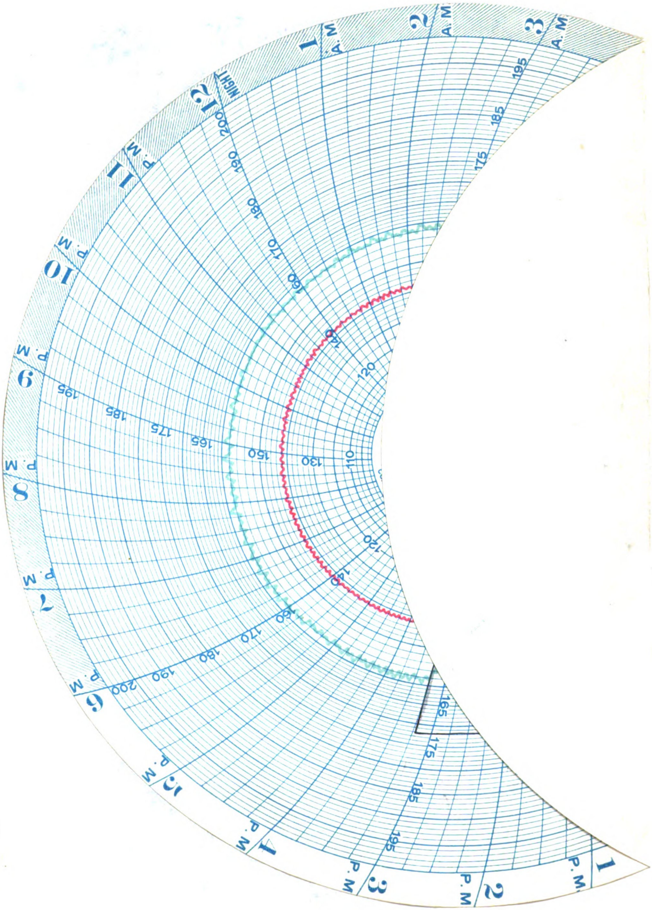

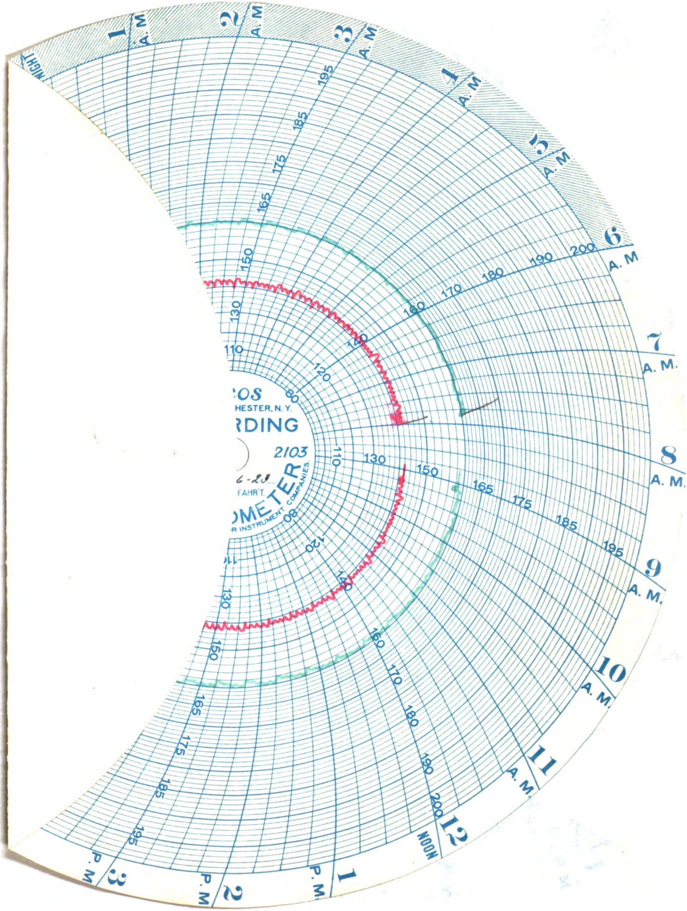
NIGHT
1 A.M
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8 A.M.
9 A.M.
10 A.M.
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NOON 12
1 P.M.
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HESTER, N.Y.
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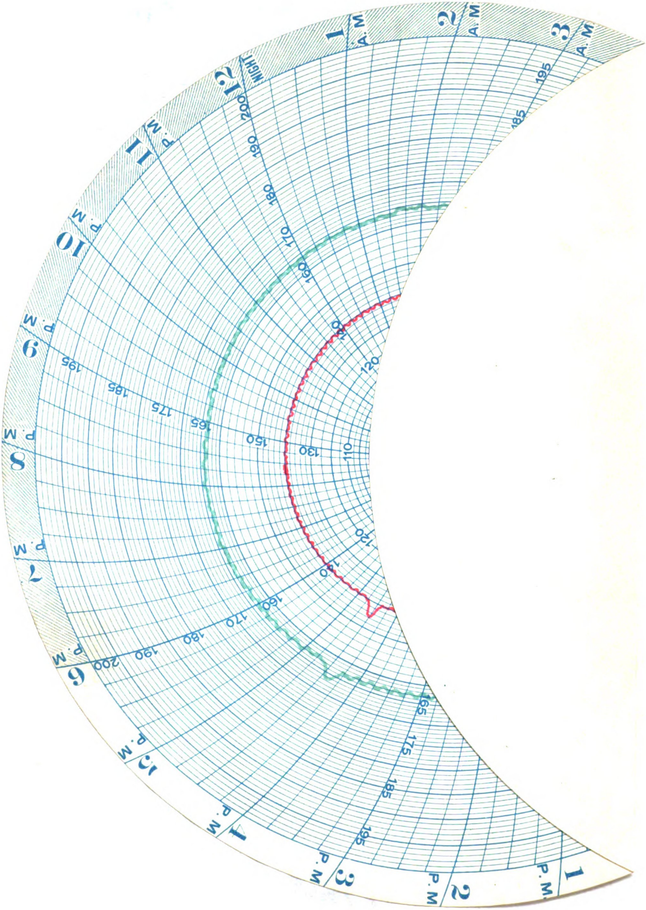

