A Study of the Variation in Efficiency of Commercial Storage Batteries

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A Study of the Variation in Efficiency of Commercial Storage Batteries.

This thesis is an account of an attempt to find out how much a difference in the voltage to which the cell is raised on closed circuit effects the efficiency. and includes an efficiency test on a system of 16 cells designed to be used to supply the current needed in the calibration of ammeters. As this test is separate I will treat of it at the end of the thesis in connection with its Data

The

The cells tested consisted of 5 different kinds and were of two types. Those of the Planté type were the Chloride and the American and of the Faure type the Sorely, Ideal, and Accumulator. The cells were new this year with the exception of the accumulator and I followed the directions sent with the cells carefully in setting them up and had no trouble with them during the test.

The only thing that happened to any of them being a slight buckling of the outside plates of the Sorely cell.

It was

It was necessary to have the cells take about 10 amp on the charge and give out about 9 amp on the discharge.

I chose the cells that were nearest to these conditions. To show exactly what the maker guaranteed for them. I append the following table taken directly from the manufacturers price list describing the cells I used

Cell	Type	Normal charging rate	discharge rate	Capacity in amp hours at normal discharge rate
Ideal	B7	15	6-15	99
Exley	3	10-15	1-15	120
American	T2	12	12	80
Accumulator	E 5 plates	15 (?)	(15)(?)	150 (?)
Chloride	E 7 plates	10	10.	100

Cell	Weight	Plate space	Height
Ideal	35 lbs	$4\frac{1}{2}$" - $8\frac{1}{2}$"	11"
Exide	38 lbs.	$6\frac{1}{4}$" - $7\frac{3}{4}$"	$9\frac{1}{2}$"
American Accumulator Chloride	34 lbs	$7\frac{3}{4}$" $4\frac{3}{4}$"	10"
	22 lbs	$3\frac{1}{4}$" - $8\frac{1}{4}$"	$10\frac{1}{2}$"

The cells were arranged in series for charging and were discharged separately through constant German silver resistances. A current of about 9.5 amperes was used for charging and a current of about 9 amps for the discharge.

Before the tests were begun the cells were given several charges and discharges to get them in condition.

In none

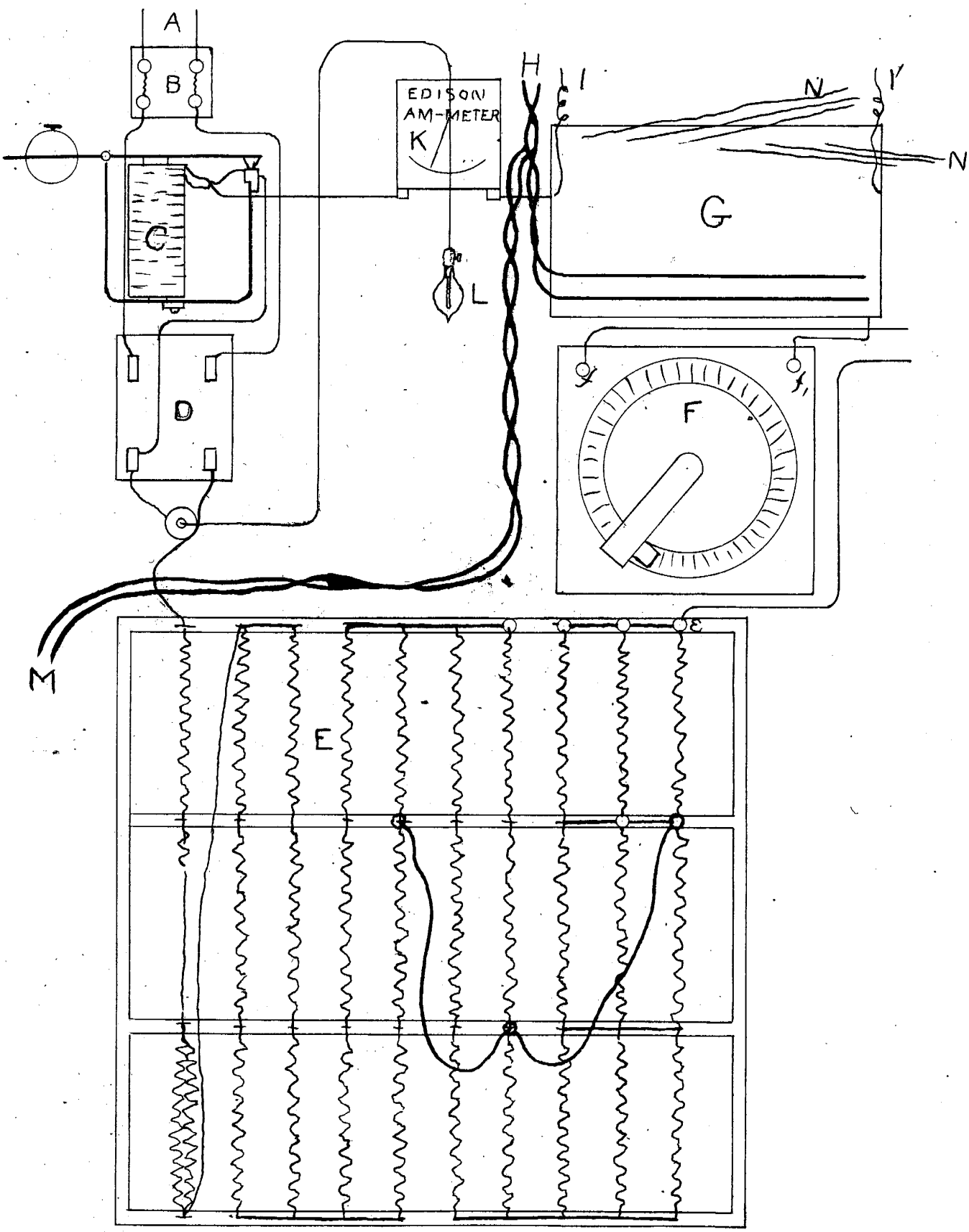
On none of the cells was the boiling point well marked. The cells were stopped from charging or discharging according to its voltage on closed circuit and no particular attention was paid to the voltage on open circuit. Except that I noticed that the voltage on open circuit some hours after discharge was about 2.1 volts and that the voltage some hours after discharge was not lower than 1.8 volts in any case. Measurements were taken every half hour on the voltage and current except at the beginning and end of the test when

when an effort was made
to stop the discharge or
change at exactly the right
voltage. The accuracy given
is obtained from the discharge
of the test having nearest
the average efficiency of
each set of tests.
I made no measurements on
the internal resistance of
the cells.

The current for the charge
was measured by a direct
reading Weston ammeter and
current of discharge was
calculated from the fall
of potential around a
German silver resistance
which resistance was
determined by comparison
with

with a standard cell and was known to within 1/10 of one percent
The fall of potential was measured by a direct reading Weston voltmeter reading to 1/300 of a volt.
Both instruments were calibrated by the Ayrton cell method which is correct to 1/10 of one percent.
The tests were in nearly all cases continuous in that all current that was measured was also all that was taken out. On account of time I found it impossible to change the discharge at once and I assumed that the

is no perceptable leakage from a well insulated cell left on open circuit for 24 hours. The results seem to show that this assumption is correct.


A
B
C
D
EDISON
AM-METER
K
H
I
L
N
N
G
F
M
E

Description of Apparatus

The board outside the storage battery room is drawn on the preceding page.

At A are the wires carrying the charging current from the dynamo room. B is a double fuse box. C is the automatic circuit breaker. D is a two pole knife switch. E is a resistance frame connected as seen.

At each circle there is a hole for a plug connection. The three plugs with their flexible connections being shown in position.

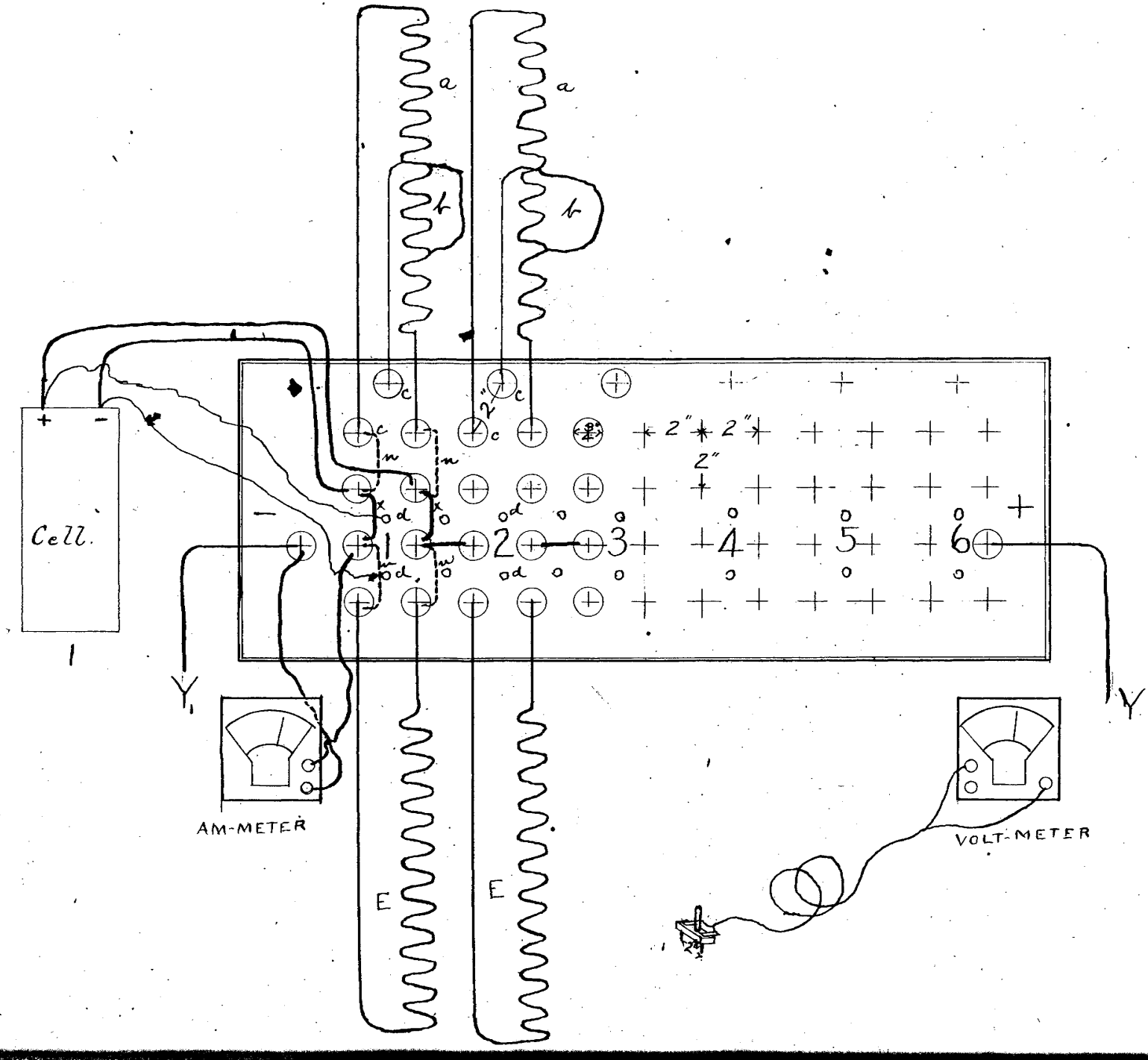
The resistance of each separate spiral one ohm

end of the whole frame 7 ohms. F is a coil of resistance of ½ an ohm which can be added or subtracted by footplug. From f and e the wire lead to any set of cells. At G is a switch for throwing the 16 cells used in ampmeter calibration in series for charging or in series-parallel for discharging. N being the wires leading to the cells. When these cells are discharging an equivalent resistance between 1 and 1' is thrown in. K is a Edison ampmeter and L an indicating lamp to show if the dynamo is in action

all

All wires which were connected with cells inside the Storage Battery room passed through holes in a piece of slate, and in all cases were carried on porcelain cleats.

The wires H are connected with room six for use in Ohm-Meter calibration and the wires go to a table near the board to be used for the same purpose.


a
a
b
b
c
c
c
c
2"
2"
2"
2"
m
m
m
m
d
d
d
d
1
2
3
4
5
6
+
−
Cell.
Y
Y1
AM-METER
VOLT-METER
E
E

On the succeeding page is a drawing showing the connection of the cells being tested.

Only one cell is shown the other being connected similarly to 2 3 etc.

A is the constant German silver resistance in series with it. E is an equivalent resistance to be thrown in the dynamo circuit when the cell is discharging. The dotted connections show the cell as discharging, and the full connections ×× as charging. As it will be seen each cell is entirely independant of the others when it is discharging

discharging.

The switch board was horizontal instead of vertical as shown. The connections being made through mercury cups placed as shown and well shellaced.

The ammeter and voltmeter with their connections are shown in position on a shelf in front of and on a level with the switch board. The voltmeter having a flexable cord and connector can by inserting the connector in c c or d d give the voltdrop around a or the volts at the cell as required.

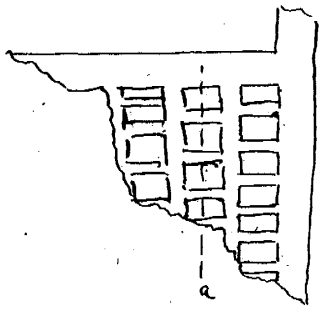
The

The charging current enters at X and leaves at X1. The cells were disposed three at the left hand two at the right of the board and were spaced about eight inches apart.

The Ideal Cell

This cell is of the Faure type having 3 positive and 4 negative plates. The plates are cast so as to have the active material in the form of pencils as shown in the two views given.

They are separated by hard rubber combs and have also thin sheets of perforated rubber interposed between each plate.



The whole element is raised from the bottom of the cell by two wedge shaped pieces of vulcanite.

The bar at a, a depending clear through the plate among great ugaddity.

This cell gave no trouble during the tests has every indication of durability though the cell does not seem to be filled for very rough mechanical usage.

The data and plots are appended. The results will be found tabulated at the end of the tests

April 3-4-5

Ideal

Charge

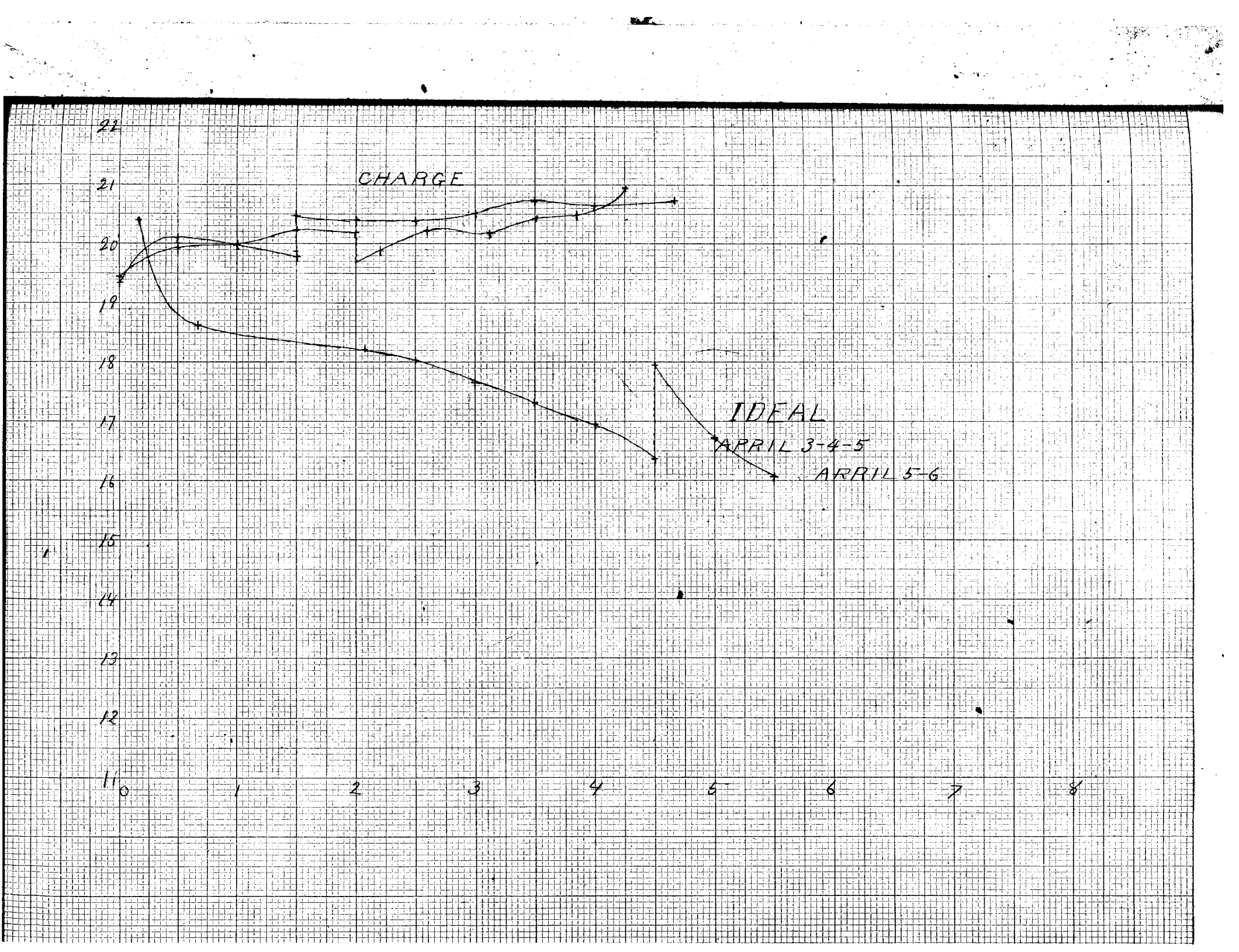
T	A	V	W	WM
3.00	9.59	2.018	19.35	290.2
3.30	9.64	2.085	20.10	603.0
4.00	9.44	2.118	19.99	599.7
4.30	9.24	2.141	19.78	296.7
9.00	9.79	2.092	20.48	307.2
9.30	9.59	2.127	20.40	612.0
10.00	9.54	2.137	20.39	611.7
10.30	9.54	2.151	20.52	615.6
11.00	9.64	2.151	20.73	621.9
11.30	9.54	2164	20.64	721.5
12.10	9.49	2.184	20.73	414.6
				5 6941

Discharge

T	A	V	W	WM
12.10	9.83	2.075	20.40	306.0
12.40	9.34	1.995	18.63	1117.8
2.05	9.27	1.965	18.22	1002.1
2.30	9.22	1.955	18.02	450.5
3.00	9.09	1.943	17.66	529.8
3.30	9.04	19.26	17.41	5223
4.00	8.98	1.896	16.96	508.8
4.30	8.79	1.863	16,37	245.5
9.00	9.31	1.929	17.96	269.4
9.30	8.87	1.886	16.73	501.9
10.00	8.69	1.849	16.07	241.1
				5 695.2

Eff = 100.02

Eff with next ch = 107.41


22
21
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7
8
CHARGE
IDEAL
ARRIL 3-4-5
ARRIL 5-6

April 5-6-9

Ideal

Charge

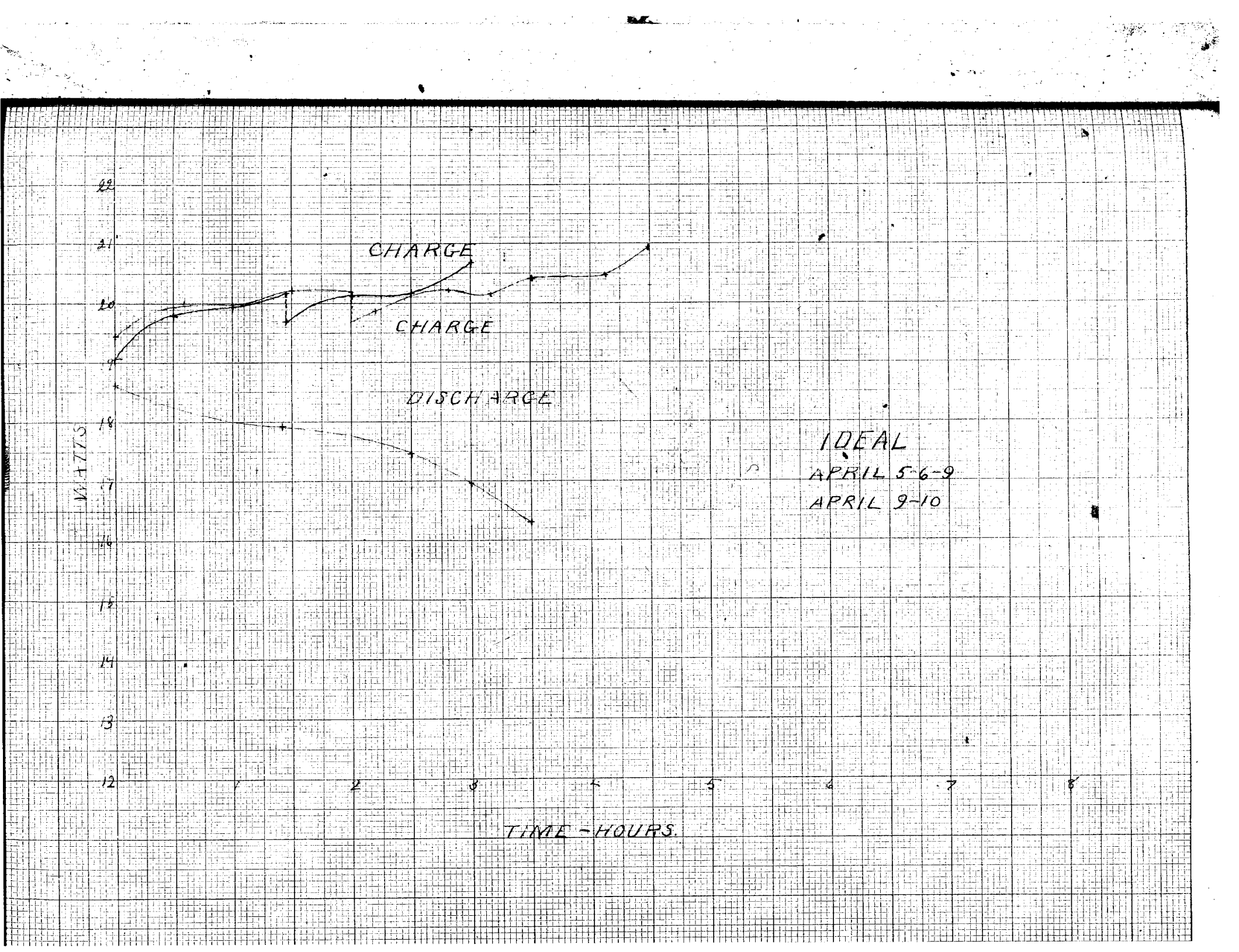
T	A	V	W	WM
10.00	9.64	2.018	19.45	209.2
10.30	9.55	2.088	19.94	598.2
11.00	9.42	2.122	19.99	599.7
11.30	9.51	2.127	20.23	606.9
12.00	9.49	2.127	20.19	302.8
9.23				
9.35	9.34	2.127	19.87	476.8
9.58	9.49	2.141	20.32	548.6
10.30	9.36	2.154	20.16	564.5
10.54	9.44	2.164	20.43	612.9
11.30	9.59	2.174	20.48	573.4
11.50	9.59	2.184	20.94	209.4
				5302.4

Discharge

T	A	V	W	WM
11.00	9.41	1.978	18.61	800.2
12.25	9.20	1.949	17.93	344.7
1.30	9.08	1.923	17.47	820.6
2.00	8.96	1.893	16.96	508.8
2.30	8.80	1.853	16.31	244.5
				3718.8

Eff = 70.13

Eff with watch = 98.11


22
21
20
9
18
7
16
15
14
13
12
WATTS
CHARGE
CHARGE
DISCHARGE
IDEAL
APRIL 5-6-9
APRIL 9-10
1
2
3
4
5
6
7
8
TIME - HOURS.

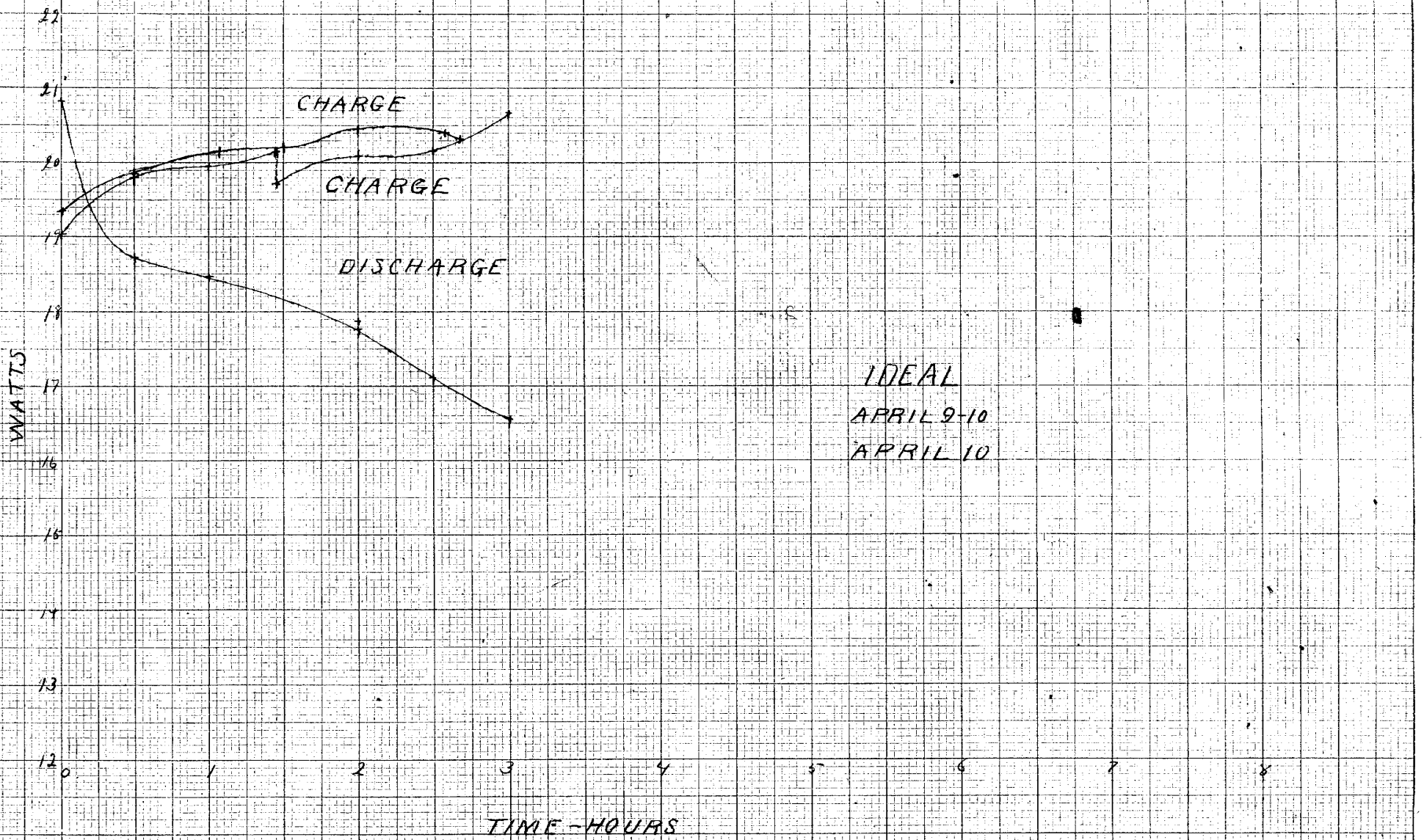
April 9-10

Ideal

Charge					Discharge				
T	A	V	W	WM	T	A	V	W	WM
2.30	9.48	2.005	19.01	285.1	11.00	10.03	2.075	20.81	312.2
3.00	9.45	2.095	19.80	594.0	11.30	9.42	1.988	18.73	561.9
3.30	9.41	2.122	19.96	598.8	12.00	9.35	1.975	18.47	831.1
3.55	9.44	2.134	20.14	201.4	1.00	9.20	1.933	17.78	800.1
9.15	9.46	2.085	19.72	453.6	1.30	8.99	1.903	17.11	513.3
10.00	9.34	2.151	20.09	743.3	2.00	8.87	1.869	16.58	248.7
10.30	9.31	2.164	20.15	604.5					3267.3
11.00	9.51	2.174	20.67	310.0					
				3790.6					