12 NIGHT
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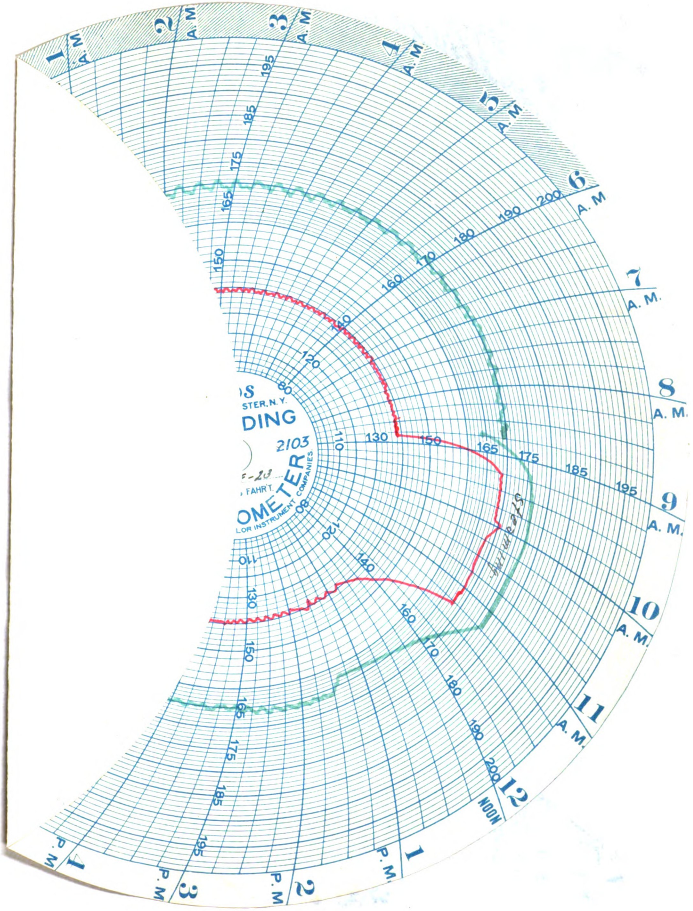
1 P.M.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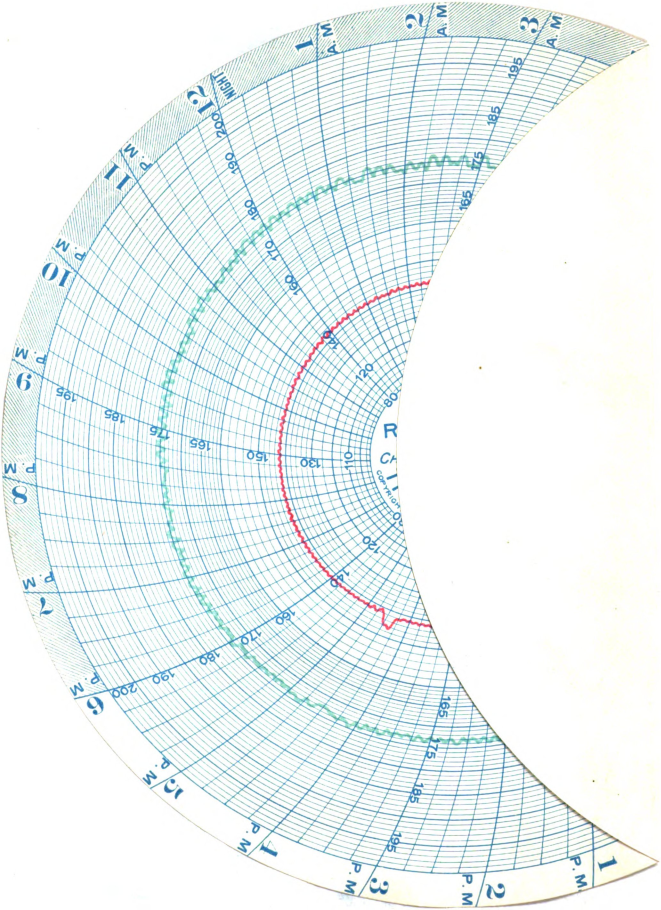
LOR INSTRUMENT COMPANIES
NOON
A. M.
P. M.