Eff = 86.19

Eff with next ch = 102.12

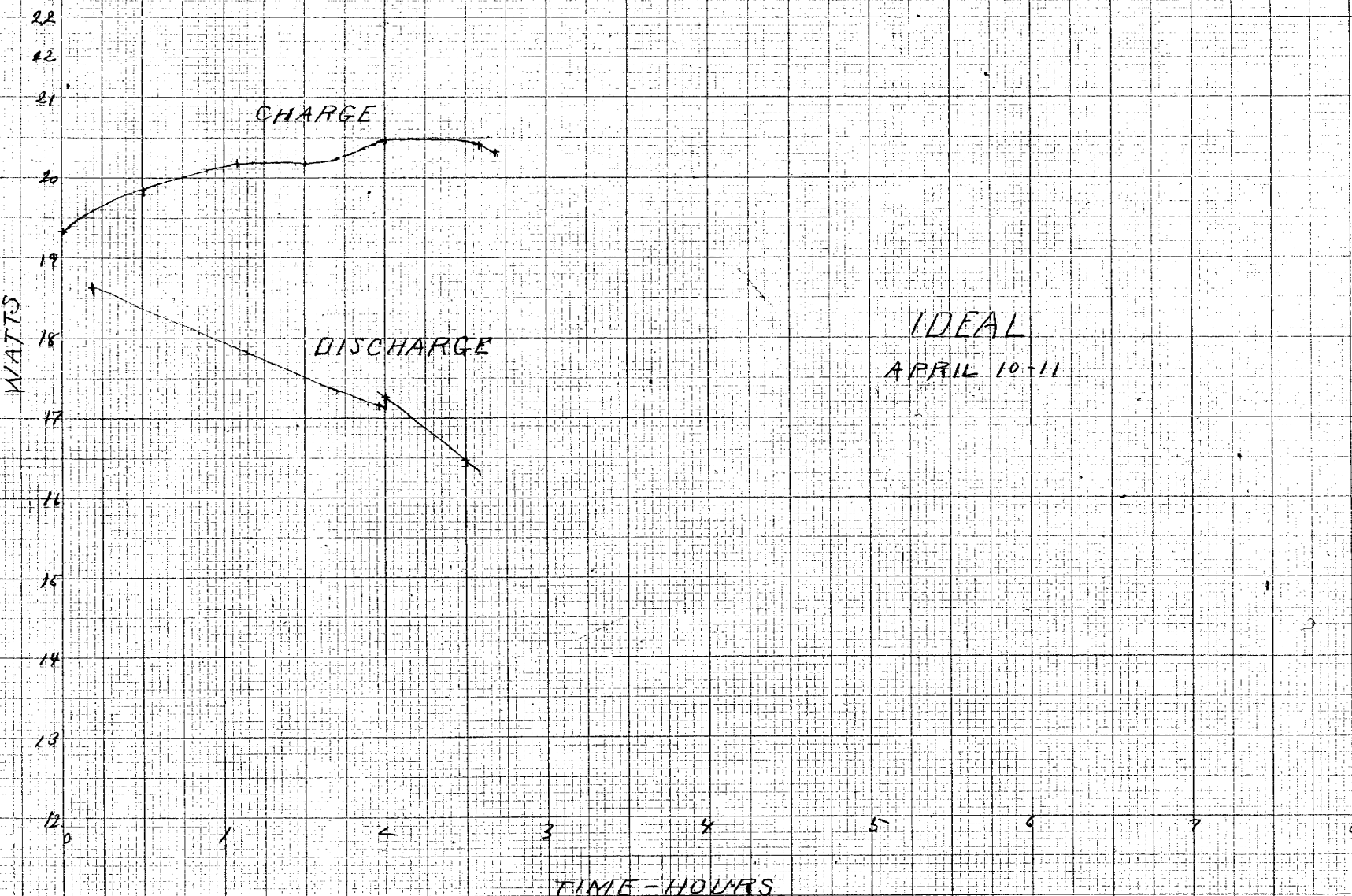

CHARGE
CHARGE
DISCHARGE
IDEAL
APRIL 9-10
APRIL 10
WATTS
TIME - HOURS
22
21
20
19
18
17
16
15
14
13
12
0
1
2
3
4
5
6
7
8

April 10-11

Ideal

Charge					Discharge				
T	A	V	W	WM	T	A	V	W	WM
2.00	9.54	2.028	19.35	290.2	9.12	9.38	1.985	18.62	986.9
2.30	9.39	2.115	19.86	655.4	10.57	8.96	1.916	17.17	944.4
3.05	9.44	2.137	20.17	605.1	11.00				
3.30	9.41	2.144	20.18	544.9	2.00	9.01	19.19	17.29	276.6
4.00	9.49	2.157	20.47	675.5	2.32	8.92	1.849	16.49	313.3
4.35	9.39	2.174	20.41	387.8	2.35				2521.2
4.39	9.36	2.174	20.33	40.7					
				3199.6					

η = 78.79%



IDEAL

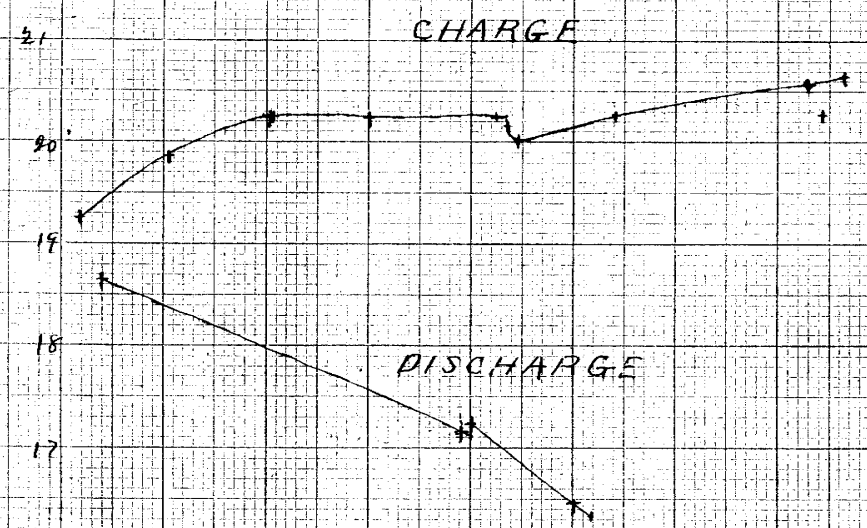
APRIL 10-11

April 11-12

Ideal

Charge					Discharge				
T	A	V	W	WM	T	A	V	W	WM
2.35	9.49	2.028	19.25	269.5					
3.03	9.39	2.115	19.86	575.9					
3.33	9.49	2.134	20.25	587.2					
4.00	9.44	2.141	20.21	666.9					
4.37	9.39	2.154	20.23	384.4					
4.39									
9.04	9.63	2.095	20.17	40.3					
9.07	9.39	2.131	20.01	320.2					
9.37	9.39	2.161	20.29	568.1					
10.03	9.46	2.171	20.54	411.8					
10.16	9.49	2.174	20.63	123.8					
				3938.1					

Eff with last discharge = 64.02%



IDEAL
APRIL 11-12
APRIL 11

WATTS

21
20
19
18
17
16
15
14
13
12
11

0 1 1 2 3 4 5 6 7 8

TIME - HOURS

April 11-12-16-17

Ideal

Charge

T	A	V	W	WM
2.35	9.49	2.028	19.25	269.5
3.03	9.39	2.115	19.86	575.9
3.33	9.49	2.134	20.25	587.2
4.00	9.44	2.141	20.21	666.9
4.37	9.39	2.154	20.23	384.4
4.39				
9.04	9.63	2.095	20.17	40.3
9.07	9.39	2.131	20.01	320.2
9.37	9.39	2.161	20.29	568.1
10.03	9.46	2.171	20.54	411.8
10.16	9.49	2.174	20.63	1238
10.15				
10.17	9.54	2.154	20.53	246.4
10.37	9.51	2.188	20.79	457.8
11.00	9.51	2.194	20.84	540.2
11.30	9.59	2.207	21.14	634.2
12.00	9.49	2.217	21.02	630.6
12.30	9.47	2.234	21.13	316.9
				6774.1

Charge

T	A	V	W	WM
2.10				
2.15	9.48	2.217	21.02	273.3
2.30	9.48	2.227	21.11	464.4
3.00	8.78	2.241	19.68	295.2
9.00				
9.03	9.46	2.214	20.92	355.6
9.30	9.56	2.241	21.40	699.2
10.00	9.41	2.241	21.07	632.1
10.30	9.41	2.294	21.56	646.8
11.00	9.41	2.317	21.78	326.7
2.10				
2.15	9.46	2.257	21.33	277.3
2.30	9.45	2317	21.77	195.9
2.32				4166.5
				6774.1
				10940.6
			Eff	= 71.95

Ideal

Discharge					Discharge				
T	A	V	W	WM	T	A	V	W	WM
2.32	10.09	2.141	21.60	43.2	2.00				
2.35	9.46	2.052	19.41	231.7	2.03	8.86	1.923	17.04	289.7
3.00	9.19	1.998	18.36	574.1	2.30	8.68	1.886	16.37	540.2
3.32	9.15	1.988	18.19	545.7	3.10	8.60	1.839	15.99	527.7
4.00	9.13	1.985	18.12	289.9	3.35	8.40	1.814	15.24	182.9
4.02									1540.5
8.07	9.52	2.015	19.18	38.4					6329.8
8.10	9.46	1.992	18.84	207.2					7870.3
8.30	9.07	1.978	17.94	398.5					
9.00	9.07	1.975	17.91	626.8					
9.39	9.07	1.965	17.82	534.6					
10.00	9.07	1.962	17.80	480.7					
10.34	9.01	1.953	17.61	514.8					
11.00	8.97	1.943	17.43	488.0					
11.30	8.89	1.933	17.18	515.4					
12.00	8.89	1.926	17.12	513.6					
12.30	8.83	1.909	16.86	337.2					
1235				6329.8					

April 17-18-20

Ideal

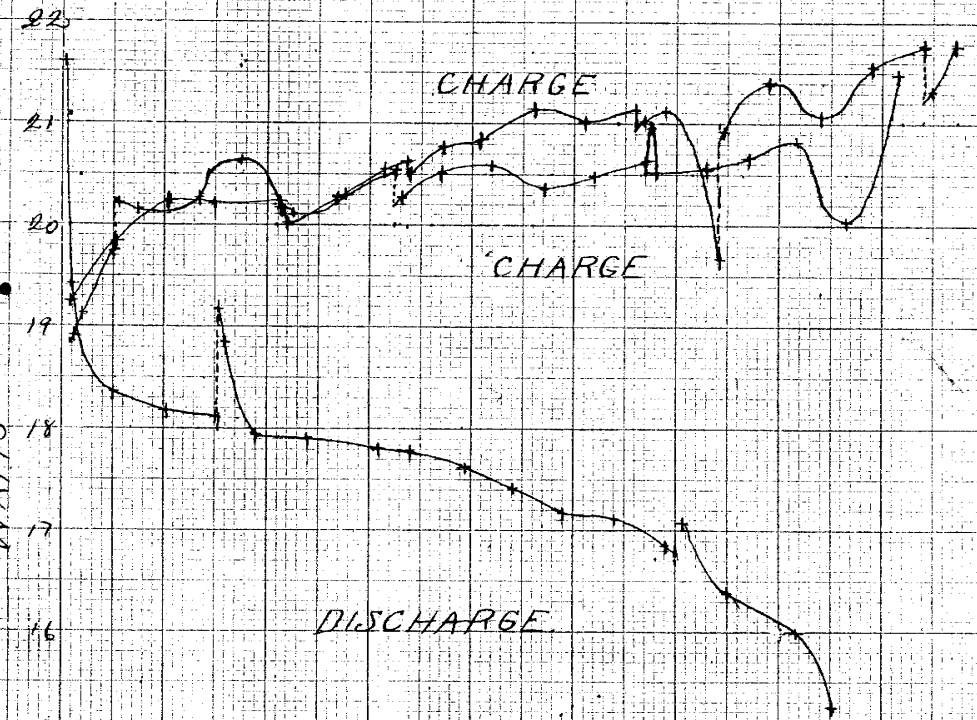
Charge

T	A	V	W	WM
3.39	9.42			
3.41	9.42	2.008	18.92	75.7
3.46	9.44	2.028	19.12	191.2
4.00	9.61	2.062	19.75	138.5
9.45				
9.48	9.55	2.118	20.21	181.9
10.00	9.49	2.124	20.16	504.0
10.38	9.56	2.124	20.28	608.4
11.00	9.69	2.127	20.61	562.8
11.30	9.46	2.127	20.10	603.0
12.00	9.54	2.141	20.30	609.0
12.30	9.59	2.144	20.54	308.1
2.02				
2.04	9.54	2.127	20.27	304.0
2.30	9.55	2.157	20.52	574.6
3.00	9.53	2.161	20.59	617.7
3.30	9.34	2.174	20.37	611.1
4.00	9.39	2.184	20.49	614.7
				6604.7

C. Charge

T	A	V	W	WM
4.30	9.39	2.197	20.61	309.2
9.02				
9.04	9.75	2.154	20.98	62.9
9.06	9.49	2.164	20.51	348.7
9.37	9.36	2.187	20.54	695.6
10.05	9.33	2.217	20.66	169.0
10.30	9.32	2.237	20.83	590.4
11.00	9.37	2.247	20.03	600.9
11.30	9.46	2.274	21.49	322.4
				3099.1
				6604.7
				9703.8

E/H = 81.10%



IDEAL

APRIL 11-12-16-17

EFF = 71.95 %

APRIL 17-18-20

EFF = 81.10 %

WATTS

22
21
20
19
18
17
16
15
14
13
12

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16

TIME-HOURS

April 27-30

Ideal

Discharge

T	A	V	W	WM
10.20	9.88	2.141	21.37	64.1
10.25	9.24	2.015	18.62	93.1
10.30	9.15	1.995	18.25	127.7
11.00	9.10	1.978	17.99	539.7
11.30	9.07	1.975	17.91	537.3
12.00	9.04	1.972	17.82	534.6
12.30	9.04	1.968	17.79	120.9
2.16	8.89	1.953	17.38	104.3
2.30	8.89	1.953	17.36	381.9
3.00	8.86	1.943	17.21	753.5
4.00	8.79	1.926	16.93	507.9
8.55				
9.00	8.89	1.953	17.14	342.8
9.30	8.79	1.929	16.89	506.7
10.00	9.77	1.919	16.84	757.8
11.00	8.60	1.886	16.22	729.9
11.30	8.51	1.859	15.82	711.9
12.30	8.40	1.833	15.40	462.0
				7276.1

Discharge

T	A	V	W	WM
2.15				
2.18	8.60	1.876	16.13	145.2
2.30	8.51	1.859	15.82	332.2
3.00	8.32	1.813	15.09	286.7
3.18	8.24	1.796	14.80	57.2
				823.3
				7276.1
		Total		8099.4

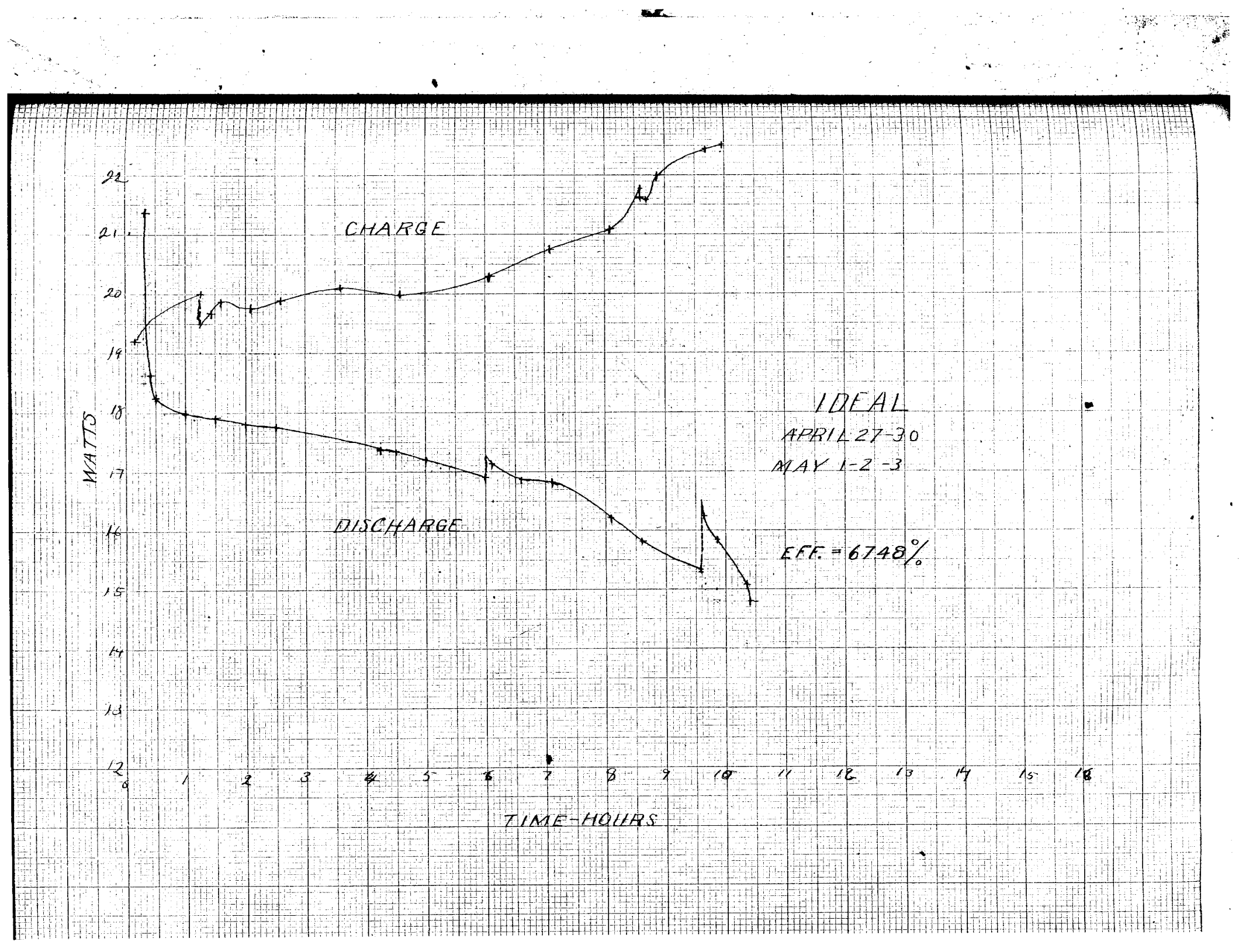
Eff = 67.48 %

Ideal

May 1-2-3

Charge

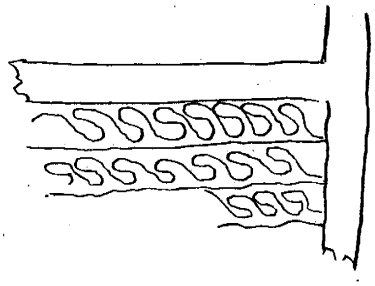
T	A	V	W	WM
3.09	9.59	2.002	19.20	633.9
4.15	9.49	2.108	20.00	660.0
9.10				
9.15	9.49	2.075	19.69	256.0
9.30	9.49	2.095	19.88	437.4
10.00	9.44	2.095	19.78	593.4
10.30	9.55	2.108	19.90	895.5
11.30	9.49	2.118	20.10	1200.0
12.30	9.39	2.127	19.97	1498.0
2.00	9.41	2.157	20.30	152.3
3.00	9.54	2.184	20.84	1250.4
4.00	9.54	2.211	21.09	949.0
4.30	9.79	2.227	21.80	327.0
9.55	9.79	2.207	21.61	64.8
10.00	9.52	2.267	21.58	151.1
10.10	9.59	2.294	22.00	660.0
11.00	9.49	2.367	22.46	741.2
11.15	9.49	2.374	22.53	157.7
				12002.0


22
21
20
19
18
17
16
15
14
13
12
WATTS
CHARGE
DISCHARGE
IDEAL
APRIL 27-30
MAY 1-2-3
EFF. = 67.48%
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
TIME-HOURS

The Sorley Cell

This cell is of the Faure Type and consists of three positive and four negative plates, separated in the same way as those in the Ideal cell. The element is held up from the bottom of the cell by two ribs in the glass.

The plates are built up of ribbon lead as shown



Negatives and positives being made in the same way.

The active material for this cell, red lead, is pressed into the interices.

This form of plate has little resistance against buckling. Indeed the outer plates of the cell & tested did buckle somewhat though the cell was used in a careful manner.

The plates are spaced about $\frac{3}{8}$ of an inch apart or $\frac{1}{8}$ of an inch more than the ideal spacing.

Sorley

Charge

T	A	V	W	WM
12.40	9.64	2.025	1952	780.8
-35 min	9.58	2.026	19.79	
2.05	9.52	2.108	2.007	1103.8
2.30	9.59	2.125	20.38	611.4
3.00	9.64	2.127	20.50	615.0
3.30	9.44	2.127	20.08	602.4
4.00	9.44	2.127	20.08	602.4
4.30	9.49	2.141	2032	304.8
9.00	9.49	2.082	19.76	296.4
9.30	9.41	2.141	20.15	604.5
10.00	9.54	2.141	20.32	609.6
10.30	9.46	2.154	20.38	611.4
11.00	9.49	2.161	20.41	612.3
11.30	9.54	2.171	2071	621.3
12.00	9.59	2.174	20.85	312.7
				8288.8
				692.6
				75962

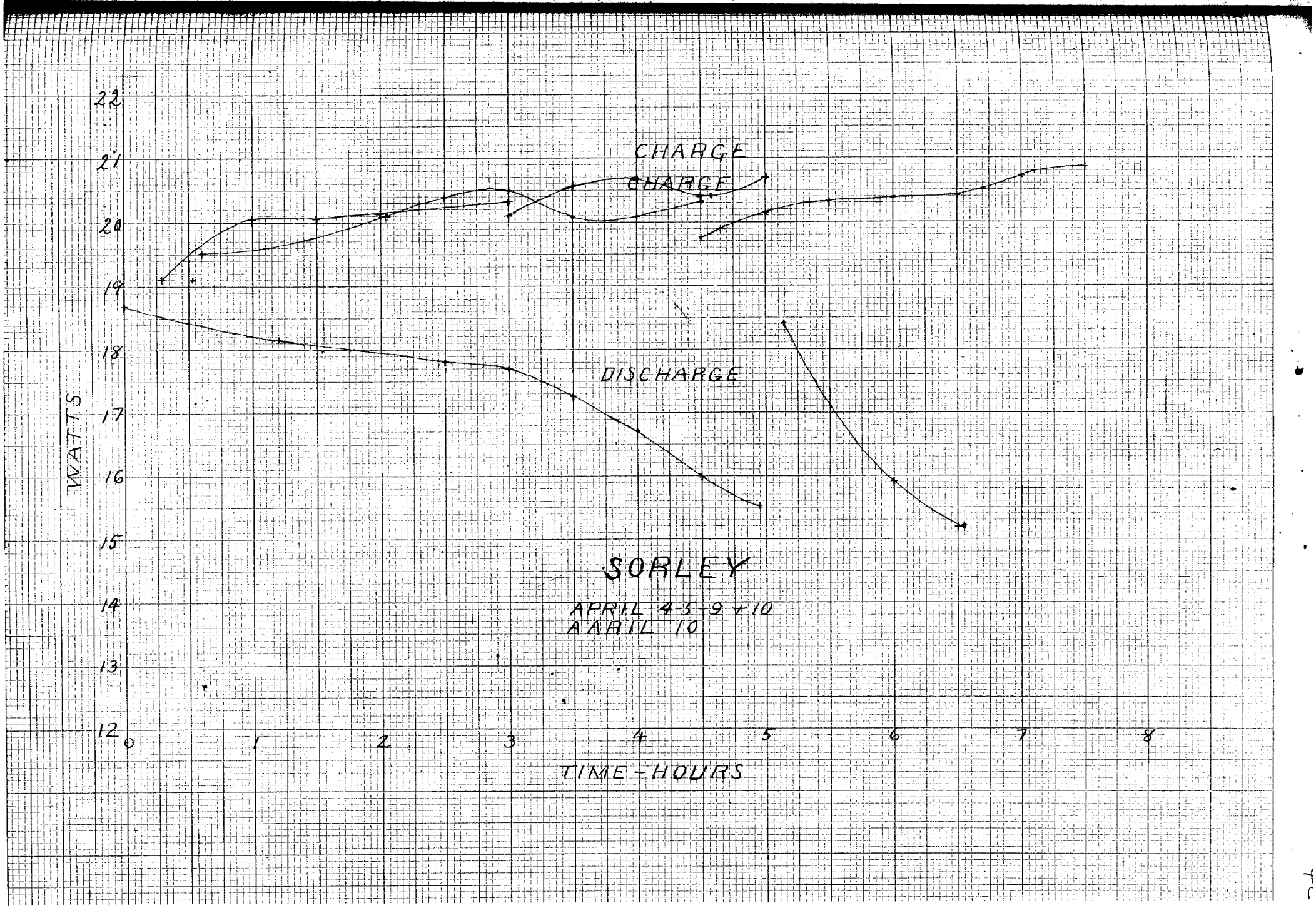
Discharge

T	A	V	W	WM
11.00	9.49	1.968	1.868	747.2
12.25	9.30	1.953	1.816	136.2
1.30	9.25	1.936	1.781	890.5
2.00	9.18	1.926	17.70	531.0
2.30	9.07	1.903	1726	517.8
3.00	8.94	1.869	16.71	501.3
3.30	8.75	1.827	15.97	479.1
3.55	8.63	1.800	15.53	155.3
9.15	9.49	1.941	18.42	368.4
10.00	8.75	1.820	15.92	636.8
10.30	8.56	1.774	15.19	258.2
10.34	8.56	1.777	15.21	30.4
				5252.2

Eff = 78.29 %

With next Charge

Eff = 94.80 %

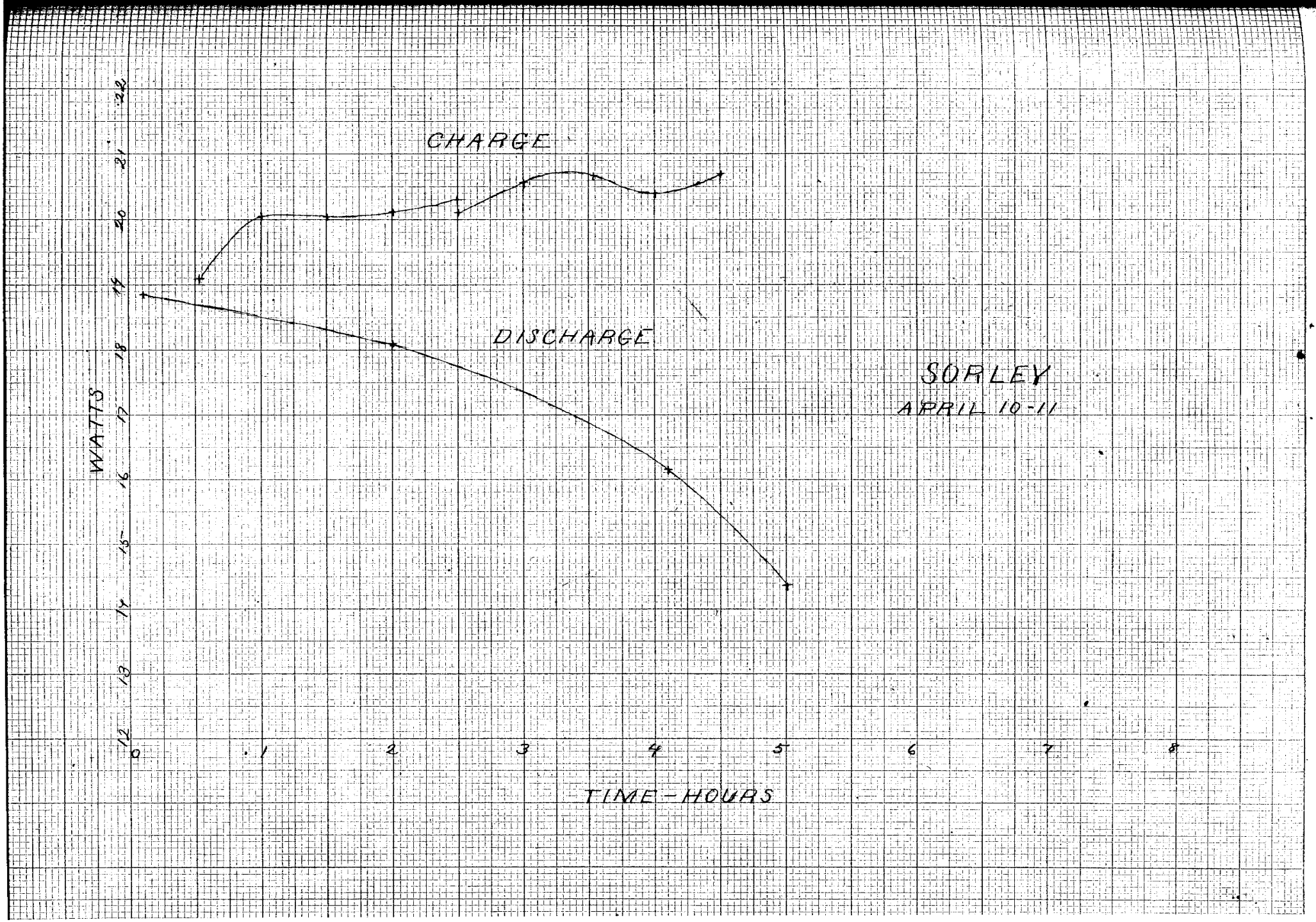

CHARGE
CHARGE
DISCHARGE
WATTS
22
21
20
19
18
17
16
15
14
13
12
0
1
2
3
4
5
6
7
8
TIME - HOURS
SORLEY
APRIL 4-3-9 + 10
AARIL 10

April 10 + 11

Sorley

Charge					Discharge				
T	A	V	W	WM	T	A	V	W	WM
10.34	9.44	2.023	19.10	210.1	9.12	9.49	1.985	18.84	1017.4
11.00	9.49	2.112	20.04	601.2	11.00	9.28	1.949	18.09	2152.7
11.30	9.42	2.127	20.04	601.2	1.10	8.82	1.843	16.25	1462.5
12.00	9.44	2.134	20.13	603.9	2.00	8.32	1.727	14.37	4317
1.00	9.44	2.151	20.31	609.3					5064.3
2.00	9.49	2.118	20.10	301.5					
2.30	9.53	2.157	20.56	616.8					
3.05	9.53	2.167	20.65	619.5					
3.30	9.38	2.174	20.39	611.7					
4.00	9.49	2.181	20.70	460.5					
				5540.3					

Eff = 91.41%


CHARGE
DISCHARGE
SORLEY
APRIL 10-11
WATTS
22
21
20
19
18
17
16
15
14
13
12
0
1
2
3
4
5
6
7
8
TIME - HOURS

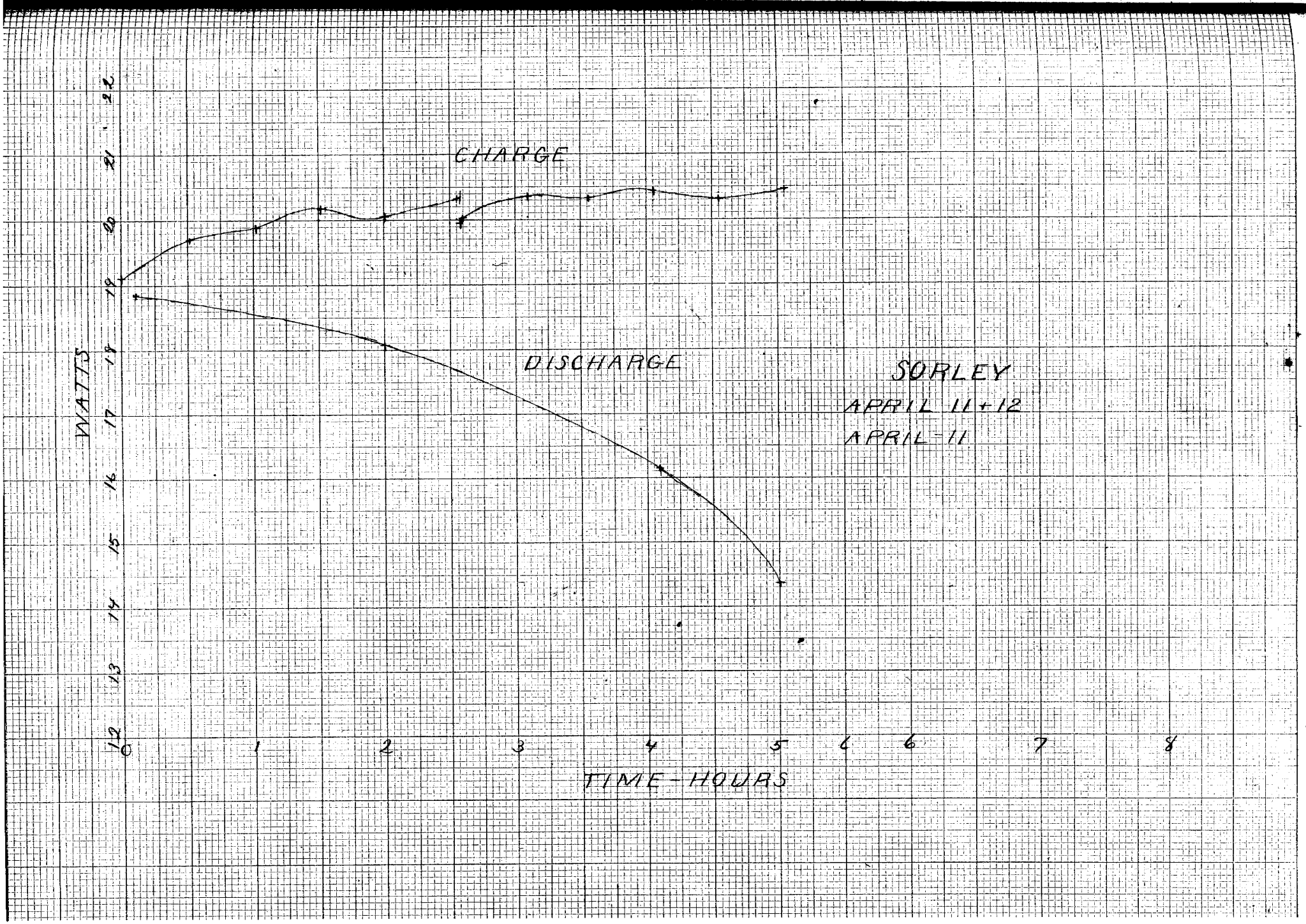
April 11 + 12.

Sorley

Charge					Discharge				
T	A	V	W	WM	T	A	V	W	WM
2.00	9.39	2.025	19.01	285.2					
2.32	9.44	2.087	19.70	291.0					
3.03	9.41	2.112	19.87	596.1					
3.33	9.51	2.122	20.18	605.4					
4.00	9.42	2.127	20.04	661.3					
4.37	9.49	2.141	20.32	426.7					
4.39									
9.04	9.53	2.095	19.96	20.0					
9.07	9.43	2.122	20.01	340.2					
9.37	9.49	2.147	20.36	570.1					
10.03	9.44	2.154	20 33	508.2					
10.30	9.46	2.161	20.44	613.2					
11.00	9.39	2.164	20.32	609.6					
11.30	9.41	2.174	20.46	306.9					
				6033.9					

With last Discharge

Eff = 83.93%


CHARGE
DISCHARGE
SORLEY
APRIL 11+12
APRIL-11
WATTS
22
21
20
19
18
17
16
15
14
13
12
0
1
2
3
4
5
6
7
8
TIME-HOURS

71.61
77.10
88.64
85.37
322.72
80.68

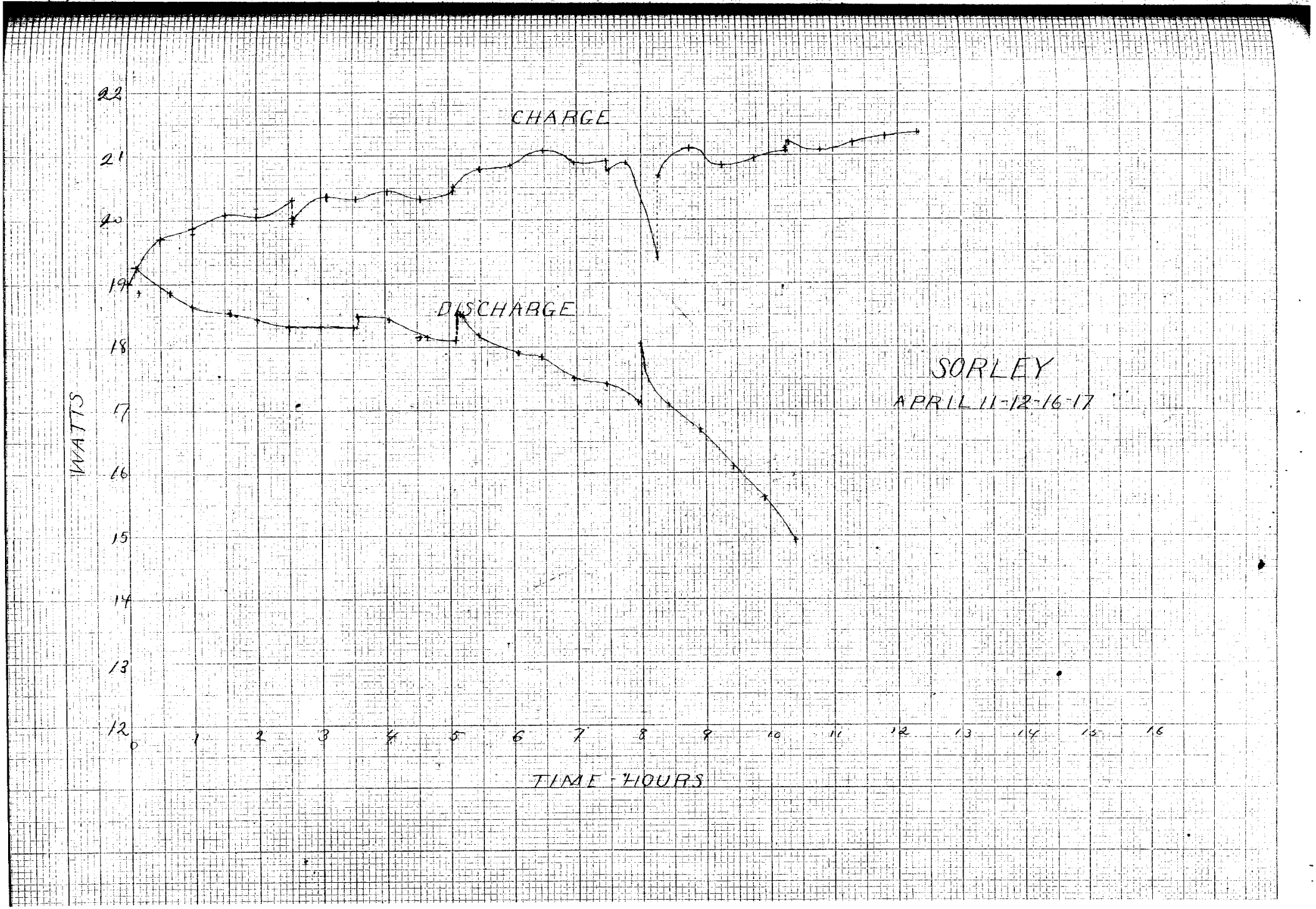
April 11-12-1911

Sorley

Charge					Charge				
T	A	V	W	WM	T	A	V	W	WM
2.00	9.39	2.025	19.01	285.2	11.30	9.59	2.197	21.07	632.1
2.32	9.44	2.087	19.70	291.0	12.00	9.49	2.204	20.89	626.7
3.03	9.41	2.112	19.87	596.1	12.30	9.48	2.207	20.92	313.8
3.33	9.51	2.122	20.18	605.4	2.10				
4.00	9.42	2.127	20.04	661.3	2.15	9.49	2.191	20.79	27.0.3
4.37	9.49	2.141	20.32	426.7	2.30	9.49	2.204	20.89	459.6
4.39					3.00	8.79	22.07	19.40	291.0
9.04	9.53	2.095	19.96	20.0	9.00				
9.07	9.43	2.122	20.01	3402	9.03	9.46	21.87	20.69	351.8
9.37	9.49	2.147	20.36	570.1	9.30	9.56	22.07	21.10	590.8
10.03	9.44	2.154	20.33	508.2	10.00	9.41	2.217	20.86	625.8
10.30	9.46	2.161	20.44	613.2	10.30	9.41	2.227	20.96	628.8
11.00	9.39	2.164	20.32	609.6	11.00	9.41	2.237	21.05	315.7
11.30	9.41	2.174	20.46	306.9	2.10	9.47			
10.15					2.15	9.46	2.231	21.20	275.6
10.17	9.54	2.161	20.52	246.2	2.30	9.45	2.231	21.08	463.8
10.37	9.51	2.184	20.77	456.9	3.00	9.42	2.251	21.20	657.2
11.00	9.51	2.193	20.85	542.1	3.32	9.42	2.261	21.30	639.0
				7260.0					7132.0

Corley 1

Charge.					Discharge.				
T	A	V	W	WM	T	A	V	W	WM
4.00	9.39	2.274	21.35	341.6	9.12				
4.02					9.14	9.63	1.997	19.26	288.9
				341.6	9.39	9.47	1.991	18.87	434.0
				7260.0	10.00	9.38	1.986	18.64	521.9
				71320	10.35	9.38	1.977	18.56	556.8
		Totals		14733.6	11.00	9.35	1.972	18.46	498.4
					11.30	9.32	1.965	18.33	559.9
					12.00	9.32	1.965	18.33	549.9
					12.30	9.32	1.962	18.31	366.2
					12.35				
					2.00	9.35	1.975	18.48	277.2
					2.30	9.28	1.965	18.45	645.8
					3.10	9.28	1.955	18.16	599.3
					3.35	9.26	1.953	18.10	217.2
					9.45				
					9.53	9.78	1.995	18.53	222.4
					10.00	9.26	1.952	18.19	400.2
					10.38	9.16	1.953	17.91	340.4
									6368.5
								Correction	197.0
									6565.5


CHARGE
DISCHARGE
SORLEY
APRIL 11-12-16-17
WATTS
TIME - HOURS
22
21
20
19
18
17
16
15
14
13
12
0
1
2
3
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11
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13
14
15
16

cycle 11-19-20-23

Sorley

Discharge

T	A	V	W	WM
11.00	9.16	1.946	17.84	462.8
11.30	9.07	1.929	17.51	525.3
12.00	9.07	1.919	17.42	522.6
12.30	8.98	1.909	17.14	292.1
2.22				
2.04	9.16	1.926	18.06	270.9
2.30	8.98	1.899	17.07	478.0
3.00	8.86	1.879	16.67	500.1
3.30	8.70	1.849	16.10	483.0
4.00	8.58	1.820	15.63	453.3
4.27	8.39	1.777	14.94	1942
				4182.3
			6	368.5
				10550.8

Eff = 71.61%

Charge

T	A	V	W	WM
9.02				
9.04	9.75	2.098	20.45	61.3
9.06	9.49	2.108	20.00	340.0
9.37	9.36	2.118	19.82	574.8
10.05	9.33	2.118	19.76	332.5
10.30	9.32	2.122	19.78	534.0
11.00	9.37	2.122	19.88	596.4
11.30	9.46	2.125	20.10	301.5
2.05	9.46			
2.09	9.46	2.127	20.12	201.2
2.20	9.24	2.131	19.69	196.7
2.30	9.43	2.141	20.19	403.8
3.00	9.49	2.151	20.41	612.3
3.30	9.42	2.154	20.29	608.7
4.00	9.31	2.161	20.12	603.6
4.30	9.22	2.168	19.99	299.8
9.10				
9.13	9.34	2.112	19.73	236.8
				6104.4

April 23-24-25

Sorley

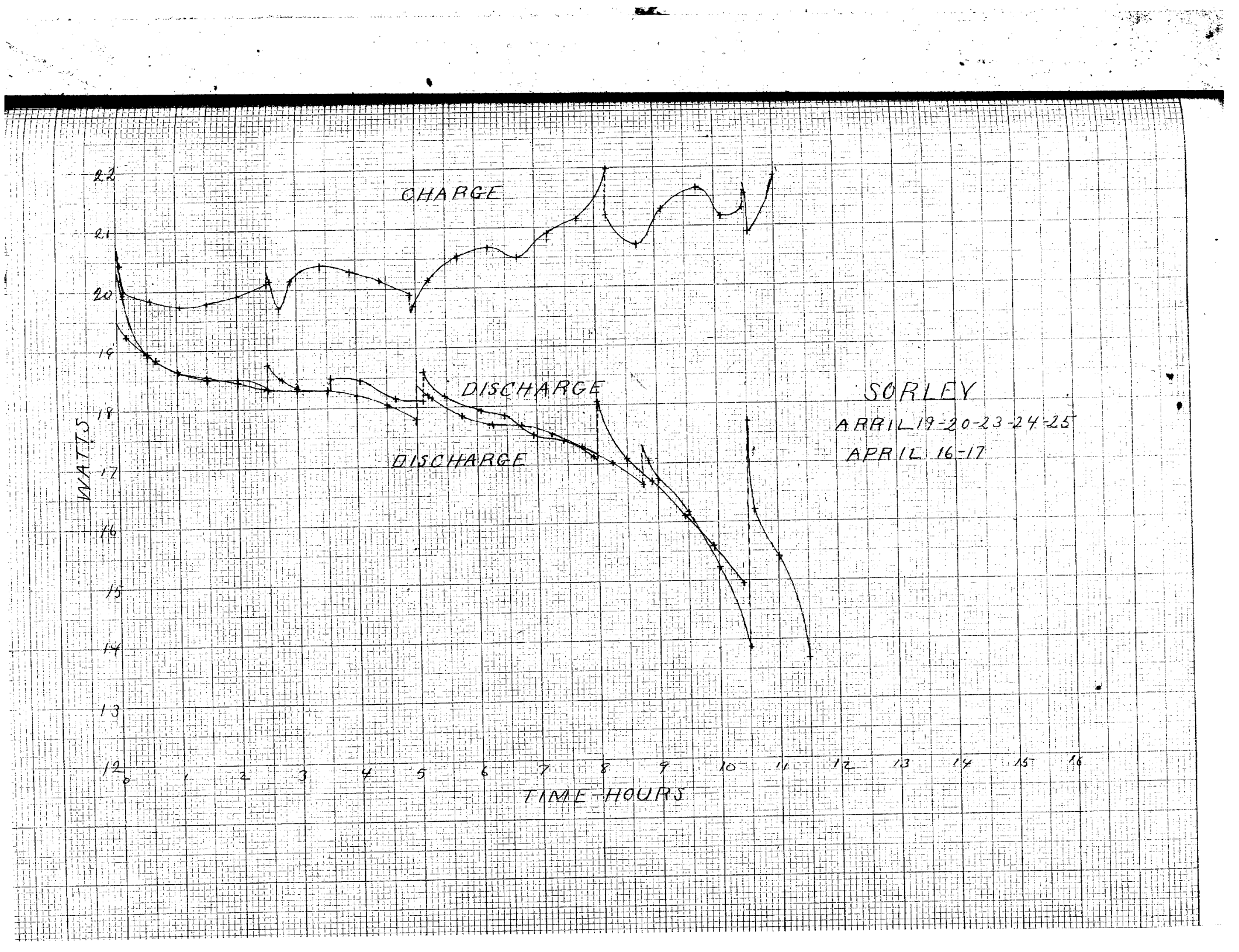
Charge					Discharge				
T	A	V	W	WM	T	A	V	W	WM
9.30	9.45	2.131	20.14	4.63.2	10.03				
10.00	9.50	2.159	20.51	604.5	10.05	9.84	2.028	19.95	299.2
10.30	9.51	2.174	20.67	620.1	10.30	9.49	1.995	18.95	511.7
11.00	9.39	2.197	20.45	621.5	11.00	9.40	1.985	18.66	559.8
11.30	9.46	2.207	20.88	571.5	11.30	9.37	1.975	18.51	555.3
12.00	9.42	2.214	21.13	6339	12.00	9.37	1.975	18.51	555.3
12.30	9.54	2.221	21.99	417.8	12.30	9.34	1.963	18.33	293.3
12.34					12.31				
2.00	9.64	2.197	21.18	317.7	1.30	9.49	1.978	18.77	150.2
2.30	9.29	2.227	20.69	620.7	1.45	9.34	1.968	18.38	275.7
3.00	9.49	2.241	21.27	638.1	2.00	9.34	1.965	18.35	412.7
3.30	9.64	2.247	21.66	649.8	2.30	9.34	1.962	18.33	549.9
4.00	9.39	2.254	21.16	4867	3.00	9.31	1.955	18.20	546.0
4.15	9.42	2.261	21.30	149.1	3.30	9.28	1.949	18.09	542.7
9.27					4.00	9.18	1.949	17.84	267.6
9.29	9.79	2.194	21.51	86.0	8.45	Jam V.	2.032		
9.32	9.39	2.234	20.88	313.2	8.53	9.30	1.958	18.21	218.5
10.00	9.62	2.274	21.87	371.8	9.00	9.28	1.956	18.15	326.7
10.03				7565.6				6	064.6
				6104.4					

Total 13670.0

Eff = 77.10

Sorley

Discharge					Charge				
T	A	V	W	WM	T	A	V	W	WM
9.30	9.18	1.953	17.84	535.2	10.02				
10.00	9.12	1.943	17.72	531.6	10.30	9.55	2.108	20.13	342.2
10.30	9.12	1.939	17.69	530.7	11.00	9.54	2.112	20.15	604.5
11.00	9.09	1.926	17.67	525.3	11.30	9.59	2.112	20.25	607.5
11.30	9.07	1.909	17.31	519.3	12.00	9.49	2.118	20.10	603.0
12.00	8.98	1.896	17.02	510.6	12.30	9.42	2.118	19.95	299.3
12.30	8.88	1.876	16.66	249.9	2.15	9.69	2.098	20.33	60.9
2.15					2.20	9.49	2.112	20.04	142.3
2.20	8.98	1.896	17.03	170.3	2.30	9.49	2.118	20.10	402.0
2.30	8.88	1.883	16.72	334.4	3.00	9.49	2.125	20.17	605.1
3.00	8.76	1.846	16.17	485.1	3.30	9.54	2.131	20.33	609.9
3.30	8.47	1.796	15.21	456.3	4.00	9.49	2.141	20.22	303.3
4.00	8.17	1.698	13.87	208.1	9.55	9.72	2.131	20.71	40.3
9.00	9.29	1.909	17.73	53.2	10.00	9.42	2.174	20.48	368.6
9.06	8.76	1.846	16.17	242.5	10.30	9.29	2.174	20.20	306.0
9.30	8.56	1.800	15.41	416.1	11.00	9.49	2.191	20.79	623.7
10.00	8.07	1.695	13.68	205.2	11.30	9.54	2.194	20.93	627.9
				5973.8					
to which add			6064.6		12.00	9.59	2.207	21.17	635.1
total			12038.4						7481.6
		Eff =	88.64						


CHARGE
DISCHARGE
DISCHARGE
SORLEY
APRIL 19-20-23-24-25
APRIL 16-17
WATTS
TIME-HOURS
22
21
20
19
18
17
16
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14
15
16

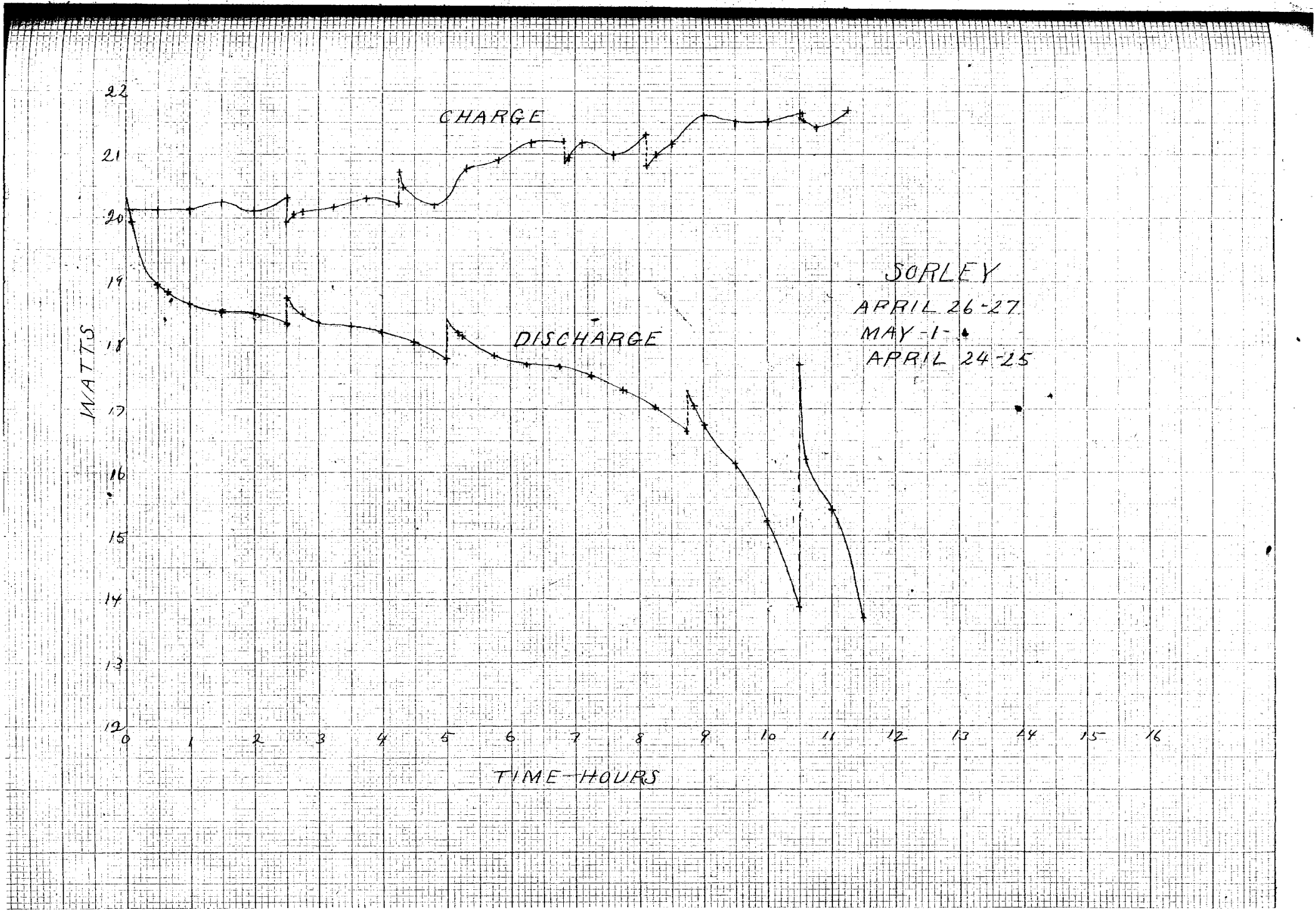
Sorley

May 1

Charge

T	A	V	W	WM	T	A	V	W	WM
12.30	9.59	2.211	21.20	318.0					
2.16									
2.18	9.59	2.184	20.94	187.5					
2.30	9.59	2.197	21.07	442.4					
3.00	9.49	2.211	20.98	629.4					
4.00	9.59	2.224	21.33	319.9					
9.05									
9.07	9.79	2.153	20.82	124.9					
9.15	9.54	2.201	21.00	252.0					
9.30	9.54	2.217	21.15	465.3					
10.00	9.69	2.231	21.62	972.9					
11.00	9.52	2.261	21.52	968.4					
11.30	9.49	2.267	21.51	645.3					
12.00	9.49	2.281	21.65	324.7					
2.15									
2.17	9.69	2.221	21.52	193.7					
2.30	9.49	2.257	21.42	449.8					
3.00	9.49	2.287	21.70	325.8					
				6620.0					
				7481.6					
			Sum	14101.6					

~~W~~ = 85.37


CHARGE
DISCHARGE
SORLEY
APRIL 26-27
MAY-1-
APRIL 24-25
WATTS
TIME-HOURS
22
21
20
19
18
17
16
15
14
13
12
0
1
2
3
4
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11
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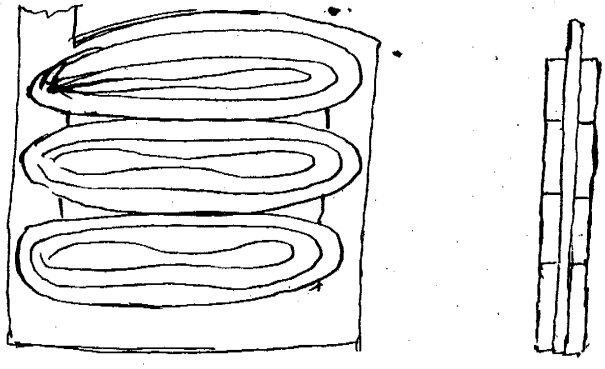
14
15
16

The American Cell

This cell is of the Plante type and is built up of ribbon lead soldered to an unoxidisable lead frame as shown.

The drawing given is of the formed plate.



The plates are separated by hard rubber combs and are kept off the bottom of the cell by glas ribs.

This form of plate seems to indicate good strength and would be suited perhaps if mounted properly to traction work.

While being tested the active material scaled off of the positive plates somewhat. And the negative plates seemed to be slightly sulphated between the ribbons. This may indicate that the cell was not in the best condition and explain the low capacity and efficiency got from it.

I can see no other

reason why it should
give such low results.