12 NIGHT
1 A.M.
2 A.M.
3 A.M.
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TAYLOR INSTRUMENT COMPANIES
1 A. M.
2 A. M.
3 A. M.
4 A. M.
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12 NOON
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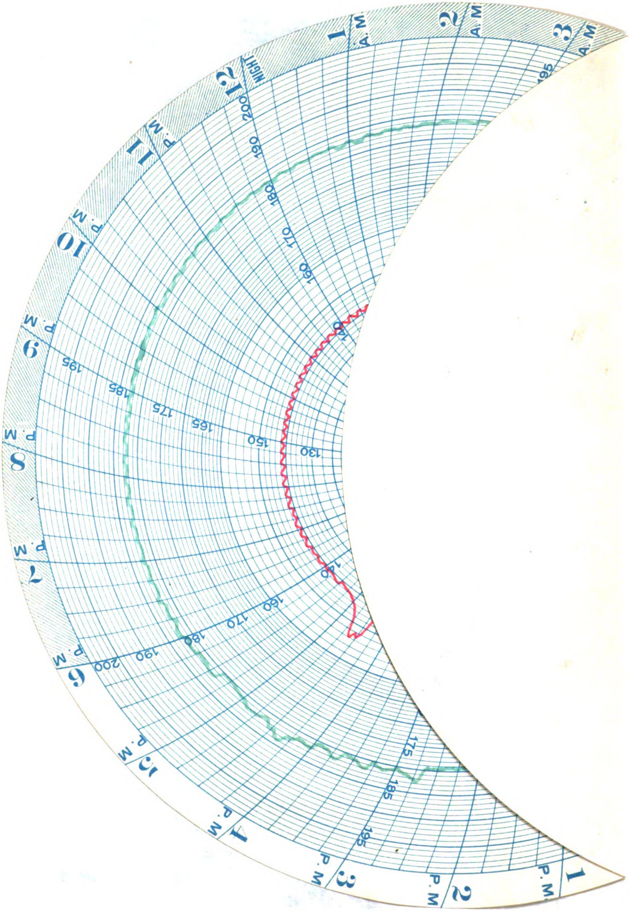
2 P. M.
3 P. M.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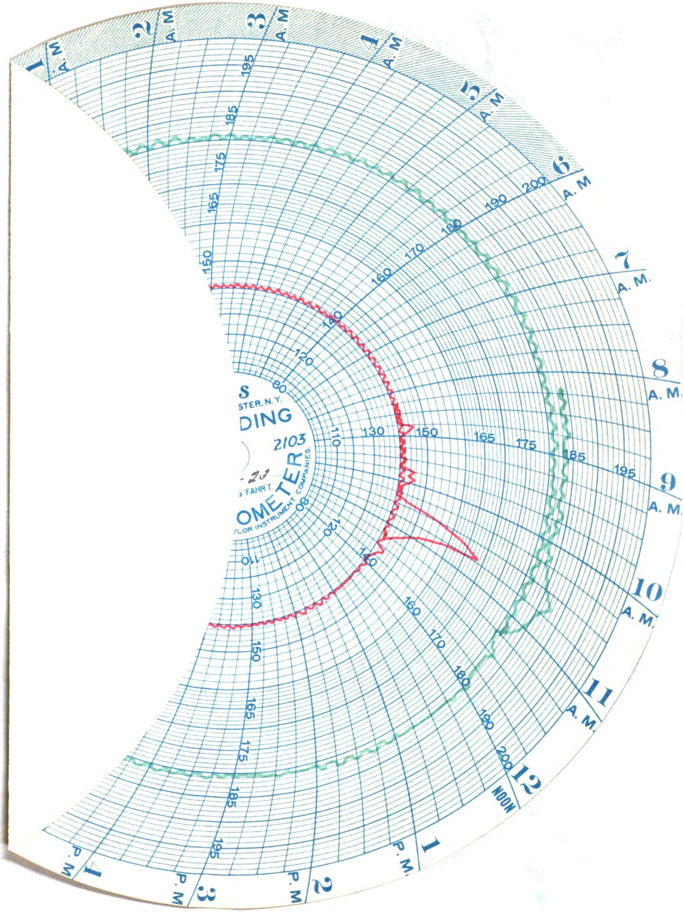
STER. N.Y.
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LOR INSTRUMENT COMPANIES.
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1 P. M.
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12 NIGHT
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HIGH
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12 NOON
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Other results obtained by using double duty thermostatic temperature control are as follows:

4/4	Cottonwood	from	41.0 %	to	7.0 %	in five days
4/4	"	"	40.0%	to	7.0 %	in four days
4/4	Chestnut	"	47.0 %	to	7.0 %	" seven "
4/4	Oak	"	38.0 %	to	6.5 %	" six "
4/4	"	"	42.0 %	to	6.0 %	" seven "
4/4	Sap Gum	"	18.0 %	to	6.0 %	" three "
4/4	Sap Gum	"	40.0 %	to	6.0 %	" five "
4/4	" "	"	43.0 %	to	6.0 %	" six "
4/4	" "	"	21.0 %	to	6.0 %	" four "
8/4	Hard Maple	"	20.0 %	to	4.0 %	" five "
8/4	Soft Maple	"	44.0 %	to	6.0 %	" nine "
8/4	Birch	"	40.0 %	to	6.5 %	" eleven "
8/4	Qtd.Sap Gum	"	32.0 %	to	6.0 %	" nine "
8/4	"	"	32.0%	to	6.0 %	" eleven "
8/4	"	"	32.0 %	to	6.0 %	" eleven "
8/4	"	"	44.0 %	to	6.5 %	" fifteen"
8/4	"	"	44.0 "	to	6.5 %	" fifteen"
10/4	Elm	"	37.0 %	to	6.5 %	" nine "
10/4	"	"	49.0 %	to	7.0 %	" eleven "
10/4	White Ash	"	48.0 %	to	7.0 %	" eleven "
10/4	Birch	"	36.0 %	to	6.0 %	" eleven "
12/4	White Ash	"	30.0 %	to	6.0 %	" nine "
12/4	"	"	33.0 %	to	6.0 %	" thirteen days
12/4	"	"	34.0 %	to	6.0 %	" fourteen "

All distribution tests were 8% or below on the center section.

CONCLUSIONS.

The following conclusions show the benefits derived from using double duty thermostatic temperature control.

1. Definite control of wet and dry bulb temperatures regardless of outside weather conditions or changes in steam pressure. Consequently less chance of spoiling the lumber thru temperatures not remaining as set.

2. Less time required and easier to set the desired conditions in the kiln.

3. Faster drying by safely using a higher temperature and lower humidity.

4. Allows greater evaporation by not having a constant supply of steam going into the kiln to hold the wet bulb temperature.

5. A kiln started late in the day can be steamed at 85% humidity over night instead of 100% as it would be if operating by hand, thus allowing some drying to take place. Excessive steaming prolongs the drying period.

6. Less case hardening consequently faster and better drying.