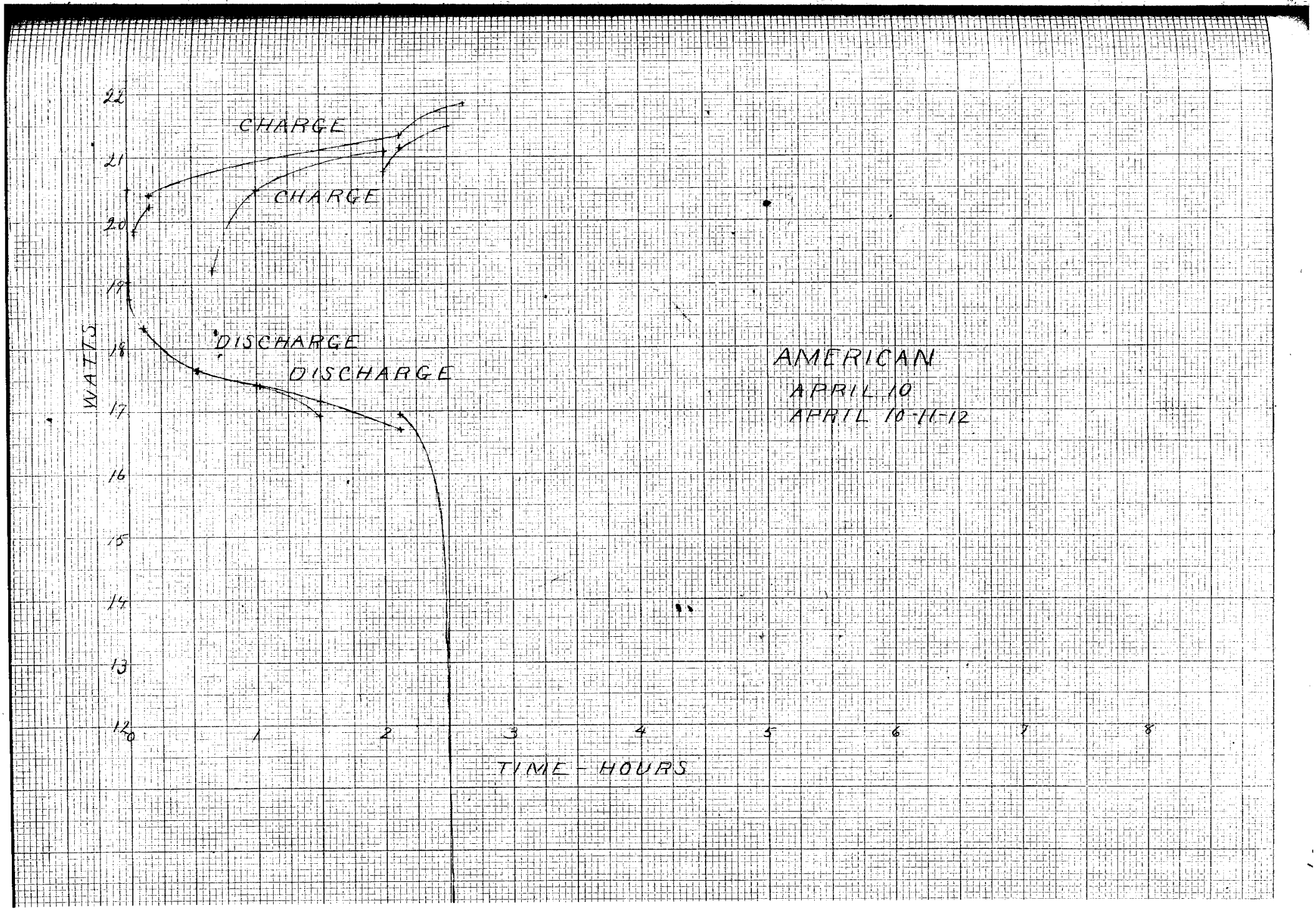
April 10

American

Charge					Discharge				
T	A	V	W	WM	T	A	V	W	WM
11.40	9.42	2.042	19.23	192.3	2.30	9.74	2.105	20.50	10.2
12.00	9.45	2.167	20.48	819.2	2.31	9.29	2.052	19.06	19.1
1.00	9.47	2.227	21.09	632.7	2.32	9.20	2.042	18.79	310.0
2.00	945	2.197	20.76	311.3	3.05	8.90	1.982	17.64	571.6
2.30	9.45	2.274	21.49	3223	3.30	8.76	1.968	17.41	487.5
				2277.8	4.00	8.72	1.943	16.93	253.9
									1592.3

Eff = 69.91%

Eff. with rest Dist. = 52.54%


CHARGE
CHARGE
DISCHARGE
DISCHARGE
AMERICAN
APRIL 10
APRIL 10-11-12
WATTS
TIME - HOURS
22
21
20
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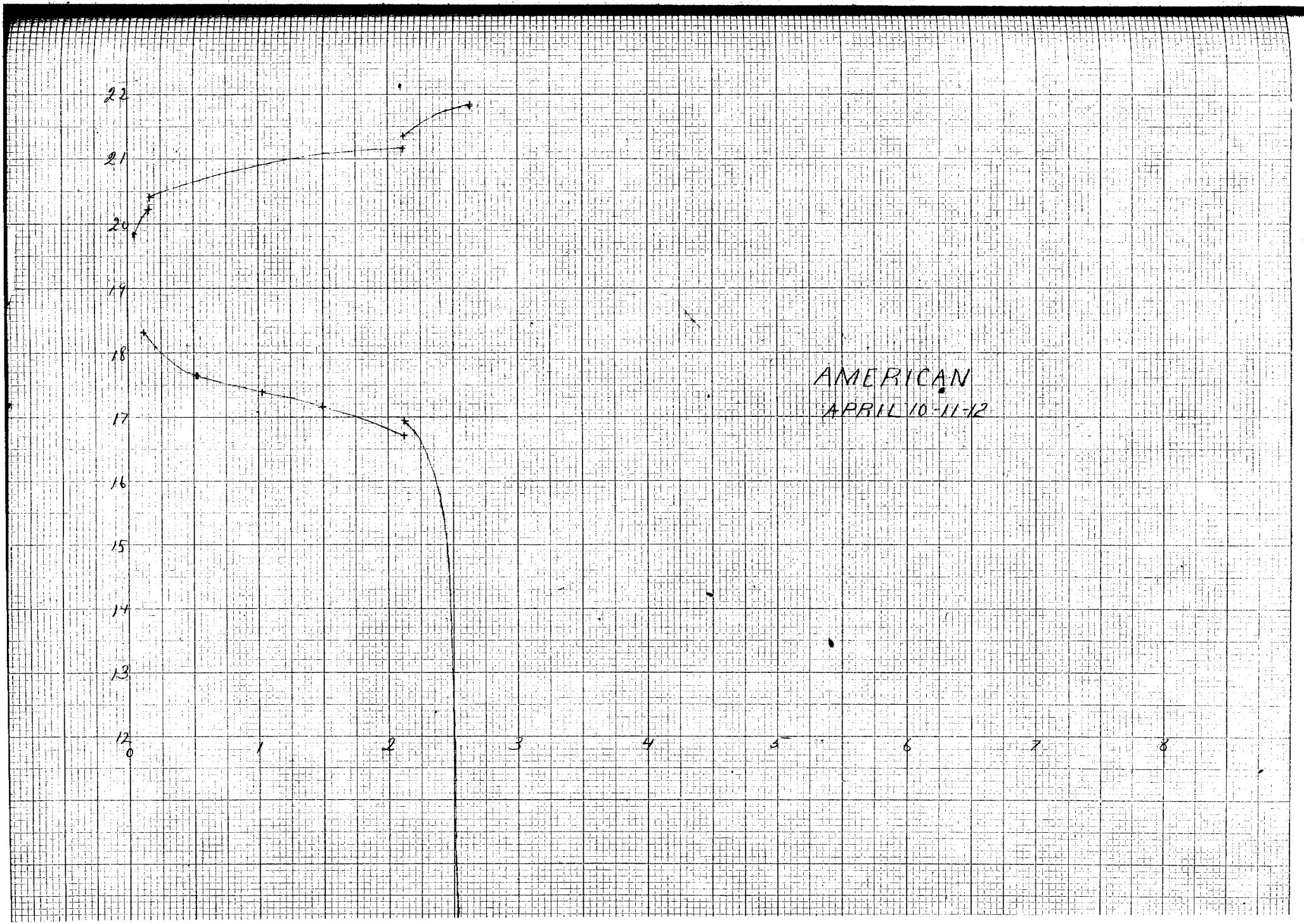
April 10-11-12

American

Charge					Discharge				
∠T	A	V	W	WM	T	A	V	W	WM
4.35	9.42	2.108	19.86	39.7	2.37	9.08	2.017	18.31	238.0
4.40	9.44	2.141	20.21	60.6	3.03	8.89	1.985	17.65	424.0
9.12	9.39	2.174	20.41	102.1	3.33	8.84	1.968	17.40	487.2
11.00	9.39	2.264	21.06	137.2	4.00	8.78	1.955	17.16	549.1
2.00	9.49	2.251	21.36	341.8	4.37	8.66	1.929	16.71	317.5
2.32	9.44	2.311	21.81	349.0	9.00	8.75	1.936	16.94	304.9
				3030.4	9.37	4.25	.081	.34	6.5
									2397.4

Eff = 79.11 %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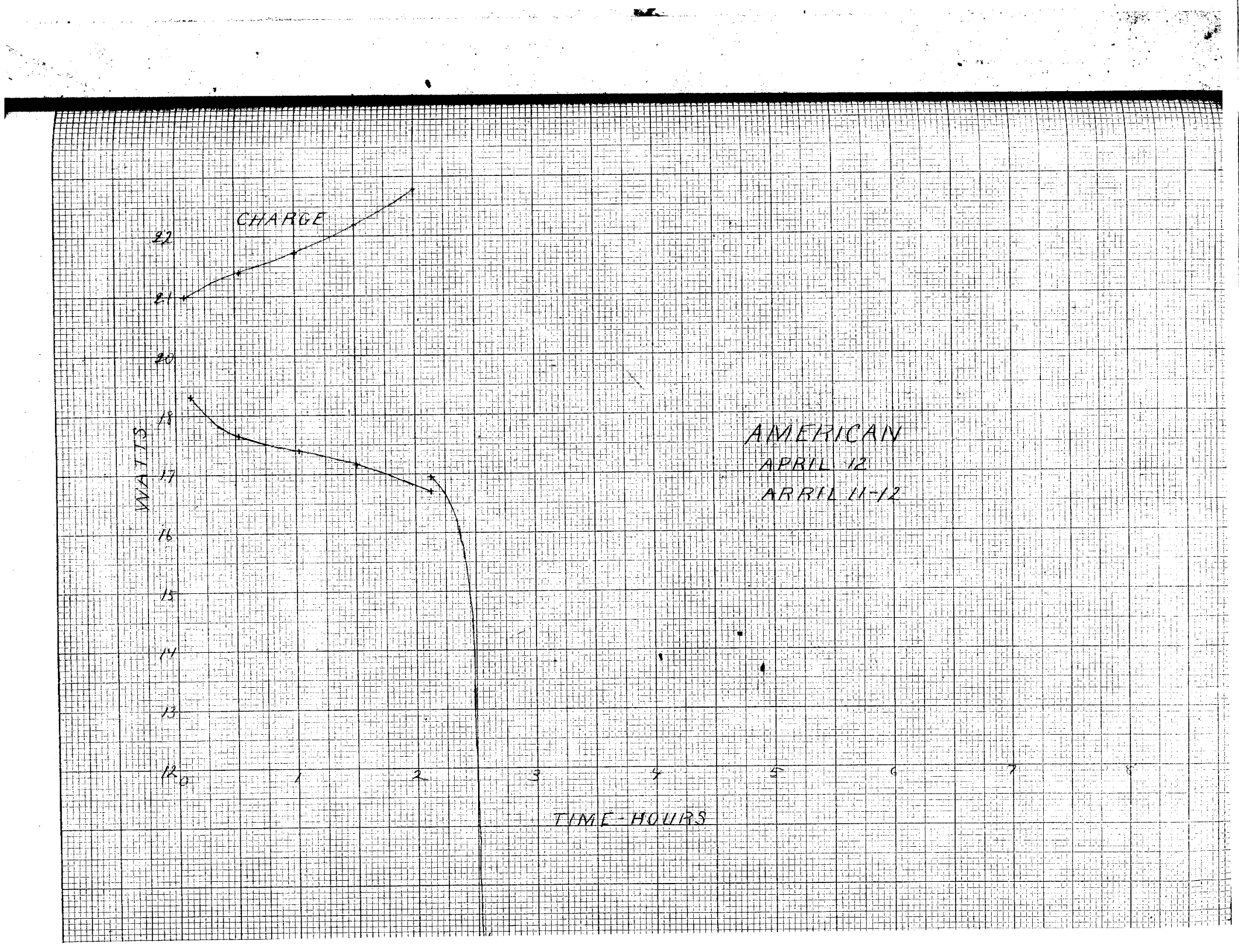
AMERICAN
APRIL 10-11-12

April 12.

American

Charge					Discharge				
T	A	V	W	WM	T	A	V	W	WM
9.37									
9.40	9.39	2.127	19.97	299.5					
10.04	9.42	2.164	20.38	509.5					
10.30	9.49	2.184	20.73	580.4					
11.00	9.49	2.231	21.17	635.1					
11.30	9.54	2.284	21.79	326.9					
				2351.4					

Eff with last Discl = 101.83


CHARGE
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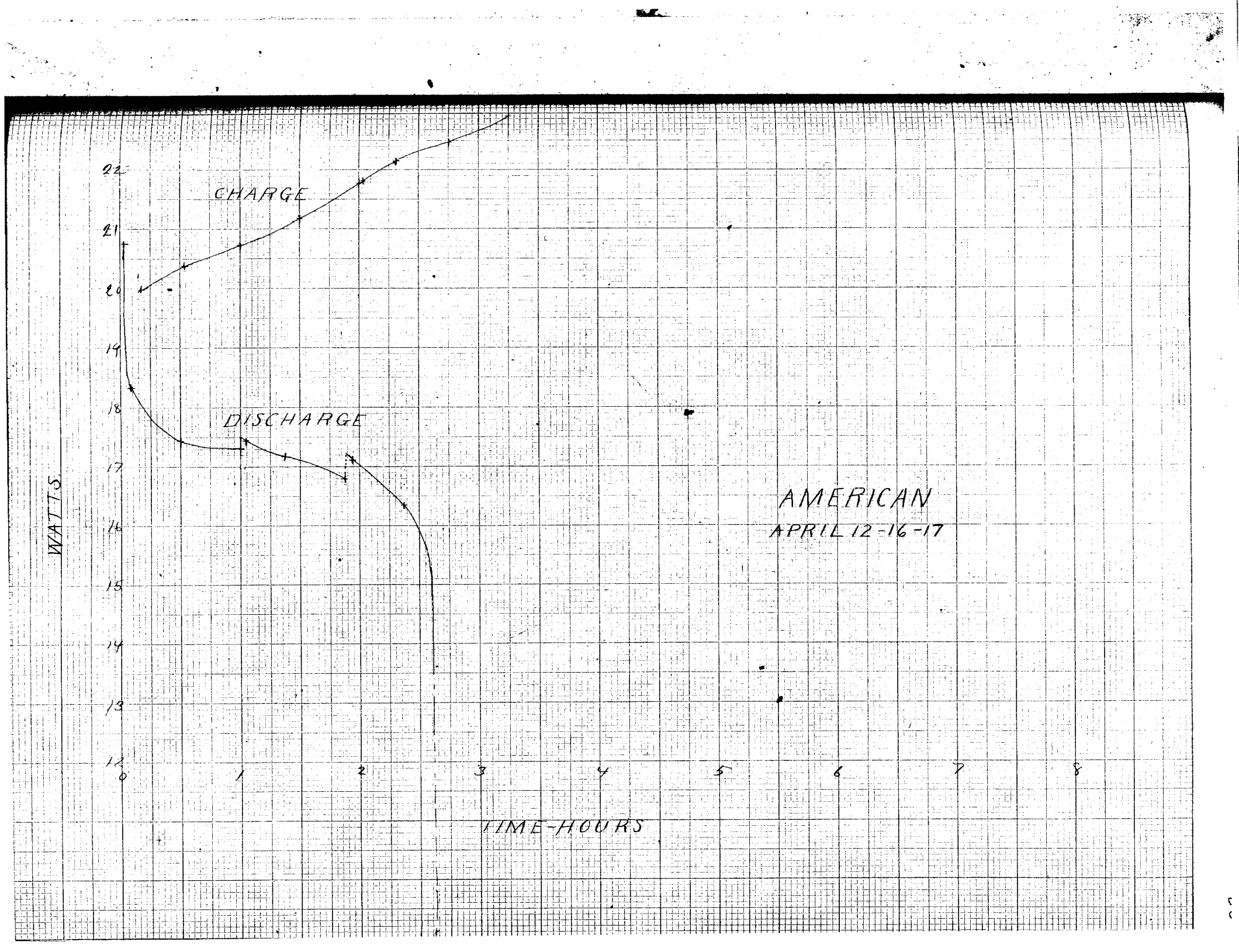
WATTS
TIME - HOURS
AMERICAN
APRIL 12
ARRIL 11-12

April 12-16-17

American

Charge					Discharge				
T	A	V	W	WM	T	A	V	W	WM
9.37					11.33	9.69	2.141	20.75	41.5
9.40	9.39	2.127	1997	299.5	11.35	9.07	2.021	18.33	256.6
10.04	9.42	2.164	20.38	509.5	12.00	8.86	1.982	17.45	471.2
10.30	9.49	2.184	20.73	580.4	12.30	8.81	1.965	17.31	259.6
11.00	9.49	2.231	21.17	635.1	2.07				
11.30	9.54	2.284	21.79	326.9	2.10	8.86	1.968	17.44	233.1
10.15					2.30	8.77	1.958	17.17	429.2
10.17	9.55	2.284	21.81	370.8	3.00	8.68	1.942	16.80	252.0
10.37	9.52	2.327	22.15	376.5	9.00				
11.00	9.52	2.361	22.48	359.7	9.04	8.77	1.951	17.11	290.9
11.30	9.60	2.391	22.95	344.3	9.30	8.32	1.965	16.35	327.0
				3802.7	9.43	.42	.100	.04	.2
									2561.7

Eff = 67.36%


CHARGE
DISCHARGE
AMERICAN
APRIL 12-16-17
WATTS
TIME-HOURS
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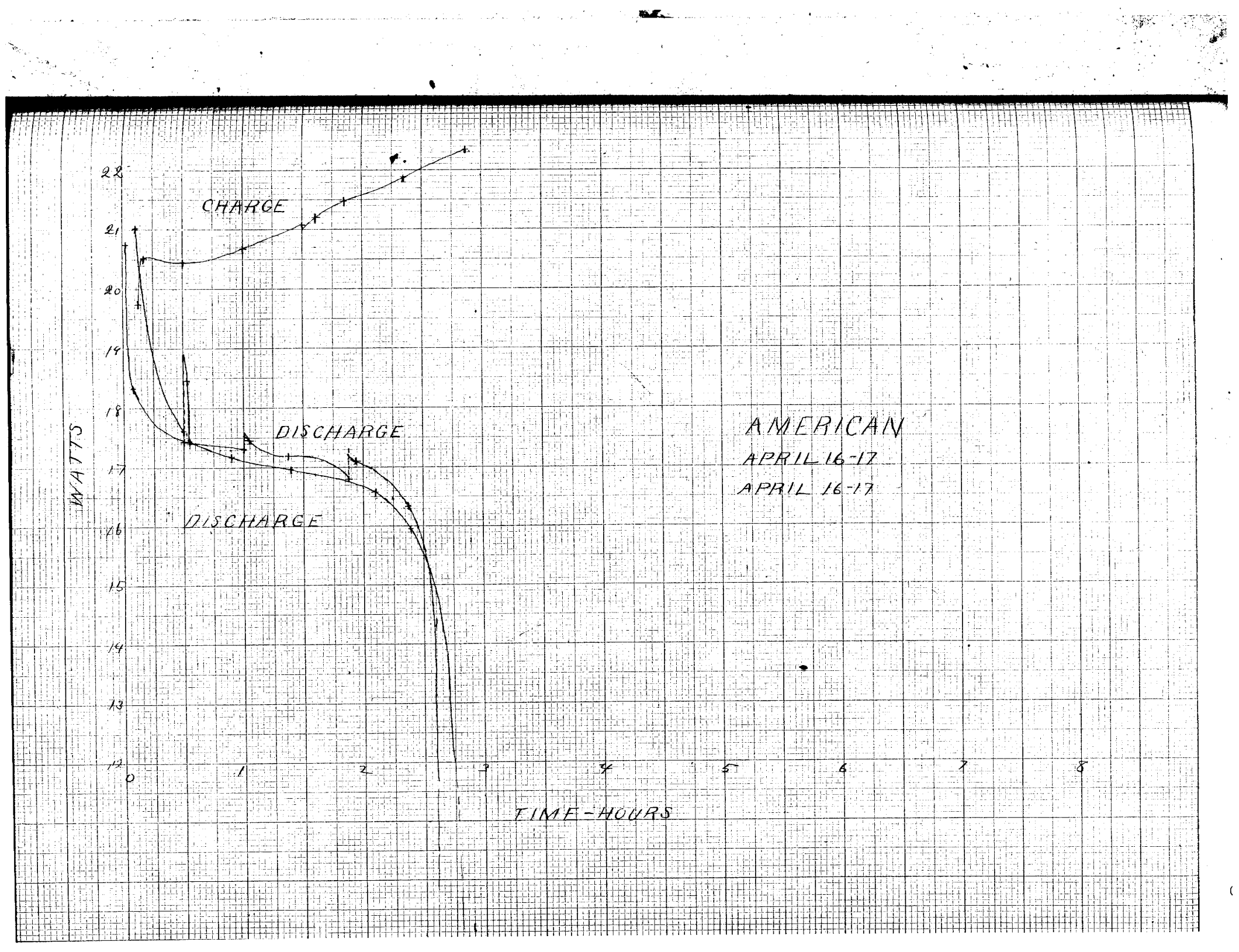
April 16-17

American

Charge					Discharge				
T	A	V	W	WM	T	A	V	W	WM
9.43	9.46	2.088	19.75	18.9	3.35	9.75	2.157	21.03	273.4
9.46	9.51	2.157	20.51	164.1	4.00	8.86	1.988	17.61	246.5
10.00	9.41	2.174	20.44	449.7	4.02				
10.30	9.41	2.197	20.67	620.1	8.07	9.19	2.008	18.45	36.9
11.00	9.41	2.241	21.09	316.3	8.10	8.83	1.978	17.44	191.8
2.10					8.30	8.75	1.965	17.19	429.7
2.15	9.46	2.241	21.20	275.6	9.00	8.68	1.958	16.99	594.6
2.30	9.46	2.274	21.49	472.8	9.40	8.60	1.928	16.58	507.4
3.00	9.42	2.324	21.89	700.5	10.00	8.32	1.918	15.96	446.9
3.33	9.42	2.374	22.36	402.5	10.35	.51	.133	.07	1.9
3.35				3420.5					2728.4

Eff = 79.77

Eff with last discharge = 75.01


CHARGE
DISCHARGE
DISCHARGE
AMERICAN
APRIL 16-17
APRIL 16-17
WATTS
TIME-HOURS
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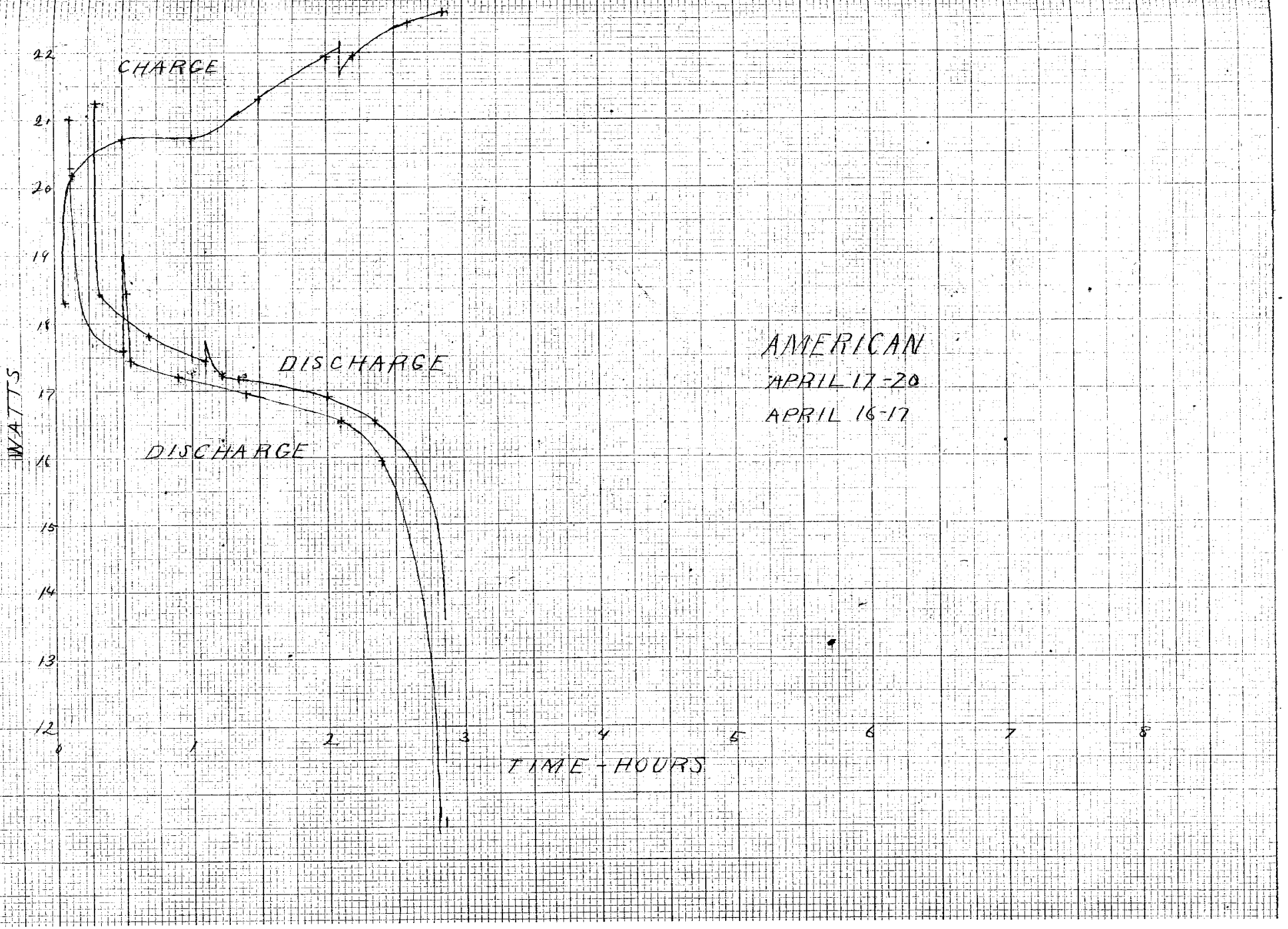
April 17-20

American

Charge					Discharge				
T	A	V	W	WM	T	A	V	W	WM
10.36	9.35	1.958	18.30	9.1	2.47				
10.37	9.44	2.141	20.20	252.5	2.48	9.78	2.174	21.26	2.3
11.00	9.69	2.157	20.71	538.5	2.49	9.09	2.028	18.43	221.2
11.30	9.49	2.184	20.73	621.9	3.10	8.91	1.988	17.71	407.3
12.00	9.52	2.241	21.33	639.9	3.35	8.83	1.975	17.44	209.3
12.30	9.57	2.301	21.95	439.0	9.47				
12.35					9.53	8.77	1.965	17.23	172.3
2.00					10.00	8.75	1.965	17.19	378.2
2.04	9.52	2.307	21.96	373.3	10.38	8.66	1.952	16.90	507.0
2.30	9.54	2.354	22.46	471.7	11.00	8.59	1.928	16.56	430.6
2.45	9.49	2.381	22.60	203.4	11.30	.42	.133	.04	.7
2.47					11.32				2346.9
				3549.3					

Eff = 66.12%

Eff with last Dis = 76.87%.


CHARGE
DISCHARGE
DISCHARGE
AMERICAN
APRIL 17-20
APRIL 16-17
WATTS
TIME - HOURS
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April 20

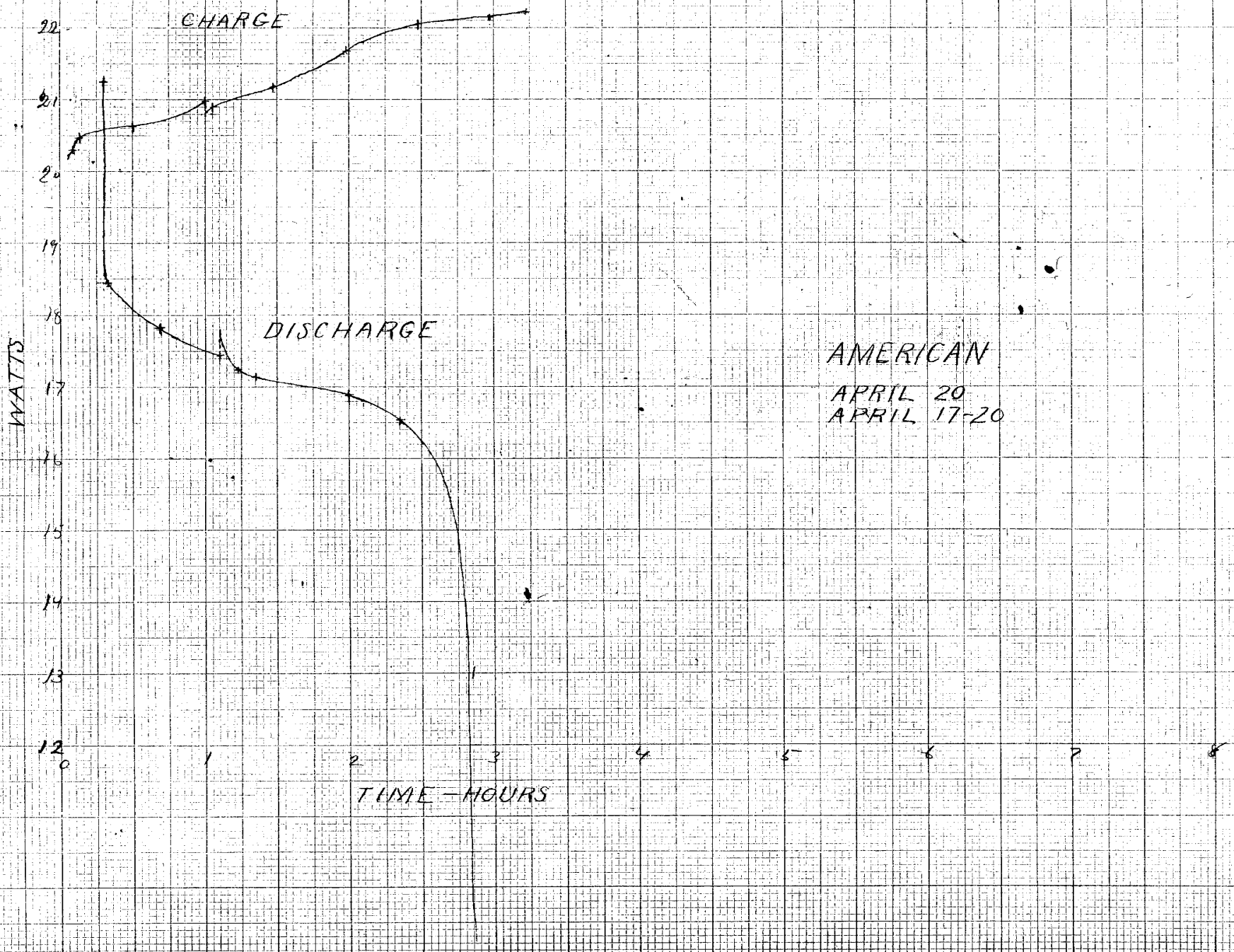
American

Charge

T	A	V	W	WM	T	A	V	W	WM
11.32	~~9.56~~	~~2.127~~							
11.34	9.56	2.127	20.33	61.0					
11.36	9.55	2.144	20.48	266.2					
12.00	9.54	2.161	20.62	556.7					
12.30	9.59	21.87	20.97	314.6					
2.02									
2.04	9.54	2.197	20.90	313.5					
2.30	9.49	2.232	21.18	593.0					
3.00	9.53	2.287	21.70	651.0					
3.30	9.42	2.341	22.05	661.5					
4.00	9.39	2.364	22.14	509.2					
4.15	9.36	2.374	2222	155.5					
				4082.2					

Eff with ~~no~~ discharge = 48.82

Eff " last " = 57.49


CHARGE
DISCHARGE
WATTS
TIME — HOURS
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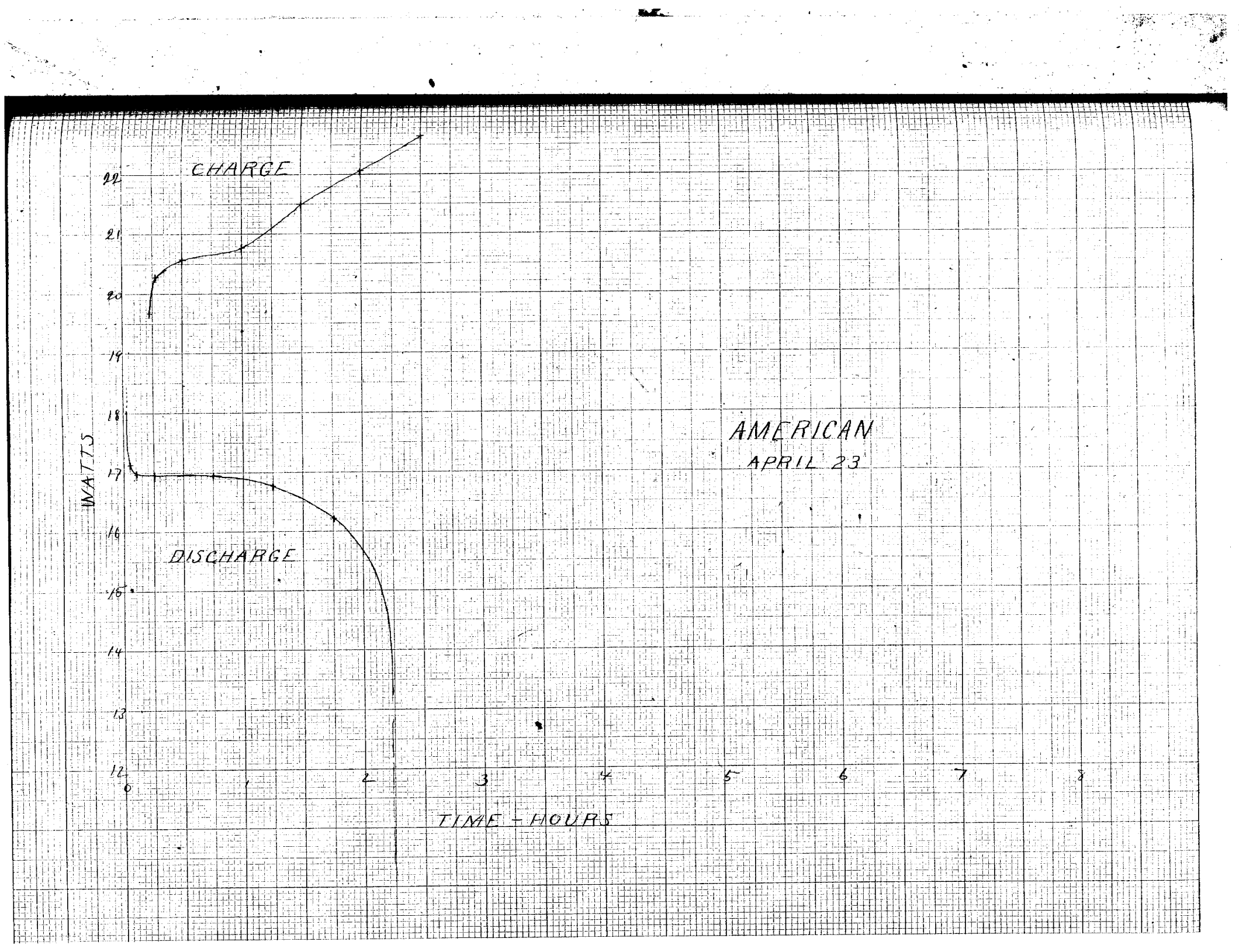
AMERICAN
APRIL 20
APRIL 17-20

April 23

American

Charge					Discharge				
T	A	V	W	WM	T	A	V	W	WM
9.13	9.34	2.108	19.69	49.4	2.15				
9.16	9.39	2.161	20.29	162.3	2.17	8.73	1.962	17.13	51.4
9.30	9.45	2.174	20.54	451.9	2.19	8.68	1.958	16.99	118.9
10.00	9.50	2.187	20.78	623.4	2.30	8.68	1.958	16.99	339.8
10.30	9.51	2.261	21.50	645.0	3.00	8.68	1.955	16.97	509.1
11.00	9.39	2.347	22.04	661.2	3.30	8.64	1.943	16.79	503.7
11.30	9.46	2.384	22.65	339.7	4.00	8.49	1.909	16.21	470.1
				2892.9	4.28	.10	.123	.01	.2
									1993.2

$\frac{W}{W} = 68.9\%$


CHARGE
DISCHARGE
AMERICAN
APRIL 23
WATTS
TIME - HOURS
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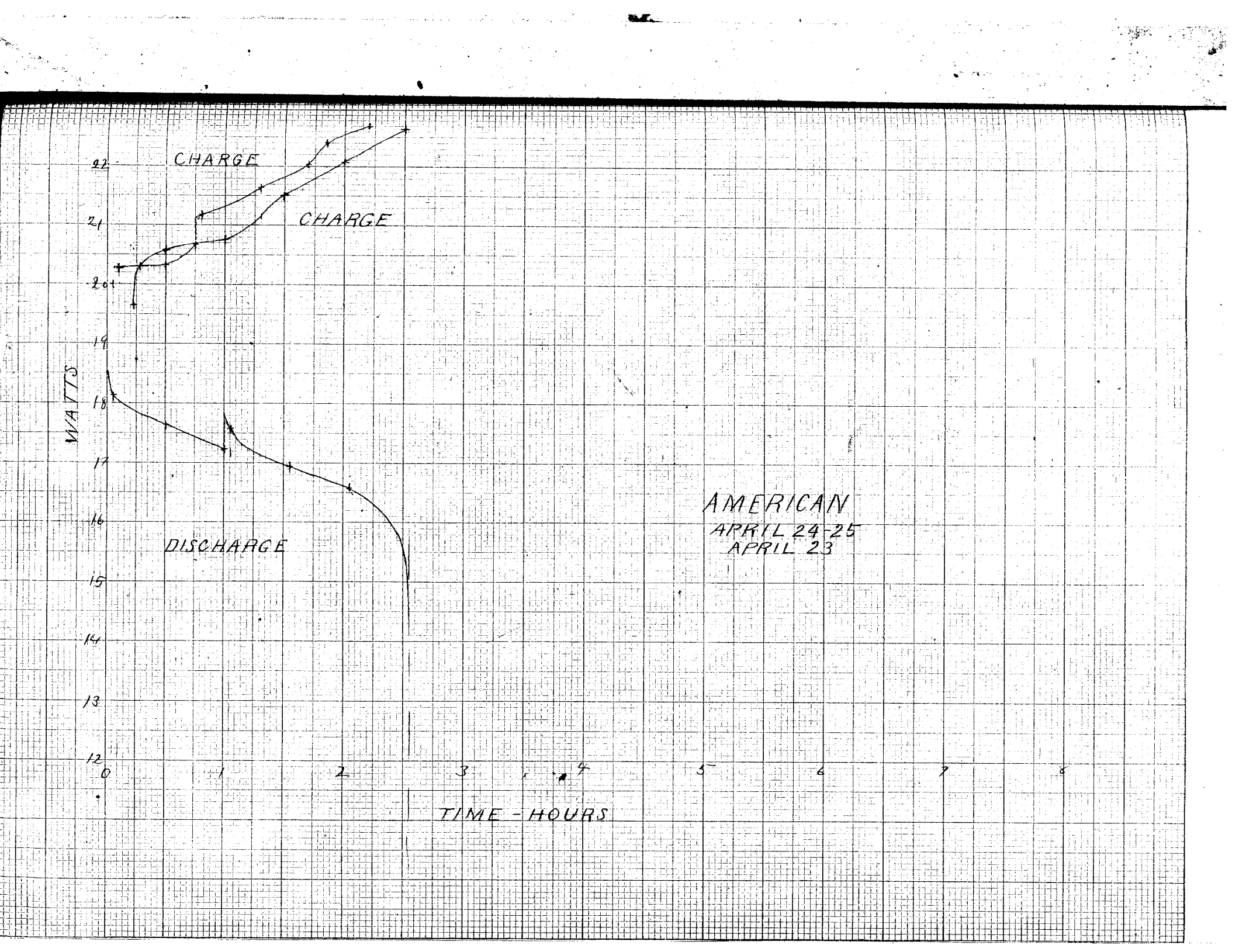
April 27-28

American

Charge					Discharge				
T	A	V	W	WM	T	A	V	W	WM
3.32					11.30				
3.34	9.43	2.151	20.28	304.2	11.33	8.99	2.017	18.13	308.2
4.00	9.39	2.164	20.32	436.7	12.00	8.86	1.991	17.64	493.9
4.15	9.42	2.184	20.57	144.0	12.30	8.77	1.965	17.23	310.1
9.27					12.33				
9.30	9.64	2.197	21.18	381.2	2.00	8.91	1.975	17.59	263.8
10.00	9.62	2.251	21.65	649.5	2.30	8.68	1.953	16.95	508.5
10.30	9.49	2.321	22.03	660.9	3.00	8.60	1.928	16.58	497.4
11.00	9.61	2.361	22.69	431.1	3.30	.10	.123	.01	.2
11.08	9.36	2.384	22.41	89.6	3.31			2	382.1
				3097.2					

Eff = 76.91

Eff with last Charge = 82.34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CHARGE
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TIME - HOURS
AMERICAN
APRIL 24-25
APRIL 23

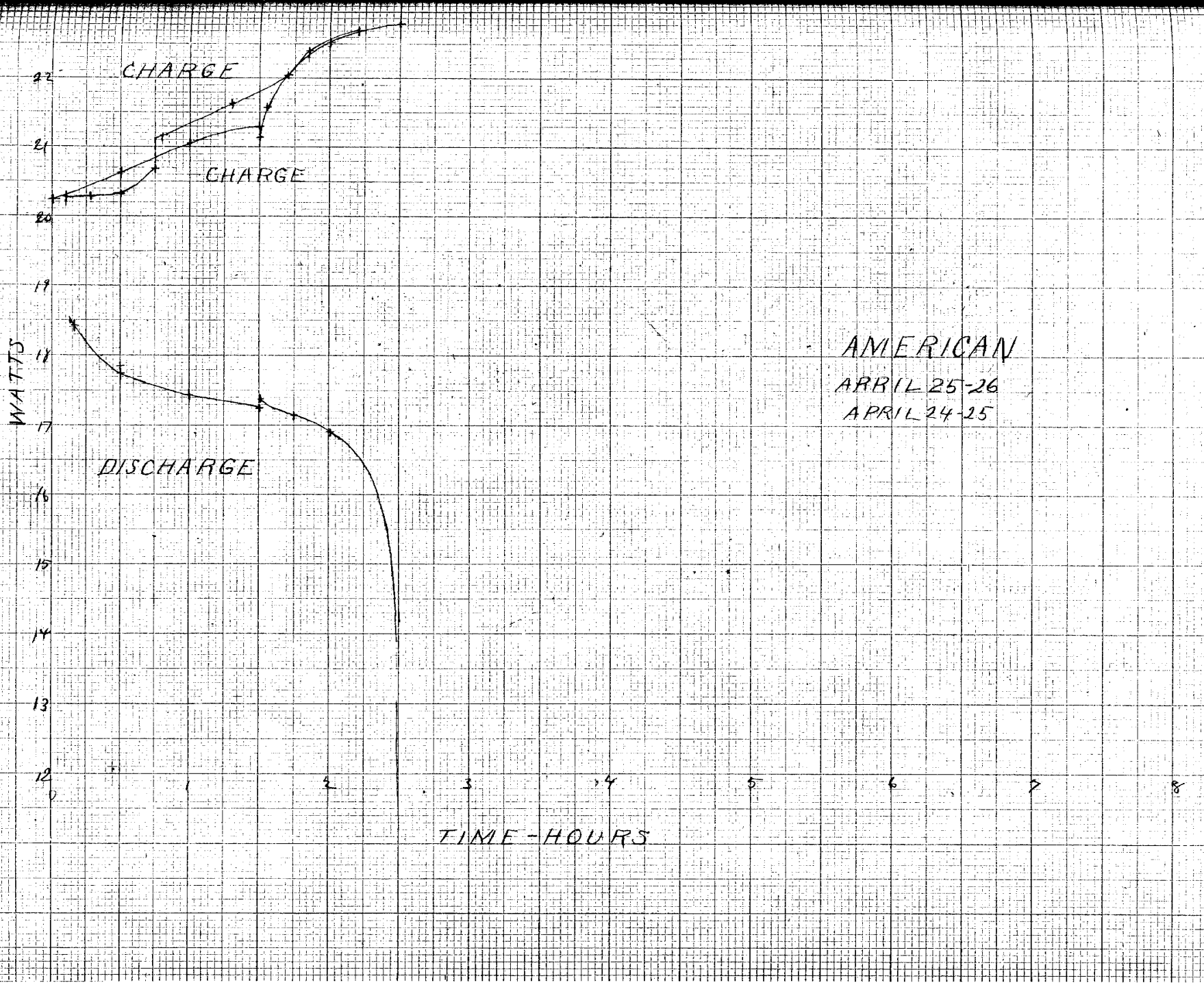
April 25-26

American

Charge					Discharge				
T	A	V	W	WM	T	A	V	W	WM
2.30	9.39	2.157	20.25	3037	11.08				
3.00	9.49	2.174	20.63	618.9	11.10	9.07	2.032	18.43	221.2
3.30	9.54	2.207	21.04	631.2	11.30	8.91	1.995	17.75	443.7
4.00	9.41	2.264	21.30	319.5	12.00	8.83	1.975	17.44	593.2
4.30	9.44	2.241	21.15	63.5	12.30	8.81	1.958	17.25	276.0
9.05	9.40	2.297	21.59	3238	12.31				
9.30	9.55	2.357	22.51	607.8	1.30	8.86	1.962	17.38	139.0
10.00	9.52	2.384	22.70	340.5	1.45	8.77	1.955	17.14	257.1
				3205.9	2.00	8.68	1.948	16.91	372.0
					2.30	.10	.123	.01	.2
									23024

Eff = 71.82%

Eff with last Ch. = 74.33%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TIME - HOURS
AMERICAN
APRIL 25-26
APRIL 24-25

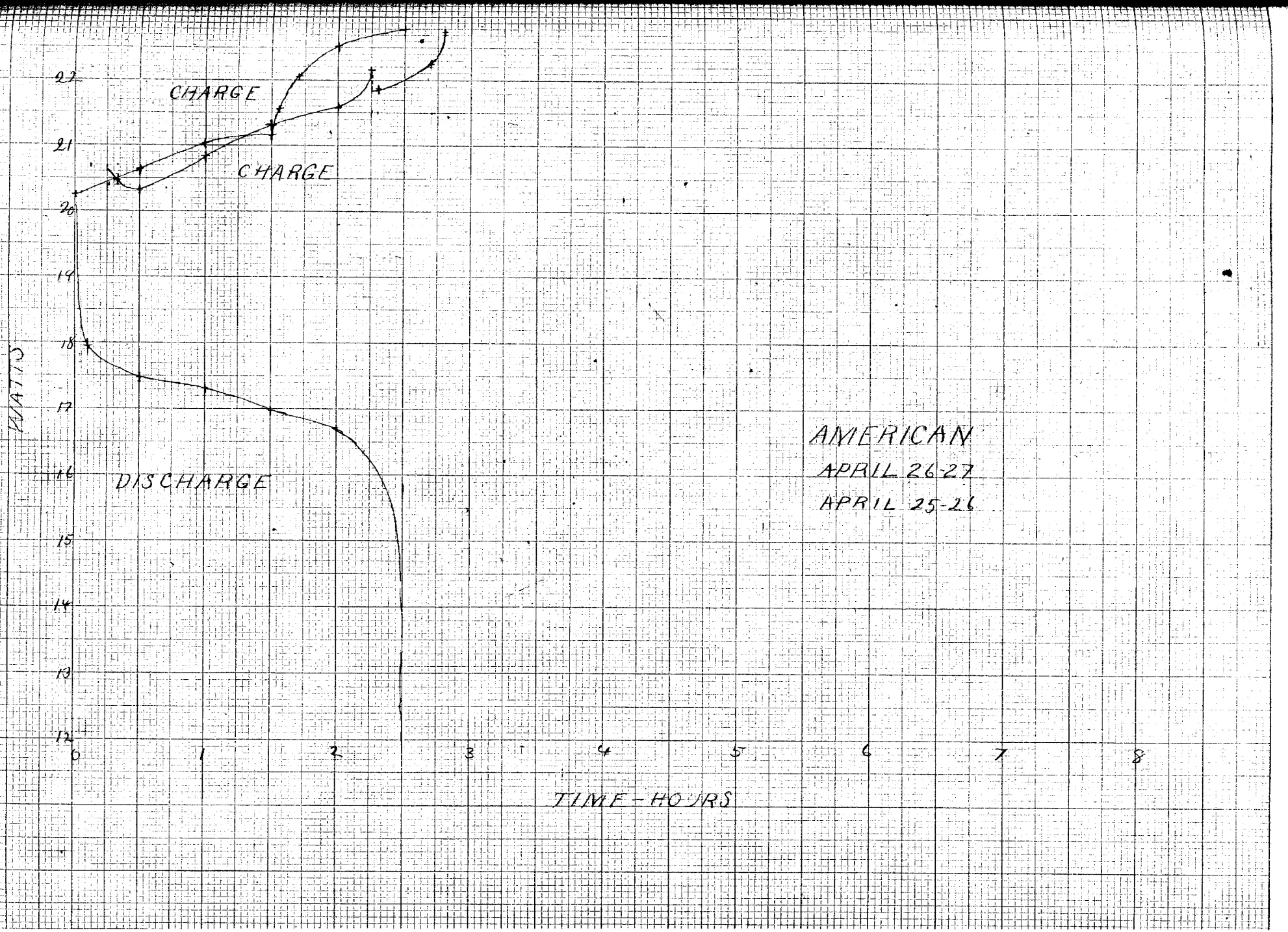
April 26-27

American

Charge					Discharge				
T	A	V	W	WM	T	A	V	W	WM
2.15					10.00				
2.20	9.49	2.157	20.47	204.7	10,05	8.91	2.015	17.95	323.1
2.30	9.42	2.157	20.32	406.4	10,30	8.81	1.985	17.49	472.2
3.00	9.59	2.184	20.84	625.2	11.00	8.77	1.975	17.32	519.6
3.30	9.51	2.241	21.31	639.3	11,30	8.68	1.958	16.99	509.7
4.00	9.45	2.284	21.59	496.6	12.00	8.60	1.943	16.71	501.3
4.15	9.42	2.351	22.15	155.0	12.30	.10	.123	.01	2
9.03									2326.1
9.06	9.52	2.297	21.87	328.1					
9.30	9.41	2.364	22.25	333.7					
9.36	9.41	2.374	22.7	68.2					
				3257.2					

Eff = 71.41%

Eff with last ch = 71.29%


CHARGE
CHARGE
DISCHARGE
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TIME - HOURS
AMERICAN
APRIL 26-27
APRIL 25-26

April 27-30
May 1-2

American

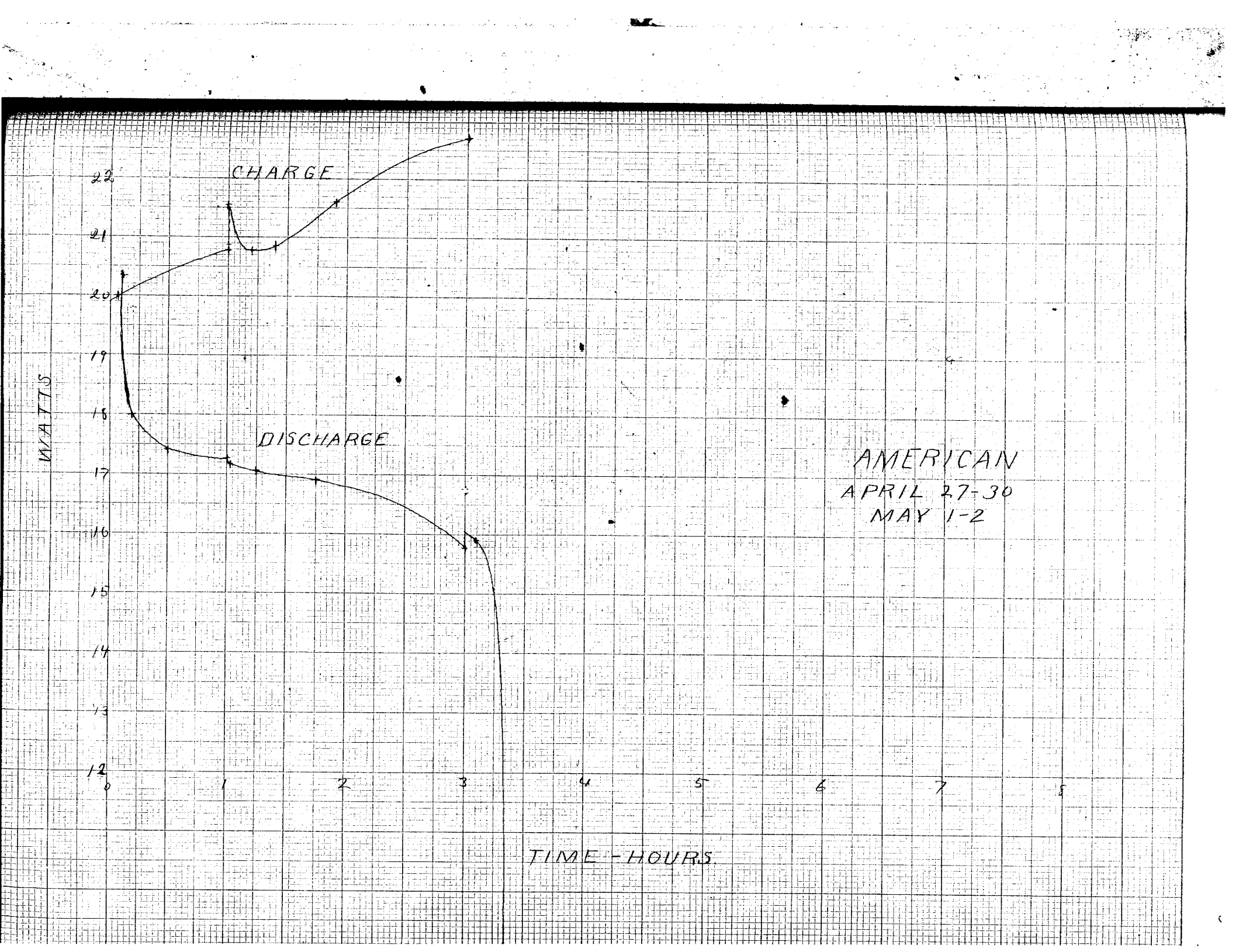
Charge

T	A	V	W	WM
3.00				
3.02	9.49	2.108	20.00	620.0
4.00	9.59	2.167	20.78	602.6
9.05	9.99	2.157	21.55	107.6
9.15	9.54	2.177	20.77	270.0
9.30	9.54	2.187	20.86	458.9
10.00	9.69	2.231	21.62	1037.8
11.05	9.52	2.384	22.70	726.4
				3823.3

Eff = 81.93

Discharge

T	A	V	W	WM
11.07	9.57	2.125	20.34	40.7
11.10	8.92	2.018	18.00	198.0
11.30	8.77	1.985	17.41	435.2
12.00	8.75	1.975	17.28	259.2
2.15				
2.17	8.71	1.972	17.17	154.5
2.30	8.68	1.965	17.06	358.3
3.00	8.65	1.955	16.91	896.2
4.15	8.33	1.893	15.77	583.5
9.10				
9.15	8.39	1.896	15.91	206.8
9.30	.10	.213	.02	.1
			31	3325


CHARGE
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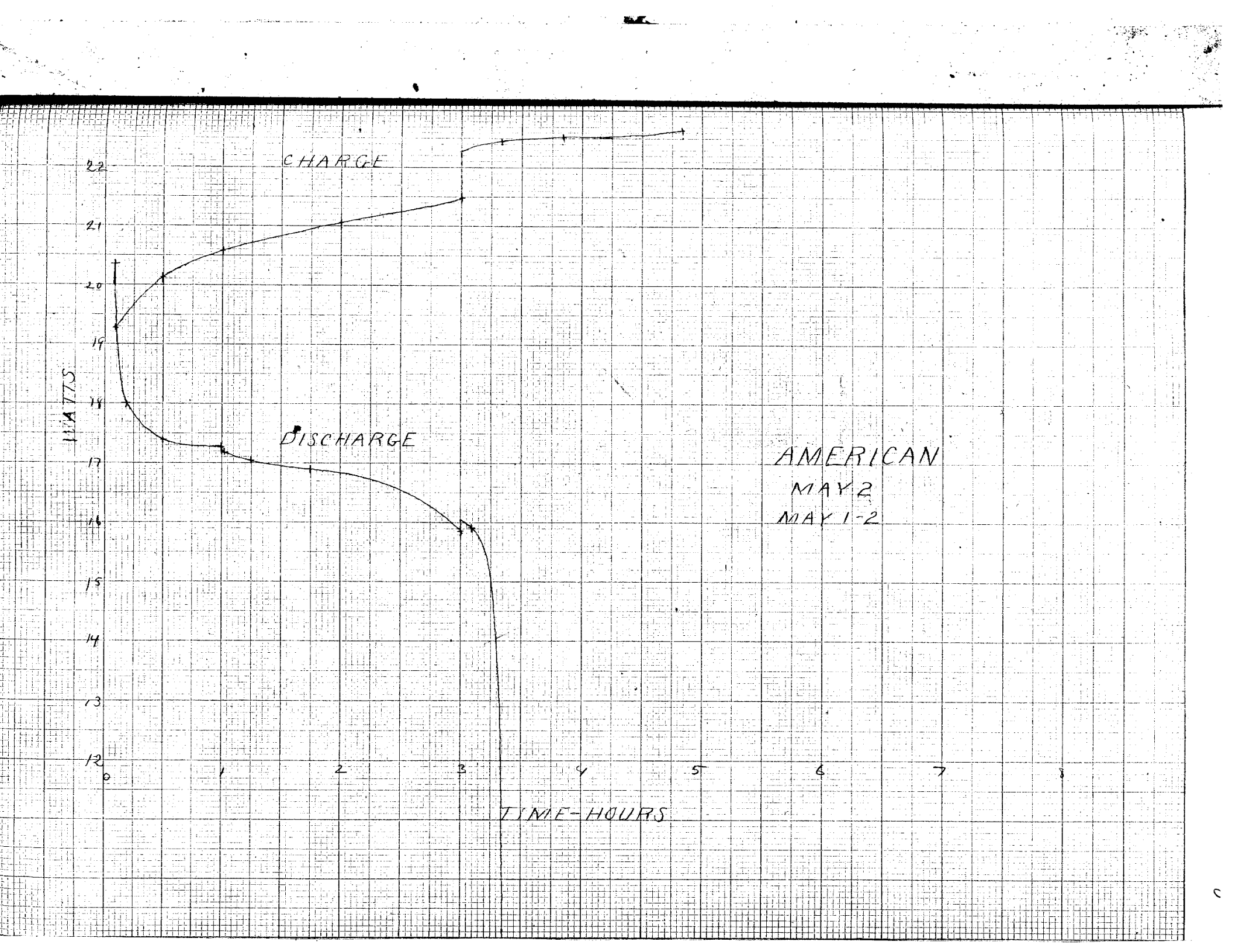
TIME - HOURS.
AMERICAN
APRIL 27-30
MAY 1-2

American May 2

Charge

T	A	V	W	WM	T	A	V	W	WM
9.35	9.49	2.032	19.28	250.6					
10.00	9.44	2.131	20.12	543.2					
10.30	9.55	2154	20.57	617.1					
11.30	9.49	2.217	21.04	946.8					
12.30	9.39	2.297	21.57	647.1					
2.10									
2.30	9.64	2.327	22.44	785.4					
3.00	9.54	2.361	22.52	1013.5					
4.00	9.54	2.374	22.65	679.5					
				5483.2					

Eff = 57.11


CHARGE
DISCHARGE
VOLTS
TIME-HOURS
AMERICAN
MAY 2
MAY 1-2
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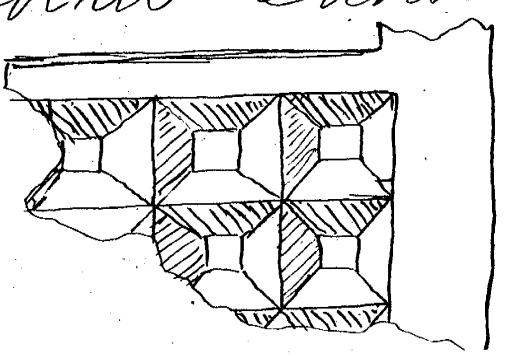
The Accumulator.

This cell is one of the old cells owned by the Institute and was tested so as to give me some means of comparing the modern cells with the older ones

On the whole no gain in efficiancy seems to have been made although the newer cells are quite superior in mechanical strength.

This cell has plates of the form shown.



The active material thus has the form of rivits.

The plates are separated and raised from the bottom of the cell by means of hard rubber cubes inserted from below.

April 4-5-6

Accumulator

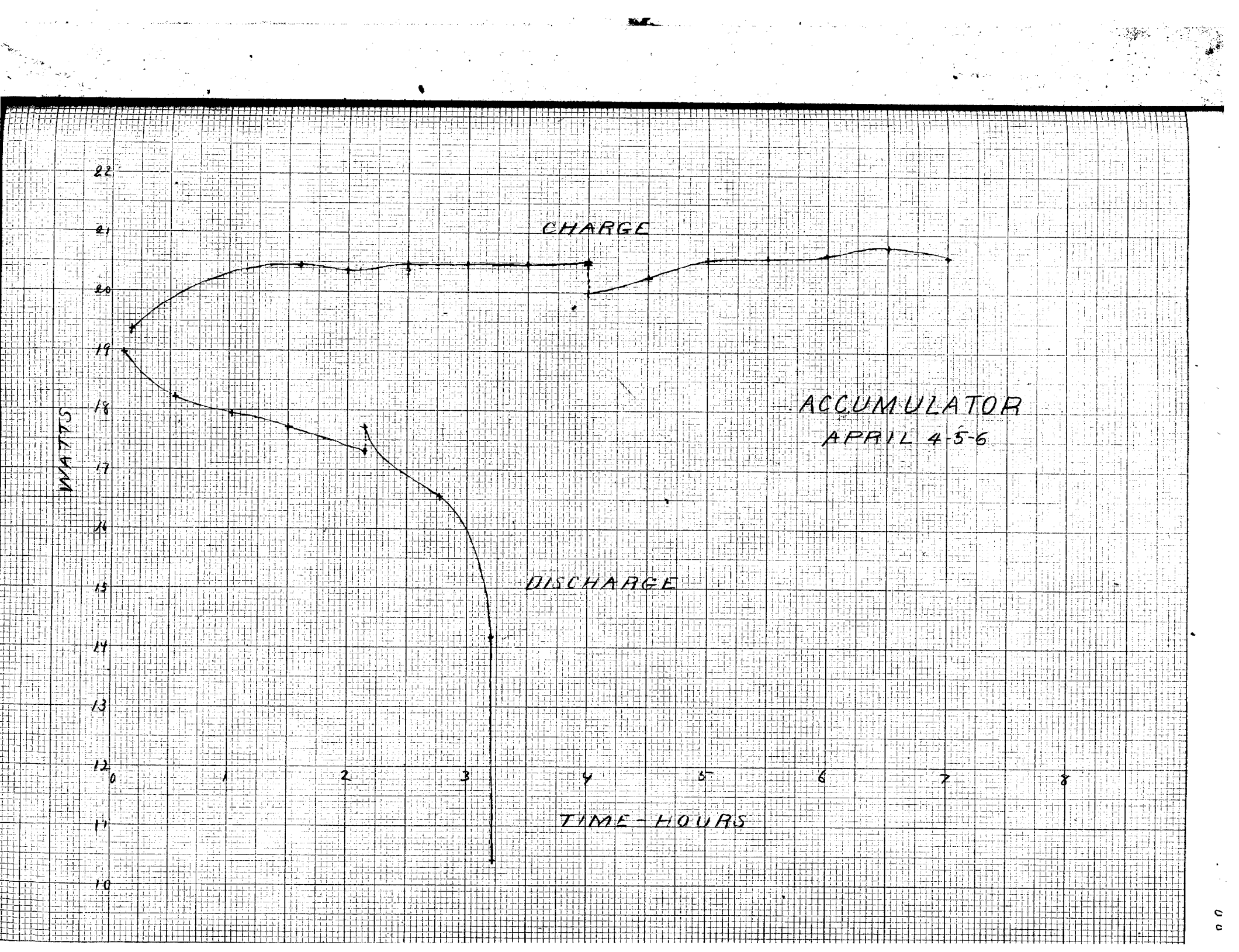
Charge

T	A	V	W	WM
12.40	9.59	2.022	19.39	833.8
-35	"	"	19.92	697.2
2.05	9.59	2.134	20.46	1125.3
2.30	9.49	2.147	20.37	550.0
3.00	9.54	2.147	20.48	614.4
3.30	9.54	2.147	20.48	614.4
4.00	9.54	2.147	20.48	614.4
4.30	9.49	2.151	20.51	307.6
9.00	9.49	2.108	20.00	300.0
9.30	9.41	2.151	20.24	607.2
10.00	9.54	2.154	20.55	616.5
10.30	9.53	2.161	20.59	617.7
11.00	9.54	2.164	20.64	619.2
11.30	9.59	2.167	20.78	623.4
12.00	9.49	2.174	20.63	3094
				8353.3
				697.2
				7656.1

Discharge

T	A	V	W	WM
2.37	9.09	2.088	18.98	246.7
3.03	8.88	2.052	18.22	670.2
3.33	8.80	2.042	17.96	520.8
4.00	8.74	2.028	17.72	567.0
4.38	8.68	2.008	17.43	331.2
9.00	8.77	2.022	17.73	358.9
9.38	8.46	1.955	16.55	546.1
10.05	7.89	1.796	14.18	212.7
10.08	7.48	1.395	10.43	10.4
				3302.0

Eff = 43.12


CHARGE
DISCHARGE
ACCUMULATOR
APRIL 4-5-6
WATTS
TIME - HOURS
22
21
20
19
18
17
16
15
14
13
12
11
10
0
1
2
3
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6
7
8

Apr 6-1

Accumulator

Charge

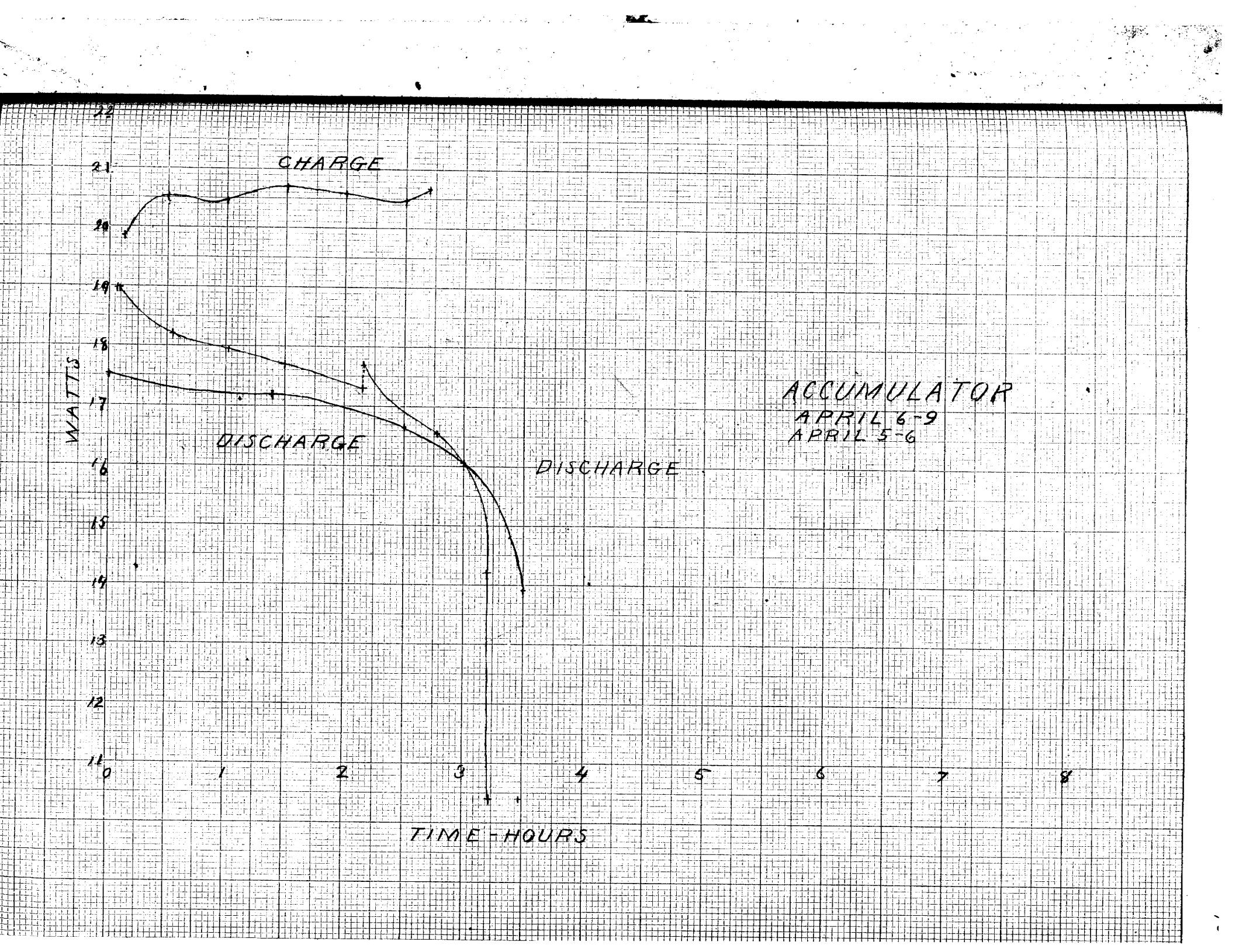
T	A	V	W	WM
10.08	9.49	1.985	18.84	207.2
10.30	9.49	2.164	20.53	533.8
11.00	9.46	2.164	20.47	614.1
11.30	9.54	2.171	20.71	621.3
12.00	9.47	2174	20.59	617.7
12.30	9.39	2.181	20.48	450.6
12.43	9.47	2.184	20.68	124.1
				3168.8

Discharge

T	A	V	W	WM
11.00	8.70	2.015	17.53	753.8
12.25	8.58	2.005	17.20	1290.0
1.30	8.48	1.965	16.66	783.0
2.00	8.30	1.923	16.06	481.8
2.30	8.21	1.695	13.92	208.8
			3	517.4

Eff = 111.00%

Eff with last Discharge = 104.20%

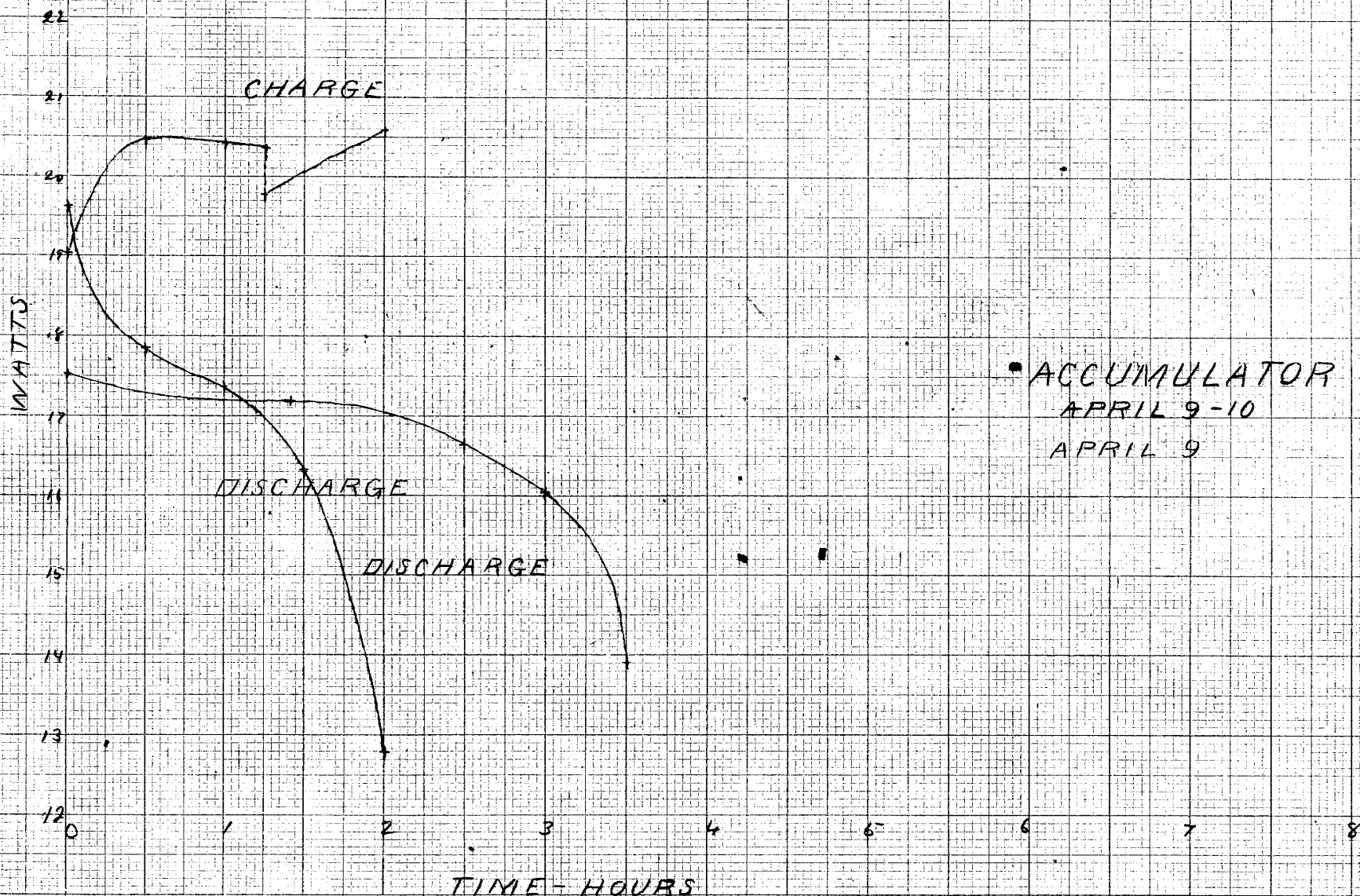

CHARGE
DISCHARGE
DISCHARGE
ACCUMULATOR
APRIL 6-9
APRIL 5-6
WATTS
TIME - HOURS
22
21
20
19
18
17
16
15
14
13
12
11
0
1
2
3
4
5
6
7
8

Accumulator

Charge					Discharge				
T	A	V	W	WM	T	A	V	W	WM
2.30	9.49	2.005	19.03	2.854	10.00	9.31	2.108	19.63	294.5
3.00	9.46	2.164	20.47	614.2	10.30	8.79	2.032	17.86	535.8
3.30	9.44	2.164	20.43	469.8	11.00	8.68	2.002	17.38	521.4
3.45	9.42	2.164	20.37	142.3	11.30	8.40	1.943	16.32	489.6
9.45	9.39	2.108	19.79	458.3	12.00	7.44	1.718	12.78	191.7
10.00	9.46	2.174	20.57	473.1				2033.0	
				24431					

Eff = 83.21

Eff with last Dis = 143.97



ACCUMULATOR
APRIL 9 - 10
APRIL 9

Accumulator

Charge

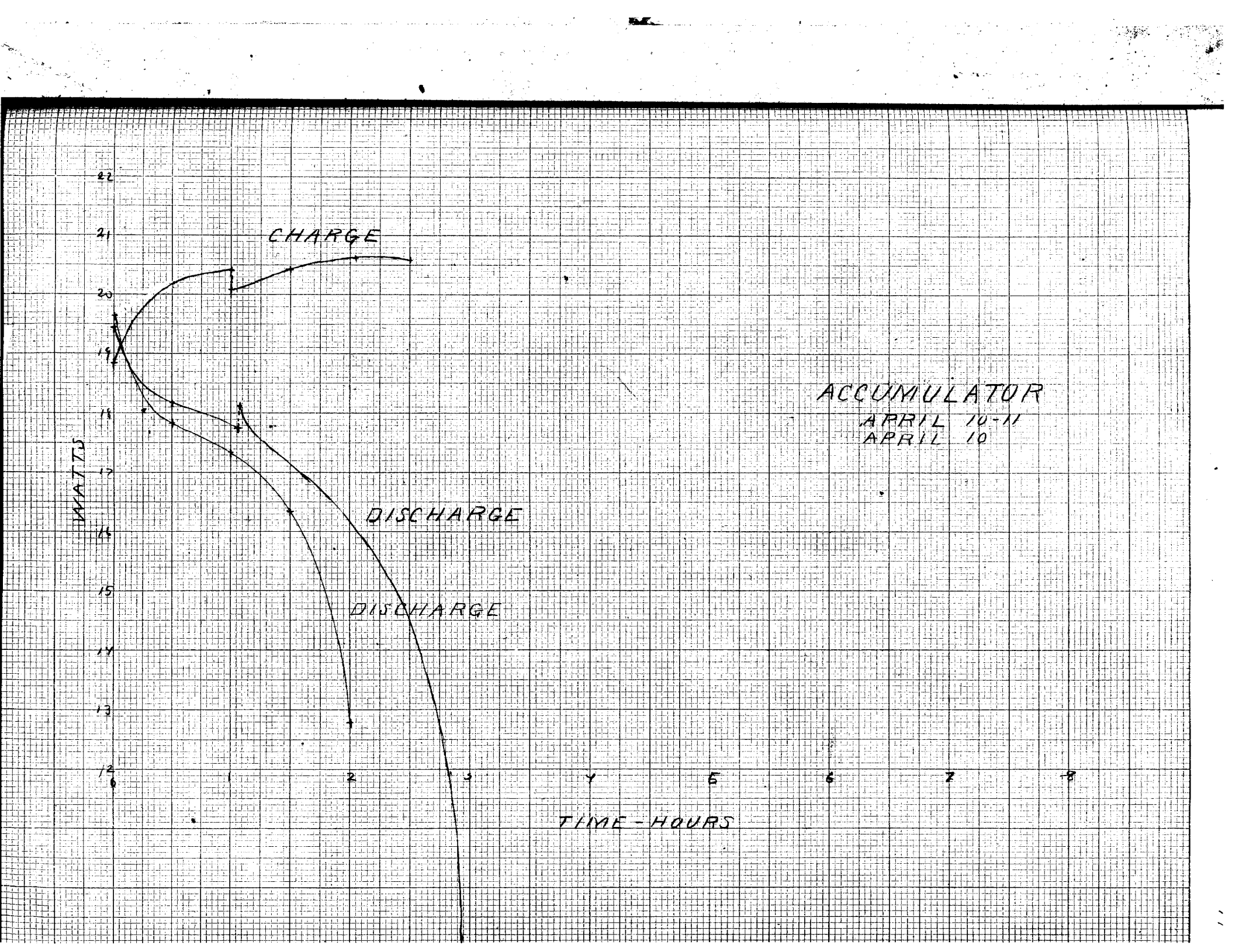
T	V	A	W	WM
12.00	9.45	1.995	18.85	565.5
1.00	9.39	2.174	20.41	612.3
2.00	9.50	2.115	20.09	301.4
2.30	9.39	2.174	20.41	612.3
3.05	9.46	2.181	20.63	618.9
3.30	9.42	2.184	20.57	308.5
				3018.9

Discharge

T	A	V	W	WM
3.30	9.25	2.102	19.44	291.6
4.00	8.87	2.049	18.17	545.1
4.35	8.77	2.025	17.76	355.2
9.12	8.89	2.035	18.12	978.5
11.00	4.68	1.149	5.38	290.5
				2460.9

Eff = 81.51

Eff with last Dist = 67.34


ACCUMULATOR
APRIL 10-11
APRIL 10
CHARGE
DISCHARGE
DISCHARGE
WATTS
TIME - HOURS
22
21
20
19
18
17
16
15
14
13
12
0
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April 11-12

Accumulator

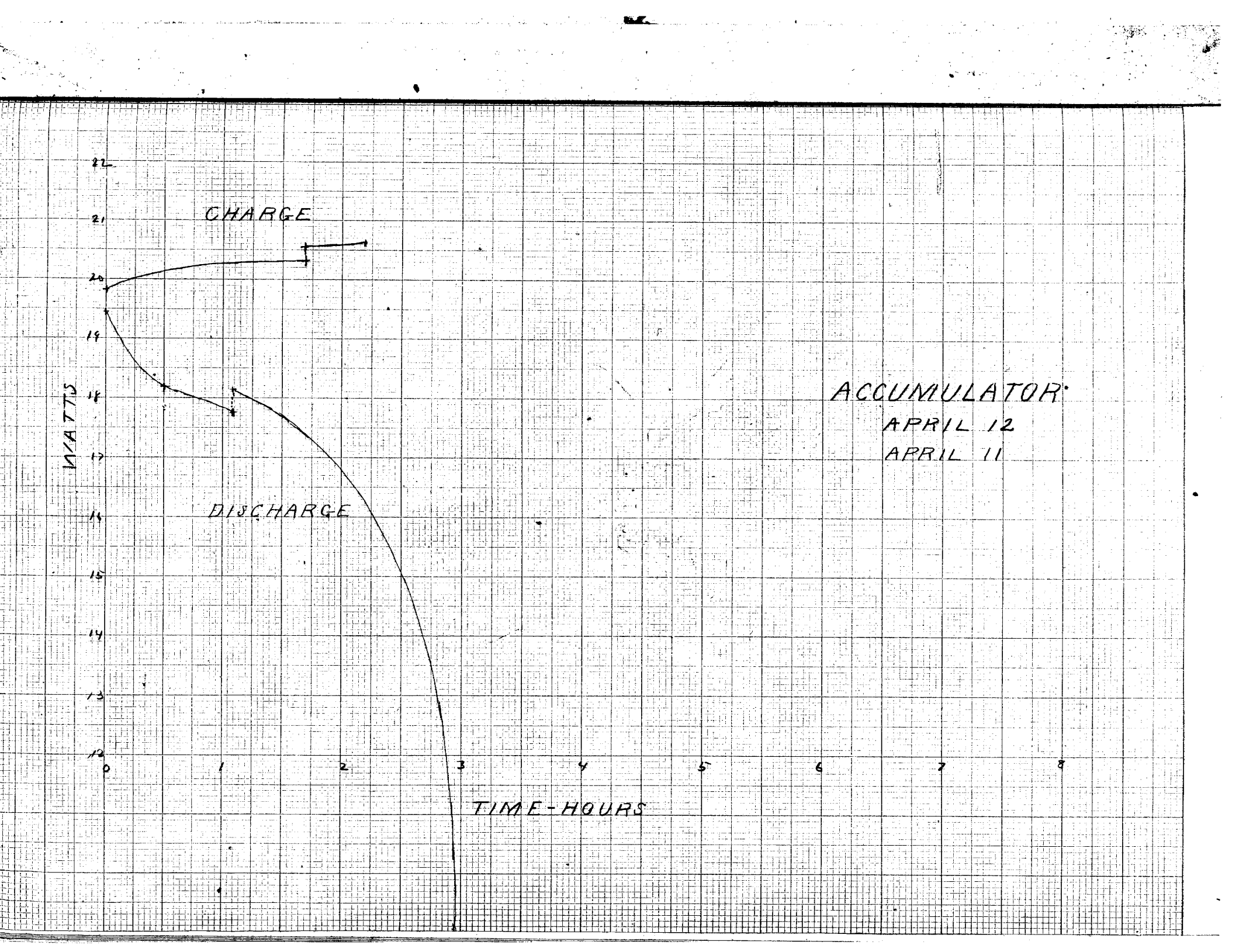
Charge

T	A	V	W	WM
11.00	9.39	2.112	19.83	1288.9
1.10	9.42	2.167	20.41	1326.7
2.00	9.55	2.157	20.54	328.6
2.32	9.44	2.184	20.62	3299
				3.274.1

Discharge

T	A	V	W	WM

Eff with last Disch 75.16


CHARGE
DISCHARGE
WATTS
TIME - HOURS
ACCUMULATOR
APRIL 12
APRIL 11

documentos

[illegible] 67.49

April 25-26

Accumulator

Discharge

T	A	V	W	WM
11.00				
11.02	9.09	2.107	19.15	306.4
11.30	8.89	2.084	18.53	537.4
12.00	8.86	2.057	18.22	546.6
12.30	8.86	2.057	18.22	291.5
1231				
1.30	8.92	2.065	18.42	147.4
1.45	8.83	2.058	18.17	272.5
2.00	8.83	2.055	18.15	399.3
2.30	8.80	2.052	18.06	541.8
3.00	8.77	2.042	17.91	537.3
3.30	8.77	2.042	17.91	537.3
4.00	8.76	2.035	17.81	267.2
~~8.45~~				
8.53	8.75	2.045	17.89	2147
9.00	8.71	2.042	17.79	320.2
9.30	8.71	2.032	17.70	531.0
10.00	8.68	2.028	17.60	528.0
				5978.6

Discharge

T	A	V	W	WM
10.30	8.68	2.028	17.60	528.0
11.00	8.63	2.022	17.45	523.5
11.30	8.60	2.018	17.35	520.5
12.00	8.60	2.018	17.35	520.5
12.30	8.60	2.012	17.30	259.5
2.15				
2.20	8.60	2.018	17.35	86.6
2.30	8.60	2.012	17.30	346.0
3.00	8.56	2.008	17.19	560.7
3.30	8.50	1.995	16.96	508.8
4.00	8.48	1.992	16.89	405.4
4.17	8.48	1.992	16.89	135.1
9.00	8.76	2.022	17.81	53.4
9.05	8.59	2.008	17.25	258.7
9.30	8.50	1.985	16.87	455.5
10.00	8.48	1.985	16.83	504.9
10.30	8.42	1.975	16.63	498.9
11.00	8.40	1.962	16.48	494.4
				6660.4

Accumulator

April 25. 26. 30.

Discharge

T	A	V	W	WM
11.30	8.31	1.943	16.15	242.3
9.55	8.56	1.978	16.92	50.8
10.00	8.48	1.972	16.82	285.9
11.30	8.18	1.909	15.62	468.6
11.00	6.67	1.365	9.10	1547
11.02				12023
				59786
				66604
	Total			138413

Charge

T	A	V	W	WM
11.03	9.49	2008	1906	19.1
11.05	9.59	20.25	19.42	271.9
11.30	9.54	2.141	20.42	551.2
12.00	9.59	2.164	20.75	621.5
12.30	9.59	2.164	20.75	310.7
2.16				
2.30	9.59	2.151	20.63	598.3
3.00	9.59	2.157	20.47	614.1
4.00	9.59	2.163	20.74	311.1
9.05	9.99	2137	21.35	106.8
9.15	9.54	2.151	20.52	266.8
9.30	9.54	2.154	20.55	452.1
10.00	9.69	2.164	20.97	943.7
11.00	9.52	2.174	20.70	931.5
11.30	9.49	2.174	20.63	618.9
12.00	9.49	2.177	20.66	309.9
2.15				
2.16	9.69	2.144	20.77	166.2
2.30	9.49	2.167	20.66	452.3

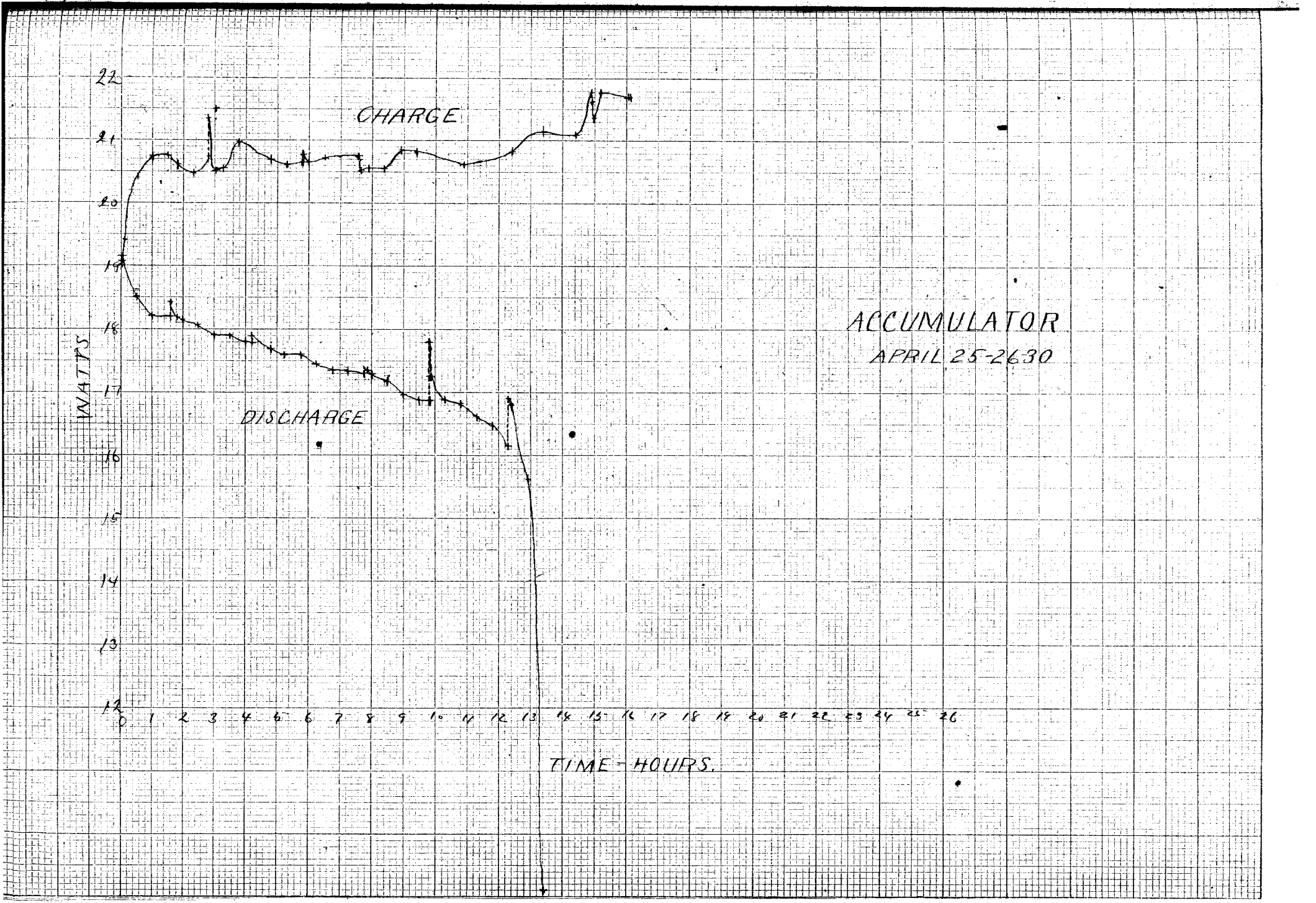
April 25-26-30
May 1-2

Accumulator

Charge

T	A	V	W	WM
3.00	9.49	2.184	20.73	1098.7
4.15	9.49	2.187	20.75	767.8
9.10				
9.15	9.49	2.161	20.51	266.6
9.30	9.49	2.167	20.56	452.3
10.00	9.44	2.177	20.55	616.5
10.30	9.55	2.184	20.86	938.7
11.00	9.49	2.194	20.82	1249.2
12.30	9.39	2.197	20.62	1546.5
2.00	9.41	2.214	20.83	1562.3
3.00	9.54	2.217	21.15	1269.0
4.00	9.49	2.221	21.08	948.6
4.30	9.79	2.224	21.77	326.5
9.55	9.79	2.207	21.61	64.8
10.00	9.53	2.241	21.36	1495
10.10	9.59	2.261	21.78	653.4
11.00	9.49	2.287	21.70	651.0
16.05				
Total Charge			20	507.5

Eff = 67.49%


CHARGE
DISCHARGE
ACCUMULATOR
APRIL 25-2630
WATTS
TIME - HOURS.
22
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12
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26

The Chloride Cell.

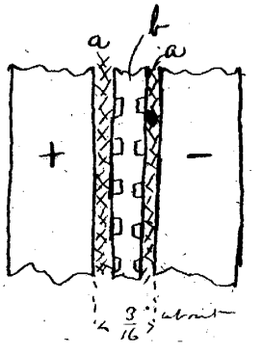
This cell is of the Planté type made in a peculiar manner which its makers claim causes it to be stronger; lighter and more efficiant than any other

The improvement affecting this is the method of making and forming the active material for the plate.

I shall not describe the process, but it results in giving the tablets of active material, which the plate is cast around a very ~~process~~ porous crystaline structure

The method of keeping the plates apart is worthy of notice as it may

Explain the results I got.



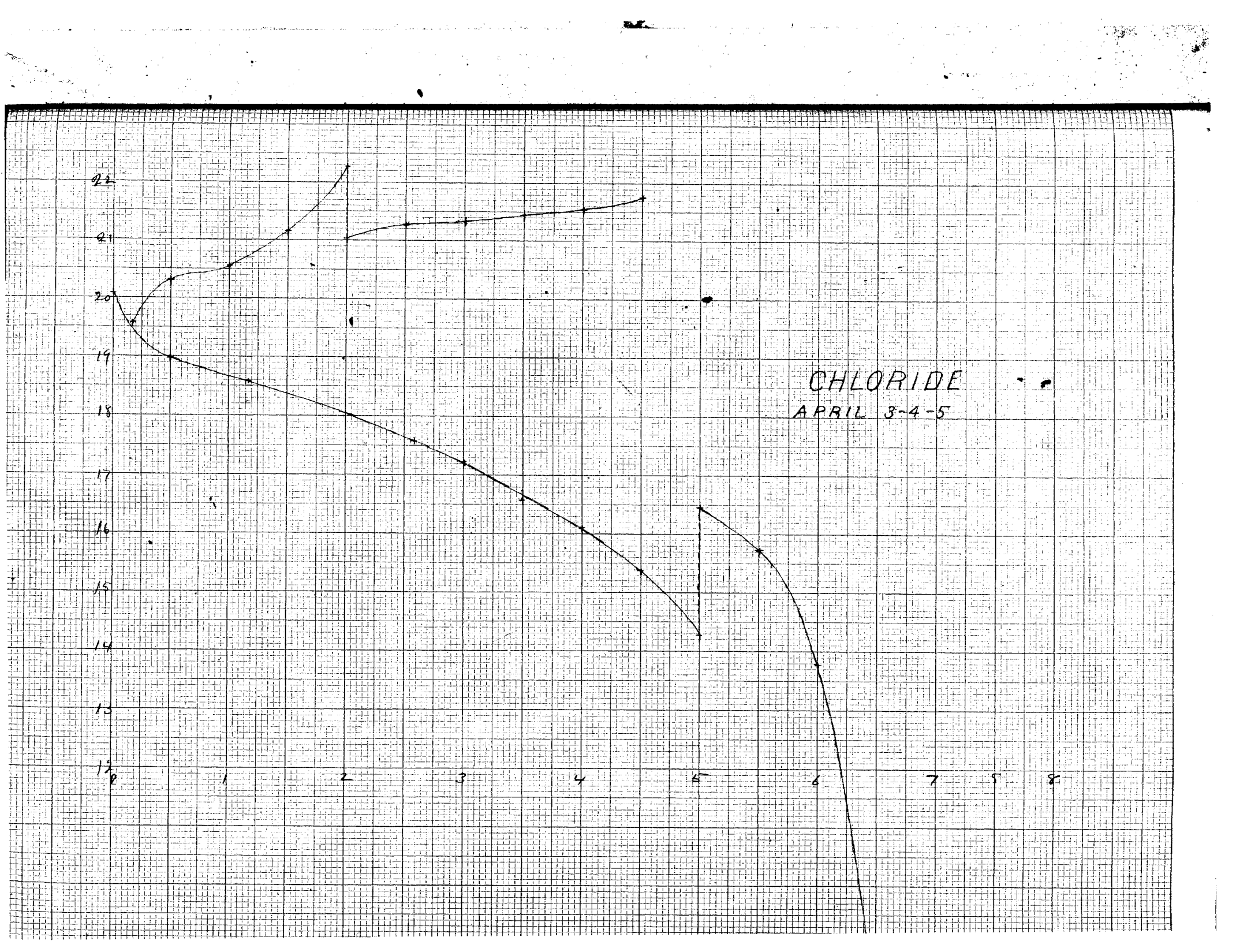
as shown in the drawing, the two plates are marked + and −. a,a, are sheets of asbestos cloth covering the whole surface of the plates, and b is a grooved sheet of wood of the same size as the plates inserted to allow circulation of the liquid.

April 3 + 4 + 5

Chloride

Charge					Discharge				
T	A	V	W	WM	T	A	V	W	WM
2.40	9.59	2.042	19.58	195.8	11.30	9.67	2.075	20.07	301.1
3.00	9.54	2.131	20.33	508.2	12.00	9.41	2.018	18.99	569.7
3.30	9.49	2.164	20.54	616.2	12.40	9.32	1.995	18.59	557.7
4.00	9.69	2.184	21.16	634.8	2.05	9.05	1.943	17.58	527.4
4.30	10.09	2.207	22.27	334.1	2.30	8.99	1.916	17.22	516.6
9.00	9.64	2.181	21.02	315.3	3.00	8.81	1.883	16.59	497.7
9.30	9.64	2.207	21.27	638.1	3.30	8.71	1.849	1610	483.0
10.00	9.59	2.224	21.33	639.9	4.00	8.49	1.810	15.37	461.1
1030	9.54	2.247	21.44	643.2	4.30	8.18	1.744	14.27	214.1
11.00	9.54	2.257	21.53	645.9	9.00	8.77	1.876	16.45	246.7
11.30	9.54	2.281	21.75	326.2	9.30	8.74	1.797	15.71	471.3
				5487.7	10.00	8.05	1.711	13.77	413.1
					1030	5.99	1.282	7.68	115.2
									5384.7

Eff = 98.12


CHLORIDE
APRIL 3-4-5
22
21
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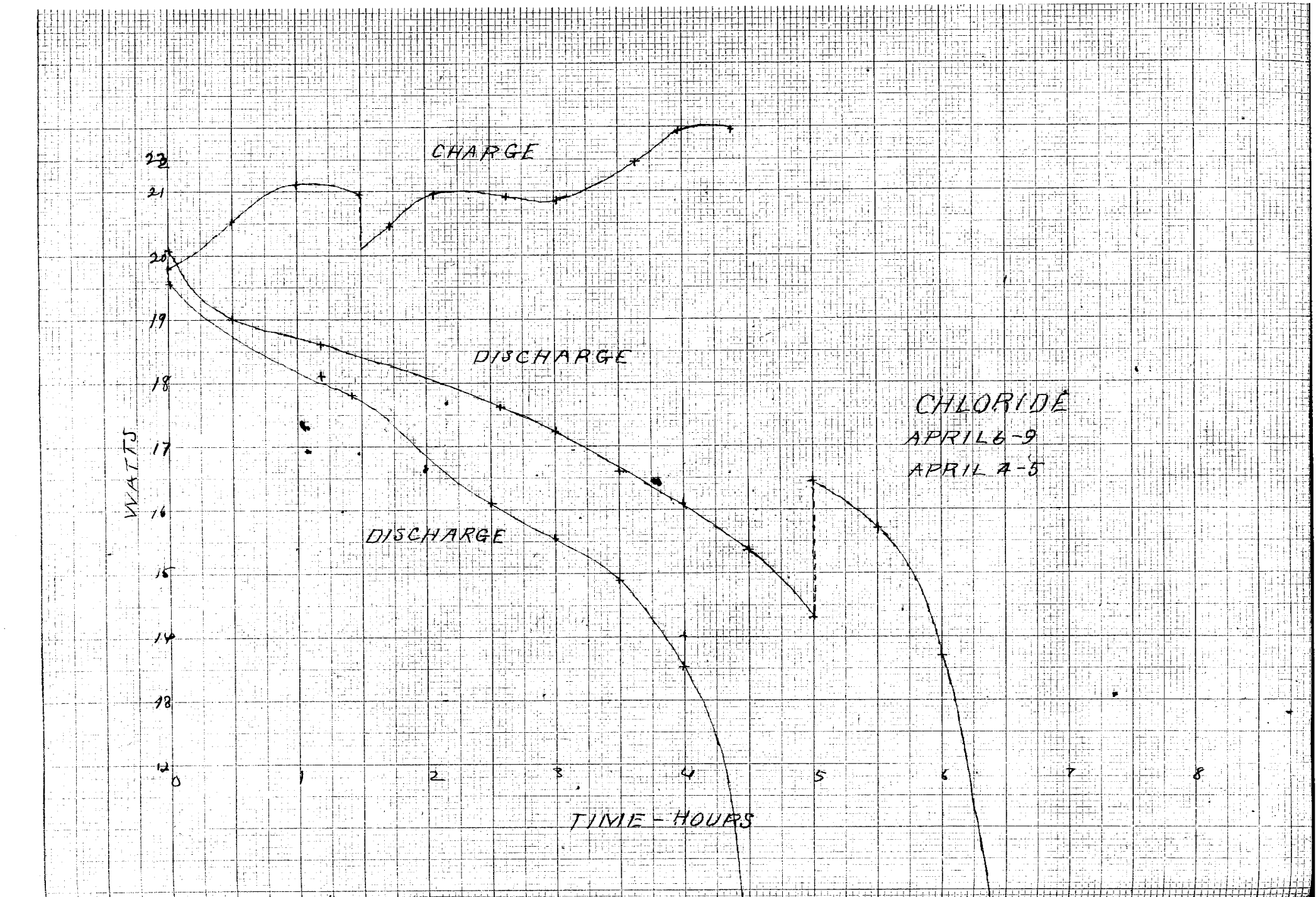
April 6-9

Chloride

Charge					Discharge				
T	A	V	W	WM	T	A	V	W	WM
10.30	9.63	2.055	19.80	297.0	11.00	9.40	1.978	18.59	743.2
11.00	9.45	2.161	20.42	612.6	12.25	9.21	1.933	17.80	1435.0
11.30	9.69	2.174	21.07	632.1	1.30	8.58	1.873	16.07	808.5
12.00	9.59	2.184	20.94	314.1	2.00	8.46	1.846	15.62	468.6
9.23					2.30	8.27	1.800	14.89	454.7
9.35	9.34	2.191	20.46	450.1	3.00	7.87	1.718	13.52	405.6
9.57	9.49	2.207	20.94	628.2	3.30	6.49	1.409	9.76	146.4
10.30	9.40	2.224	20.90	627.0					4562.0
10.55	9.34	2.234	20.86	625.8					
11.30	9.54	2.254	21.45	643.5					
11.50	9.64	2.264	21.82	436.4					
12.15	9.62	2.281	21.94	219.4					
				5486.2					

Eff. = 83.15

Eff with Cap Diss = 98.13


CHARGE
DISCHARGE
DISCHARGE
CHLORIDE
APRIL 6-9
APRIL 4-5
WATTS
TIME - HOURS
22
21
20
19
18
17
16
15
14
13
12
0
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4
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6
7
8

April 9+10

Chloride

Charge

T	A	V	W	WM
3.30	9.42	2.032	19.12	191.2
3.45	9.49	2.147	20.38	101.9
9.15	9.37	2.161	20.25	405.0
10.00	9.39	2.181	20.48	8.19.2
10.30	9.39	2.227	20.91	627.3
11.00	9.45	2.241	21.18	6354
11.30	9.42	2.261	21.30	639.0
1200	9.43	2.274	21.45	3218
				3740.8

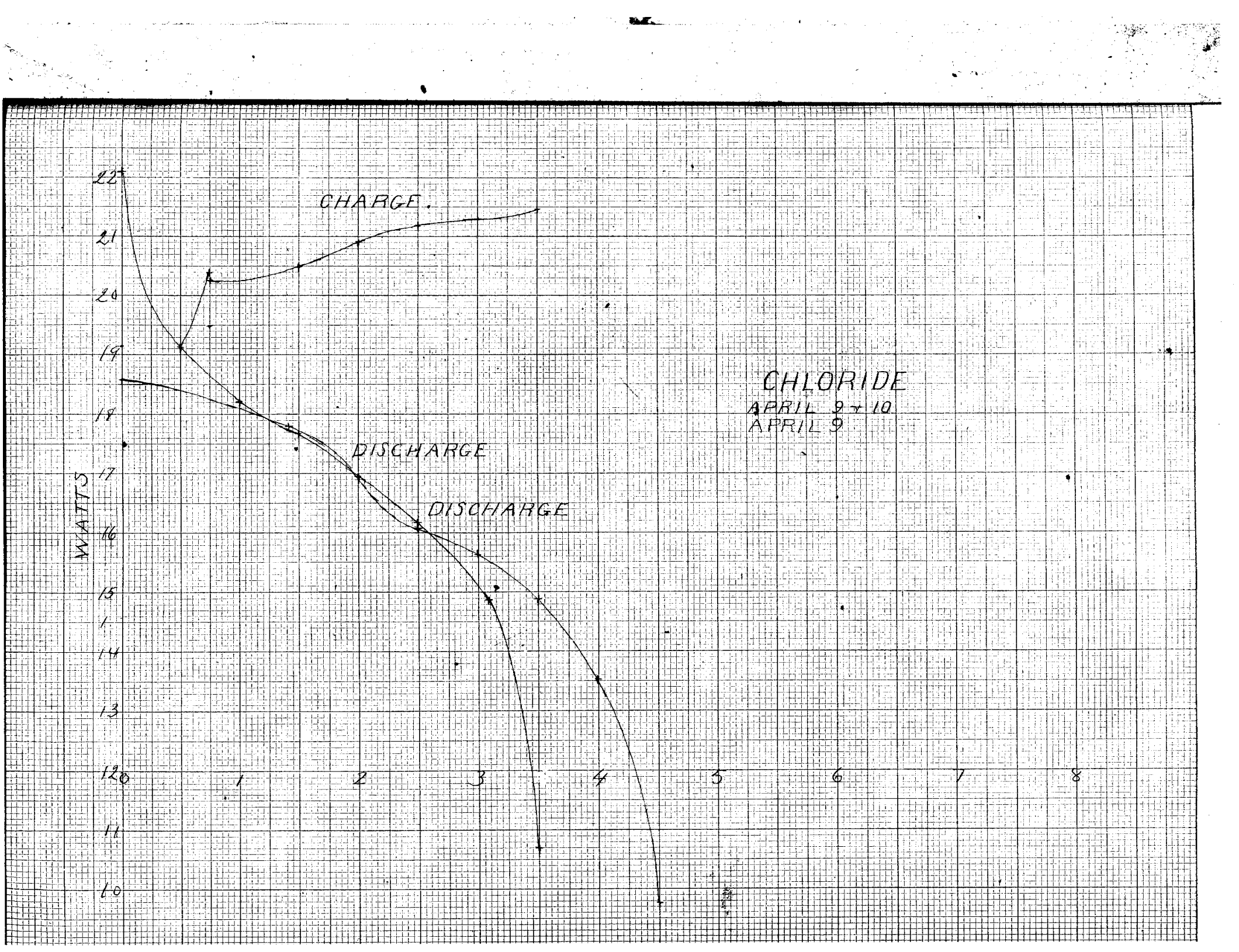
Discharge

T	A	V	W	WM
12.00	9.94	2.227	22.10	663.0
1.00	9.13	1.995	18.21	910.5
1.30	9.01	1.962	17.68	528.4
2.00	8.82	1.923	16.96	508.8
2.30	8.63	1.873	16.16	484.8
3.05	8.28	1.797	14.88	446.4
3.30	7.65	1.329	10.07	151.0
				3692.9

Eff = 98.72

Eff with next Chr = 58.28

Eff with last Dist = 121.96


CHARGE.
DISCHARGE
DISCHARGE
CHLORIDE
APRIL 9 & 10
APRIL 9
WATTS
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April 10-11-12

Chloride

Charge

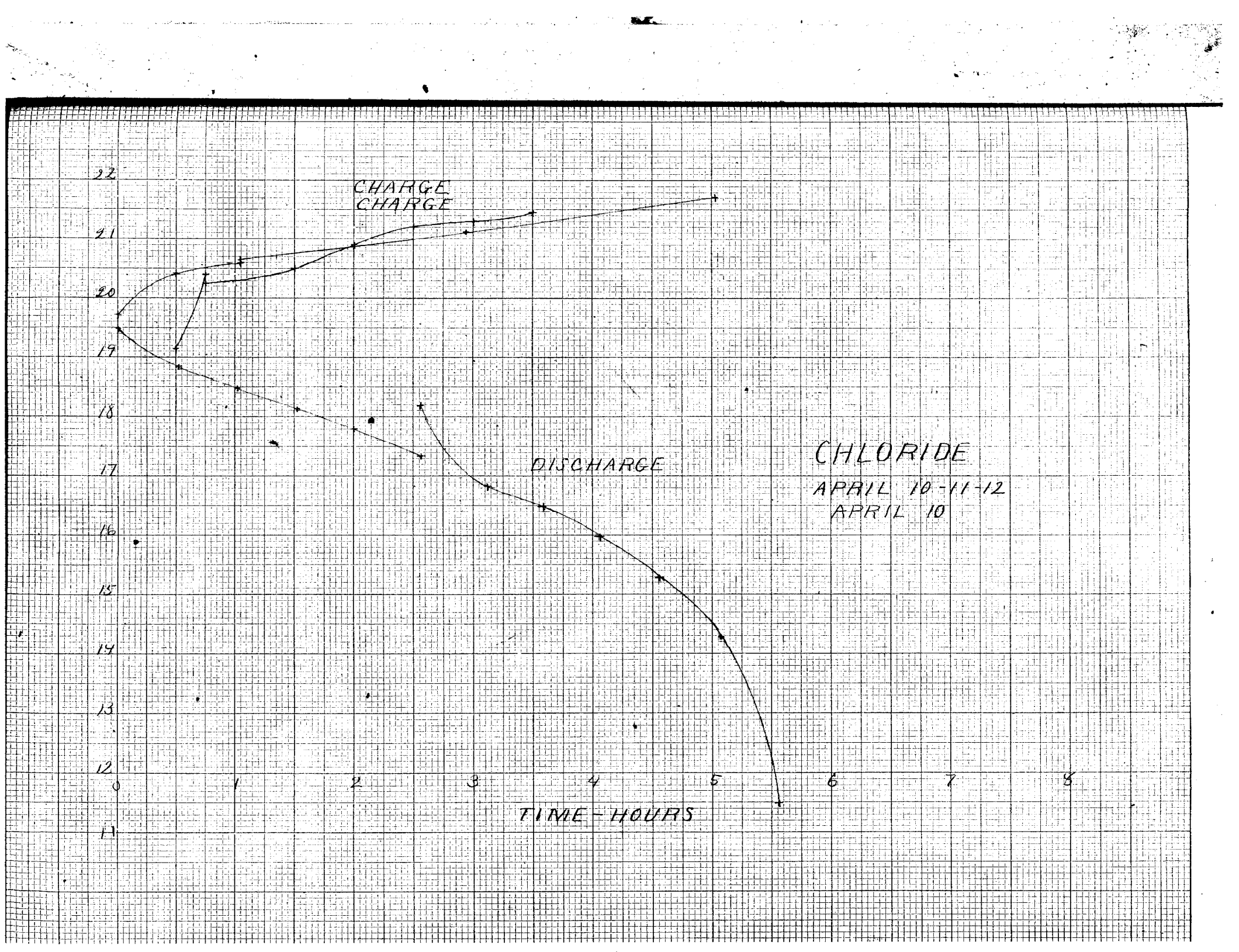
T	A	V	W	WM
3.30	9.47	2.085	19.73	295.9
4.00	9.43	2.164	20.4	653.1
4.35	9.39	2.191	20.57	370.3
9.13	9.47	2.181	20.66	1196.0
11.00	9.39	2.247	21.10	2510.9
1.10	9.41	2.307	21.71	1411.2
				6336.4

Discharge

T	A	V	W	WM
2.00	9.43	2.065	19.49	311.8
2.33	9.27	2.035	18.86	603.5
3.03	9.21	2.008	18.49	554.7
3.33	9.12	1.988	18.12	507.4
4.00	9.03	1.972	17.80	587.4
4.38	8.91	1.949	17.36	329.8
9.00	9.21	1.975	18.19	345.6
9.38	8.81	1.909	1682	538.2
10.05	8.68	1.899	1648	412.0
10.30	8.56	1.869	15.99	463.7
11.00	8.37	1.827	15.29	458.7
11.30	8.09	1.764	14.27	428.1
12.00	7.21	1.593	11.49	172.3
				5713.2

Eff = 90.17

Eff with rest + ch = 120.22


22
21
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11
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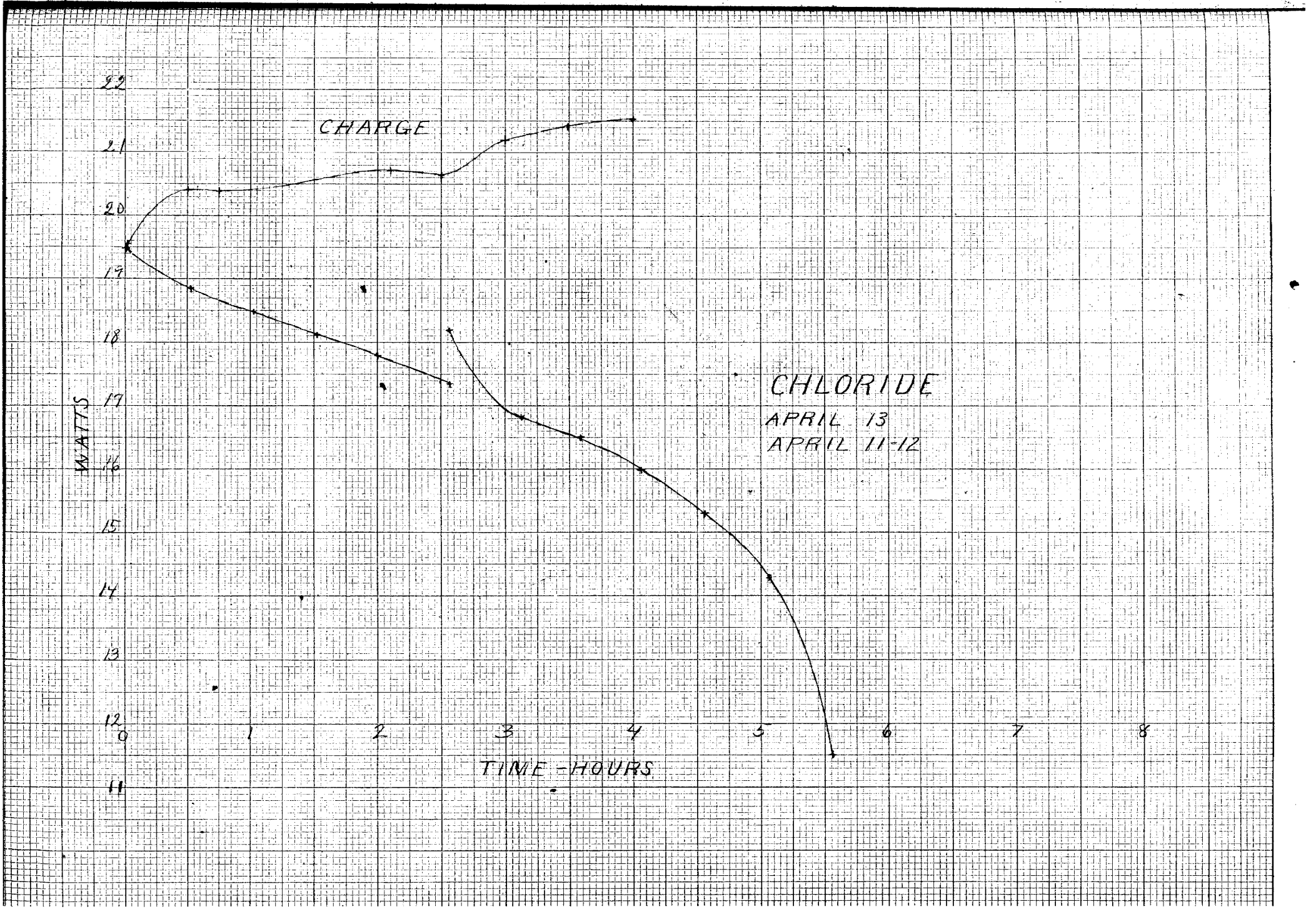
8
CHARGE
CHARGE
DISCHARGE
CHLORIDE
APRIL 10-11-12
APRIL 10
TIME - HOURS

April 13

Chloride

Charge					Discharge				
T	A	V	W	WM	T	A	V	W	WM
12.00	9.44								
12.02	9.44	2.082	19.64	294.6					
12.30	9.49	2.151	20.41	449.0					
12.45	9.44	2.161	20.39	1039.9					
- 12[m]	9.41	2.184	20.53	246.6					
2.12	9.39	2.207	20.72	1118.2					
2.30	9.31	2.217	20.64	495.4					
3.00	9.49	2.234	21.20	636.0					
3.27	9.51	2.254	21.43	64.29					
4.00	9.43	2.274	21.53	322.9					
				4998.9					
				246.6					
				4752.3					

Eff with Cor Dis = 120.22 %


CHARGE
CHLORIDE
APRIL 13
APRIL 11-12
WATTS
TIME - HOURS
22
21
20
19
18
17
16
15
14
13
12
11
0
1
2
3
4
5
6
7
8

Chloride

Charge

T	A	V	W	WM
12.00				
12.02	9.44	2.082	19.64	294.6
12.30	9.49	2.151	20.41	449.0
12.45	9.44	2.161	20.39	1039.9
-12[m]	9.41	2.184	20.55	246.6
2.12	9.39	2.207	20.72	1118.2
2.30	9.31	2.217	20.64	495.4
3.00	9.49	2.234	21.20	636.0
3.27	9.51	2.254	21.43	642.9
4.00	9.43	2.274	21.53	322.9
10.15				
10.17	9.54	2.231	21.28	255.4
10.37	9.51	2.264	21.53	258.3
11.00	9.51	2.287	21.75	565.5
11.30	9.59	2.307	22.12	663.6
12.00	9.49	2.324	22.05	661.5
12.30	9.48	2.337	22.15	332.2
2.10				
				7735.4

Charge

T	A	V	W	WM
2.15	9.49	2.307	21.89	284.6
2.30	9.49	2.324	22.05	485.1
3.00	8.79	2.331	20.49	307.4
9.00				
9.03	9.46	2.284	21.61	367.4
9.30	9.56	2.331	22.28	623.8
10.00	9.41	2.347	22.06	661.8
10.30	9.41	2.361	22.22	666.6
11.00	9.41	2.384	22.43	336.5
2.10				
2.15	9.46	2.341	22.16	332.2
				4065.4
				7735.4
				11800.8
				246.6
				11554.2

April 15-17

Chloride

Discharge

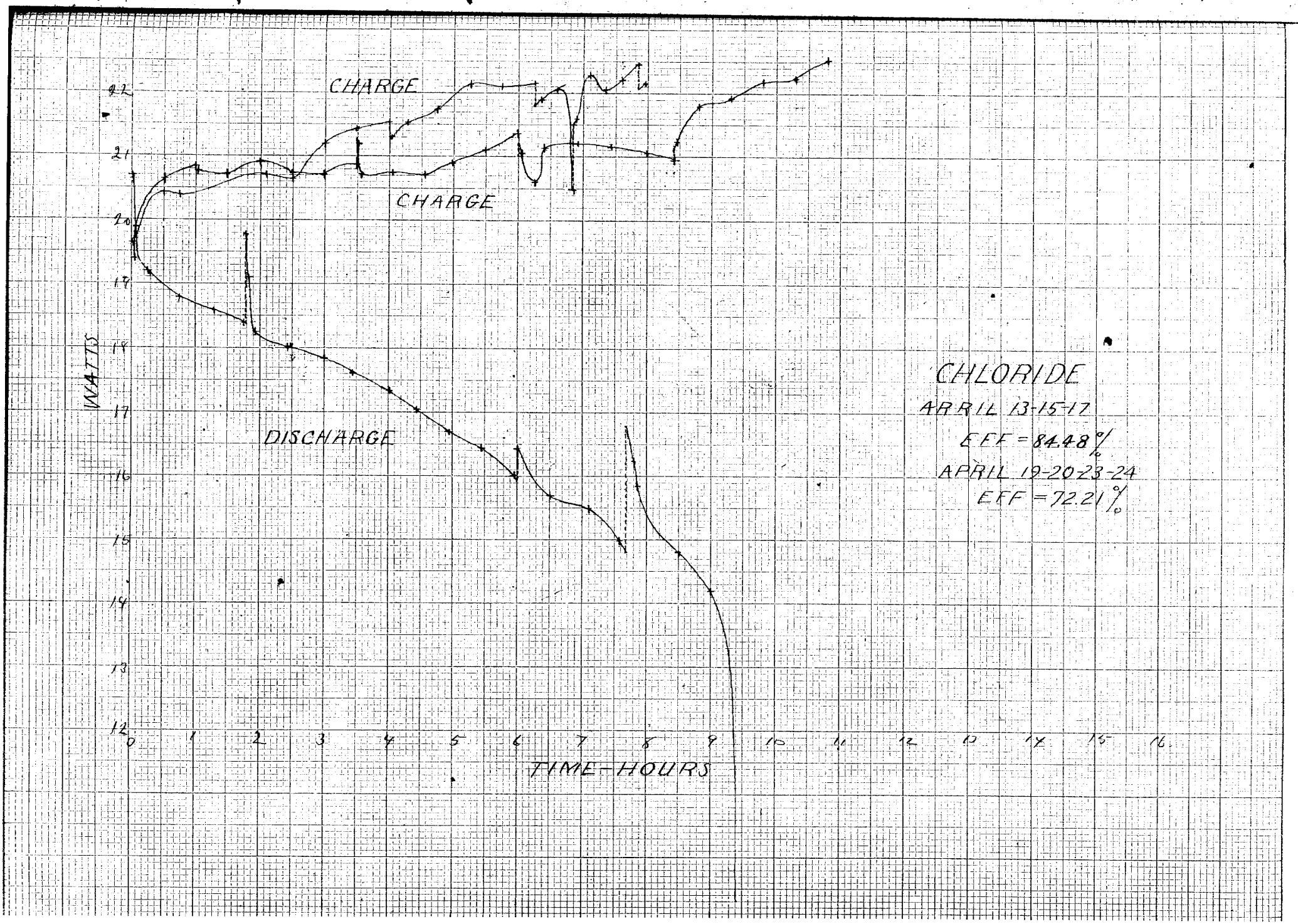
T	A	V	W	WM
2.15	9.76	2.122	20.71	165.7
2.30	9.35	2.055	19.21	422.6
3.00	9.28	2.028	18.82	602.2
3.33	9.21	2.018	18.59	557.7
4.00	9.15	2.008	18.37	293.9
4.03				
8.08	9.64	2.052	19.78	39.6
8.11	9.20	2.022	18.60	204.6
8.30	9.09	2.008	18.26	438.0
9.00	9.03	1.995	18.02	630.7
9.40	9.03	1.978	17.86	535.8
10.00	8.96	1.965	17.61	493.1
10.35	8.90	1.949	17.35	520.5
11.00	8.81	1.933	17.03	449.8
11.30	8.72	1.913	16.68	500.4
12.00	8.68	1.896	16.46	493.8
12.30	8.58	1.866	16.01	320.2
12.35				
				6668.6

Discharge

T	A	V	W	WM
2.00	8.68	1.896	16.46	246.9
2.30	8.49	1.853	15.73	550.5
3.10	8.37	1.823	15.48	510.8
3.35	8.27	1.786	14.77	236.2
3.39				
9.47				
9.55	8.58	1.889	16.21	178.3
10.00	8.49	1.866	15.84	348.5
10.39	8.24	1.799	14.77	443.1
11.00	8.06	1.763	14.21	355.2
11.30	7.33	1.599	11.72	222.7
11.34				
				3092.2
				6668.6
		total		9760.8

Eff = 84.48% with last change

Eff = 72.21% with much



CHLORIDE

APRIL 13-15-17

EFF = 84.48 %

APRIL 19-20-23-24

EFF = 72.21 %

April 19-20-23-24

Chloride

Charge

T	A	V	W	WM
11.34	9.55	2.032	19.41	19.4
11.36	9.49	2.093	19.86	258.2
12.00	9.54	2.163	20.66	558.2
12.30	9.59	2.173	20.84	312.6
2.02				
2.05	9.54	2.174	20.74	331.8
2.30	9.49	2.184	20.73	559.7
3.00	9.53	2.194	20.91	627.3
3.30	9.44	2.197	20.74	622.2
4.00	9.39	2.207	20.72	621.6
4.30	9.39	2.224	20.88	313.2
9.02				
9.04	9.75	2.174	21.20	63.6
9.06	9.49	2.184	20.73	352.4
9.37	9.36	2.217	20.75	601.7
10.05	9.33	2.231	20.72	539.4
10.30	9.32	2.241	20.89	564.0
11.00	9.37	2.251	21.09	632.7
				6997.0

Charge

T	A	V	W	WM
11.30	9.46	2.264	21.36	320.4
2.05				
2.09	9.46	2.224	21.04	210.4
2.20	9.19	2.241	20.59	205.9
2.30	9.48	2.261	21.63	432.6
3.00	9.49	2.284	21.68	650.4
3.30	9.42	2.294	21.61	648.3
4.00	9.31	2.314	21.54	646.2
4.30	9.22	2.327	21.45	321.8
9.10				
9.13	9.34	2.274	21.24	254.9
9.30	9.45	2.307	21.80	501.4
10.00	9.50	2.307	21.92	657.6
10.30	9.51	2.331	22.17	665.1
11.00	9.39	2.367	22.23	666.9
11.30	9.46	2.381	22.52	337.8
				6519.7
				6997.0
			Total =	13516.7
			Eff =	75.63%

April 24-25-26

Chloride

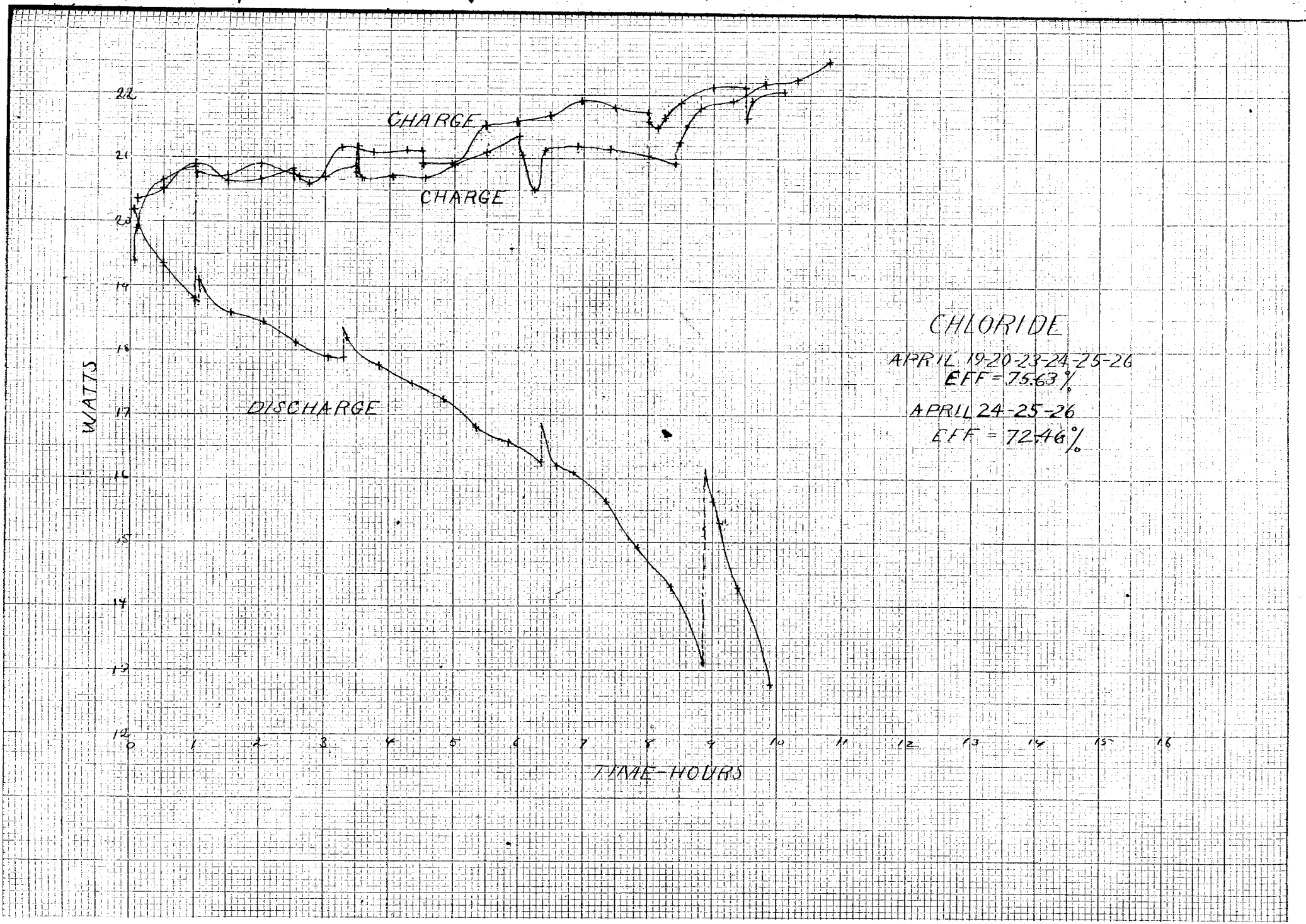
Discharge

T	A	V	W	WM
11.30				
11.33	9.55	2.112	20.17	342.9
12.00	9.35	2.068	19.34	541.5
12.30	9.21	2.032	18.71	336.8
12.33				
2.00	9.35	2.042	19.09	286.3
2.30	9.21	2.018	18.59	557.7
3.00	9.17	2.012	18.46	553.5
3.30	9.09	1.992	18.11	543.3
4.00	9.03	1.985	17.92	412.2
4.15	9.03	1.982	17.90	125.3
9.27				
9.30	9.12	1.995	18.19	327.4
10.00	9.00	1.975	17.77	533.1
10.30	8.93	1.958	17.48	524.4
11.00	8.87	1.946	17.26	517.8
11.30	8.78	1.913	16.80	504.0
12.00	8.72	1.903	16.59	497.7
				6603.9

Discharge

T	A	V	W	WM
1230	8.62	1.886	16.26	260.2
1231				
1.30	8.81	1.909	16.82	134.6
1.45	8.58	1.889	16.21	243.2
2.00	8.58	1.876	16.10	354.2
2.30	8.47	1.846	15.64	469.2
3.00	8.24	1.810	14.92	447.6
3.30	8.12	1.764	14.32	429.6
4.00	7.77	1.688	13.12	196.8
8.45	[illegible]	2.025		
8.52	8.43	1.856	15.65	172.1
9.00	8.34	1.833	15.29	290.5
9.30	8.09	1.767	14.29	428.7
10.00	7.64	1.674	12.79	191.9
				3618.6
				6603.9
			Total =	10222.5

Eff = 72.46 %



CHLORIDE

APRIL 19-20-23-24-25-26
EFF = 75.63%

APRIL 24-25-26
EFF = 72.46%

April 25-26-27

Chloride

Charge

T	A	V	W	WM
10.00				
10.05	9.50	2.141	20.34	366.1
10.30	9.49	2.161	20.51	553.8
11.00	9.49	2.164	20.38	611.4
11.30	9.49	2.174	20.63	618.9
12.00	9.45	2.184	20.64	618.2
12.30	9.48	2.197	20.83	312.4
2.15				
2.20	9.49	2.181	20.70	207.0
2.30	9.42	2.184	20.57	411.4
3.00	9.59	2.207	21.16	634.8
3.30	9.51	2.217	21.08	632.4
4.00	9.45	2.234	21.11	485.5
4.15	9.42	2241	21.11	147.8
9.03	9.52	2.197	20.91	292.9
9.30	9.41	2227	20.96	586.9
10.00	9.53	2247	21.51	645.3
10.30	9.53	2.264	21.57	647.1
				7871.9

Charge

T	A	V	W	WM
11.00	9.54	2.274	21.69	650.7
11.30	9.59	2.287	21.93	657.9
12.00	9.49	2.297	21.80	654.0
12.30	9.42	2.307	21.73	326.0
2.15	9.69	2.227	21.58	64.7
2.20	9.49	2.264	21.48	150.4
2.30	9.49	2.281	21.65	433.0
3.00	9.49	2.307	21.89	656.7
3.30	9.54	2.321	22.12	663.6
4.00	9.49	2.331	22.12	331.8
9.55				
9.57	9.44	2294	21.65	86.6
10.00	9.42	2.327	21.92	350.7
10.30	9.29	2.374	22.05	330.7
				5256.8
				7871.9
				13128.7
		Eff =	63.73	%

April 27-30
May 1

Chloride

Discharge					Discharge				
T	A	V	W	WM	T	A	V	W	WM
10.32									
10.35	9.41	2.085	19.62	313.9					
11.00	9.17	2.026	18.57	501.7					
11.30	9.11	2.015	18.36	550.8					
12.00	9.09	2.008	18.25	547.5					
12.30	9.03	1.995	18.01	1224.7					
2.16	8.82	1.955	17.24	1034.4					
2.30	8.77	1.953	17.13	376.9					
3.00	8.73	1.943	16.96	763.2					
4.00	8.62	1.909	16.46	493.8					
8.56	9.03	1.956	17.66	53.0					
9.00	8.81	1.953	17.21	292.6					
9.30	8.75	1.923	16.83	504.9					
10.00	8.65	1.899	16.43	739.3					
11.00	8.37	1.843	15.43	694.4					
11.30	8.18	1.807	14.78	443.4					
12.00	8.06	1.764	14.22	213.3					
				8347.5					

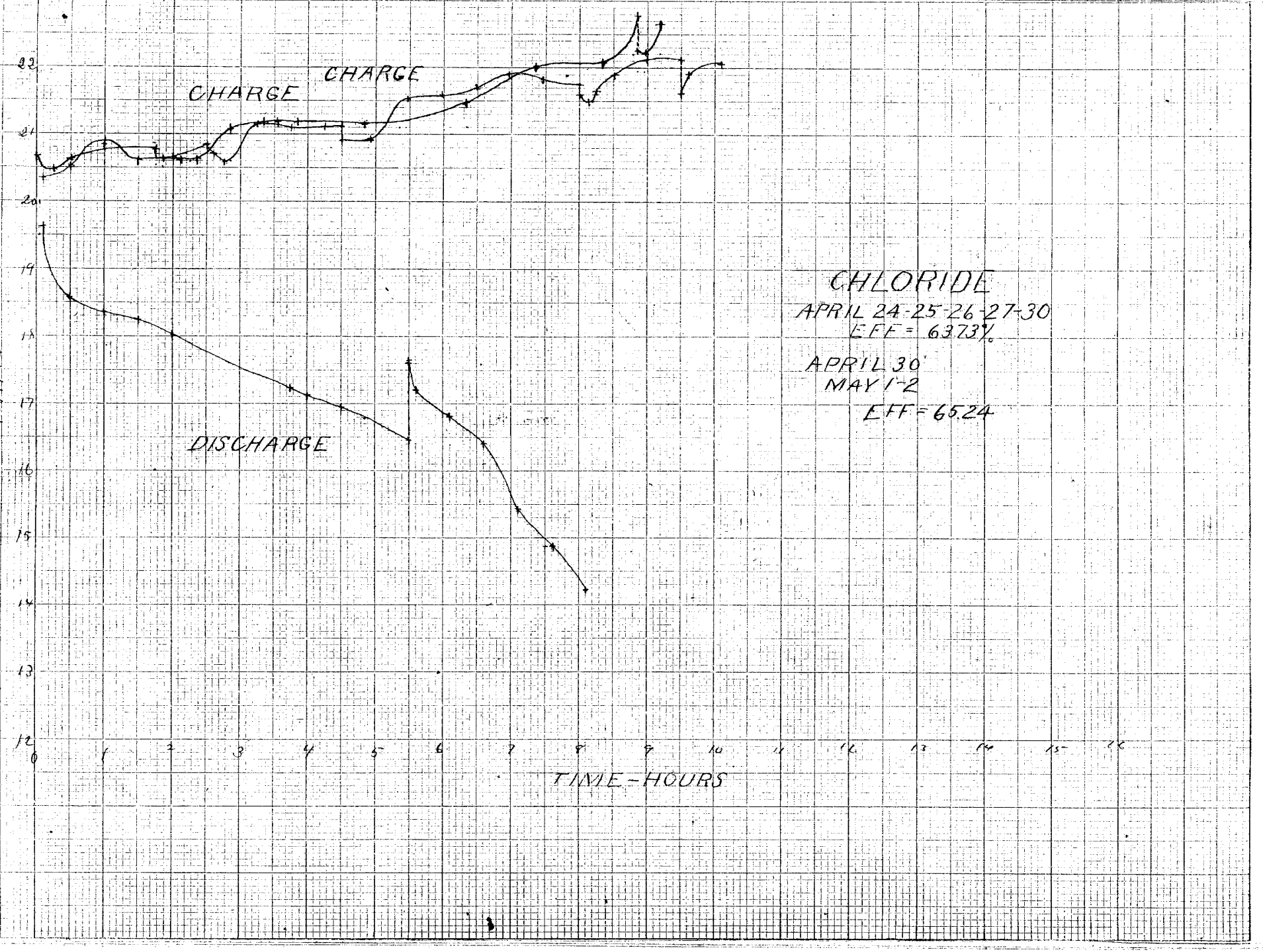
Eff = 65.24%

April 30
May 1-2

Chloride

Charge

T	A	V	W	WM	T	A	V	W	WM
2.15	9.69	2.134	20.68	16 54	11.00	9.49	2.397	22.75	568.7
2.30	9.49	2.157	20.47	450.3					568.7
3.00	9.49	2.174	20.63	1093.4					
4.15	9.49	2.191	20.79	769.2					
9.10									
9.15	9.49	2.174	20.63	268.2					
9.30	9.49	2.174	2.0.63	453.9					
10.00	9.44	2.187	20.64	619.2					
10.30	9.55	2.207	21.08	948.6					
11.30	9.49	2.231	21.17	1270.2					
12.30	9.39	2.251	21.14	1585.5					
2.00	9.42	2.284	21.47	1610.2					
3.00	9.54	2.307	22.01	1320.6					
4.00	9.53	2.317	22.08	993.6					
4.30	9.79	2.327	22.78	3452					
9.55	9.79	2.274	22.26	66.8					
10.00	9.53	2.331	2221	155.5					
10.10	9.59	2.361	22.64	679.2					
				12795.0					


CHARGE
CHARGE
DISCHARGE
WATTS
TIME-HOURS
CHLORIDE
APRIL 24-25-26-27-30
EFF = 63.73%
APRIL 30
MAY 1-2
EFF = 65.24

Conclusion.

Instead of giving a lengthy description of the results I obtained I give the table on the next page which shows everything at a glance

The two results which are most noticable are first, the capacity of the American cell in the two sets of tests and second the great variation in efficiancy of the Chloride.

The first of these peculiarities I cannot explain except that the cell may have been sulphated more on the touching surfaces of the lead ribbons than it was on the outside of the plate.

The second of these facts

Name of Cell		av. Higher Voltage	av. Lower voltage	av. Eff %	Cap Amp. hours
Ideal	1st test	2.178	1.855	88.35	27.6
"	2nd "	2.482	1.805	73.51	66.5
Sorley	1st "	2.176	1.752	87.11	43.1
"	2nd "	2.278	1.736	8068	104.5
American	1st "	2.315	1.012	75.85	20.0
"	2nd "	2.380	.130	70.56	19.7
Chloride	1st "	2.283	1.403	96.09	57.6
"	2nd "	2.384	1.672	72.29	89.0
Accumulator	1st "	2.180	1.487	88.69	17.0
"	2nd "	2.287	1.365	67.49	122.5
Set of cells for Am-meter Calibration		40.1	3.75	24.88	422.1
Per Cell		2.51	1.87		52.8

is explained I think by the separating device of the Chloride cell.

In the first set of tests the highest voltage was not that at which gas is evolved In the second tests considerable gas was given off. It would seem that this gas had great difficulty in passing up to the surface through the asbestos cloth and in the wood grooves. Thus the surface of the plate touching the liquid was much cut down and this by raising the internal resistance of the cell increased the difference of efficiency by

about seven per cent.

As I expected the efficiancy fell off greatly at the higher charging limit. But it fell off much more than I expected or rather the higher efficiancy was much higher than I expected to get.

I can show no curve of variation of efficiancy as I had only time to test the cells at two points. It seems from the great rise of capacity and lowering of efficiancy with the raising of the charging limit that the curves showing their relations would be very interesting. I any one hereafter

should try to get them I should advise him to take maximum charge points at a distance apart of at most .05 of a volt.

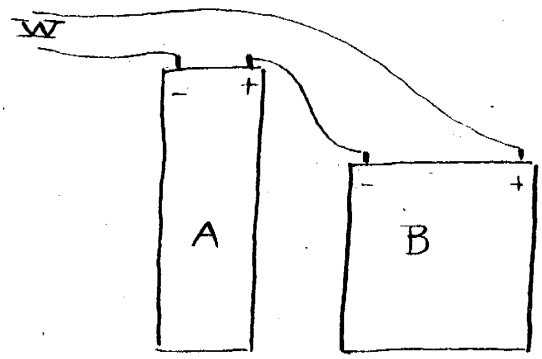
From a consideration of the results it appears that with a lead cell giving a reasonable storage capacity one cannot expect more than 65-70% efficiency.

In regard to the correctness of the results. I believe, from noticing the variation from the mean in efficiencies got from two charges and two discharges beginning and ending at the

at the lower limit and therefore on the steepest part of the potential curve that the averages efficiency got when three efficiencies are given is within 5% of correct when six efficiencies are given within 2% and when 9 or more are given within 1%.

Set of Cell for Amp-meter Calibration.

The cells were of two kinds and were coupled as shown being charged in series and discharged in series parelled two in series and eight series in parellel. All of them were old cells and most of them were partly made over with solder.



A is the accumulator cell B the Julien. W are the two wires leading to the special switch outside the room.

The "voltage at the cells" was taken outside the storage battery room and upon the special switch thus allowing the multiple spring contacts and lead wires to the cells to have an effect.

The discharge current was passed through a varible carbon and iron wire resistance invented by Mr Puffer and it was more to test this than to test the cells that the runs on these sixteen cells were made.

The cells showed a very low efficiancy which has

been given, but the resistance worked admirably, it being extremely easy to hold the ampere at 7.1.3 without allowing a variation of more than .1 of an ampere.

System For Ameter Calibration

Charge

T	A	V	W	WM
2.00	9.51			
2.03	9.51	36.0	342.4	2054.4
2.08	9.52	36.3	342.6	4453.8
2.30	9.54	36.3	346.3	10735.3
310	9.55	36.3	345.7	11408.1
3.35	9.42	36.4	342.9	8572.5
4.00	9.61	36.4	349.8	4197.6
9.45	9.55	36.2	345.7	2765.6
10.00	9.49	36.4	345.4	9671.2
10.41	9.56	36.5	348.8	10364.0
11.00	9.69	36.5	35.36	8486.4
11.30	9.46	36.6	346.2	10386.0
12.00	9.54	36.7	350.1	10503.0
12.30	9.59	37.0	354.8	5322.0
2.02	9.53	36.7	3.39.8	4757.2
2.30	9.49	37.0	351.1	10181.9
300	9.53	37.3	355.5	11731.5
3.35	9.44	37.6	354.9	10647.0
				136237.5

Charge

T	A	V	W	WM
4.00	9.39	38.0	356.8	9633.6
4.30	9.39	38.3	367.3	5509.5
9.02				
9.04	9.75	35.9	350.0	1050.0
9.06	9.49	36.9	349.1	5934.7
9.37	9.36	37.5	351.0	10179.0
10.05	9.33	37.7	351.7	9495.9
10.30	9.32	38.0	354.2	9562.4
11.00	9.37	38.1	357.0	1071.00
11.30	9.46	38.3	362.7	5440.5
2.05	9.46			
2.10	9.46	37.7	356.6	3566.0
2.20	9.19	38.0	348.2	3482.0
2.30	9.48	38.3	363.1	7262.0
3.00	9.49	38.5	365.4	10962.0
3.30	9.42	38.7	3645	10935.0
4.00	9.31	38.7	360.3	10809.0
4.30	9.22	39.0	359.6	5394.0
				119882.5

April 17-18-20

System for Ameter Calibration

Charge

T.	A	V	W	WM
9.10				
9.14	9.35	38.4	359.0	4308.0
9.30	9.45	39.0	368.6	8477.8
10.00	9.50	39.3	374.3	11229.0
10.30	9.51	39.3	374.6	11238.0
11.00	9.39	39.4	370.0	11100.0
11.30	9.46	39.4	372.7	11181.0
12.00	9.42	39.6	373.0	11190.0
1230	9.54	39.6	377.8	7178.2
1234				
2.00	9.64	39.3	378.8	5682.0
2.30	9.29	39.7	368.8	11064.0
3.00	9.49	39.7	376.7	11301.0
3.30	9.64	39.7	382.7	11481.0
4.00	9.39	39.7	376.7	8864.0
4.15	9.42	39.7	374.0	2618.0
9.27				
930	9.59	38.6	370.1	16661.8
				133573.9

Charge

T	A	V	W	WM
10.00	9.55	39.7	379.1	11373.0
10.30	9.49	39.9	378.7	11361.0
11.00	9.61	40.0	384.4	5766.0
			2	8500.0
		total-	418	193.9

April 17-18-20

System for Ameter Calibration

Discharge

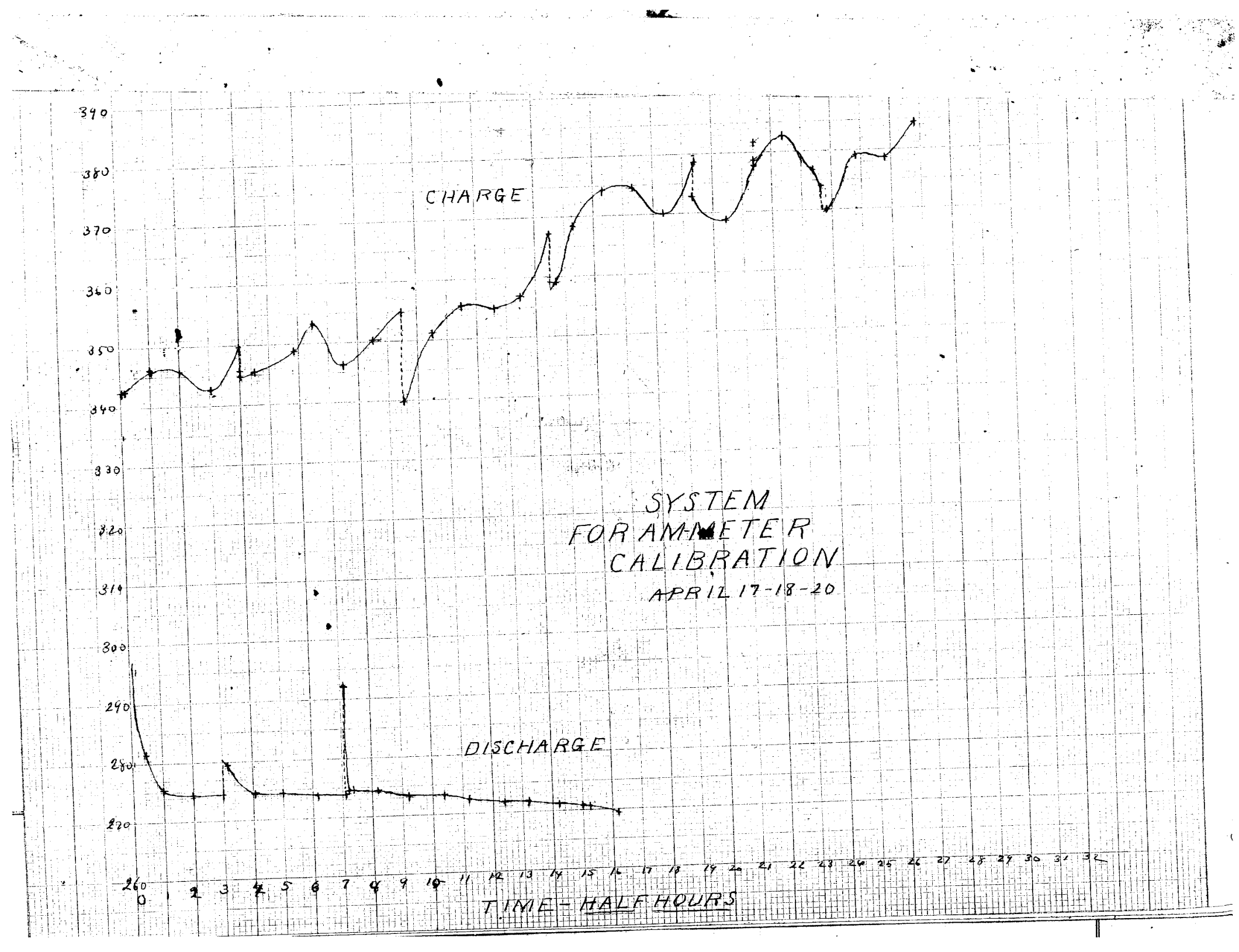
T	A	V	W	WM
9.34	71.3			
9.42	"	3.95	281.6	4787.2
10.00	"	3.89	275.4	6509.6
10.30	"	3.88	274.4	8232.0
11.00	"	3.88	274.4	4.116.0
2.07	"			
2.10	"	3.92	279.4	4470.4
2.35	"	3.88	274.4	6860.0
3.00	"	3.88	274.4	8232.0
3.35	"	3.87	273.9	8664.8
4.04	"	3.87	273.9	3834.6
8.12	"	4.10	292.3	2923
8.14	"	3.88	274.4	548.8
8.15	"	3.88	274.4	2195.2
8.30	"	3.88	274.4	60368
9.00	"	3.86	273.2	9562.0
9.39	"	3.86	273.2	8196.0
10.00	"	3.85	272.5	7902.5
				90440.2

Discharge.

T	A	V	W	WM
10.36	71.3	3.84	271.8	8424.8
11.02	"	3.84	271.8	7338.6
11.30	"	3.83	271.1	7861.9
12.00	"	3.80	270.9	8127.0
12.30	"	3.78	269.5	4042.5
				35794.8

Total = 126235.0

Eff = 30.14%


390
380
370
360
350
340
330
320
310
300
290
280
270
260
CHARGE
DISCHARGE
SYSTEM
FOR AMMETER
CALIBRATION
APRIL 17-18-20
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
TIME - HALF HOURS

April 2021-30
May 1

Cells for Ammeter Calibration

Discharge

T	A	V	W	WM
8.48	71.3			
8.50	"	3.954	281.5	1972.6
9.00	"	3.928	280.1	5602.0
9.30	"	3.929	2.80.1	8403.0
10.00	"	3.928	2.80.1	8403.6
10.80	"	3.921	2.79.6	8388.0
11.00	"	3.918	279.4	8382.0
11.30	"	3.894	277.6	8328.0
12.00	"	3.881	276.7	8301.0
12.30	"	3.861	275.3	4129.0
2.15	"			
2.20	"	3.881	276.7	2767.0
2.30	"	3.857	2750	5500.0
3.00	"	3.838	273.6	8208.0
3.30	"	3.821	272.4	8172.0
4.00	"	3.748	267.2	4275.2
4.01	"			
9.03	"			
				90830.6

Discharge

T	A	V	W	WM
9.04	71.3	3.814	271.9	3807.0
9.30	"	3.728	265.8	3721.0
9.31	"			
				7528.0
				90830.6
			total =	98358.6

Eff = 20.99%

Eff with Last Charge = 23.52%

April 26-27-30
May 1

Cells for Amp-Meter Calibration

Charge

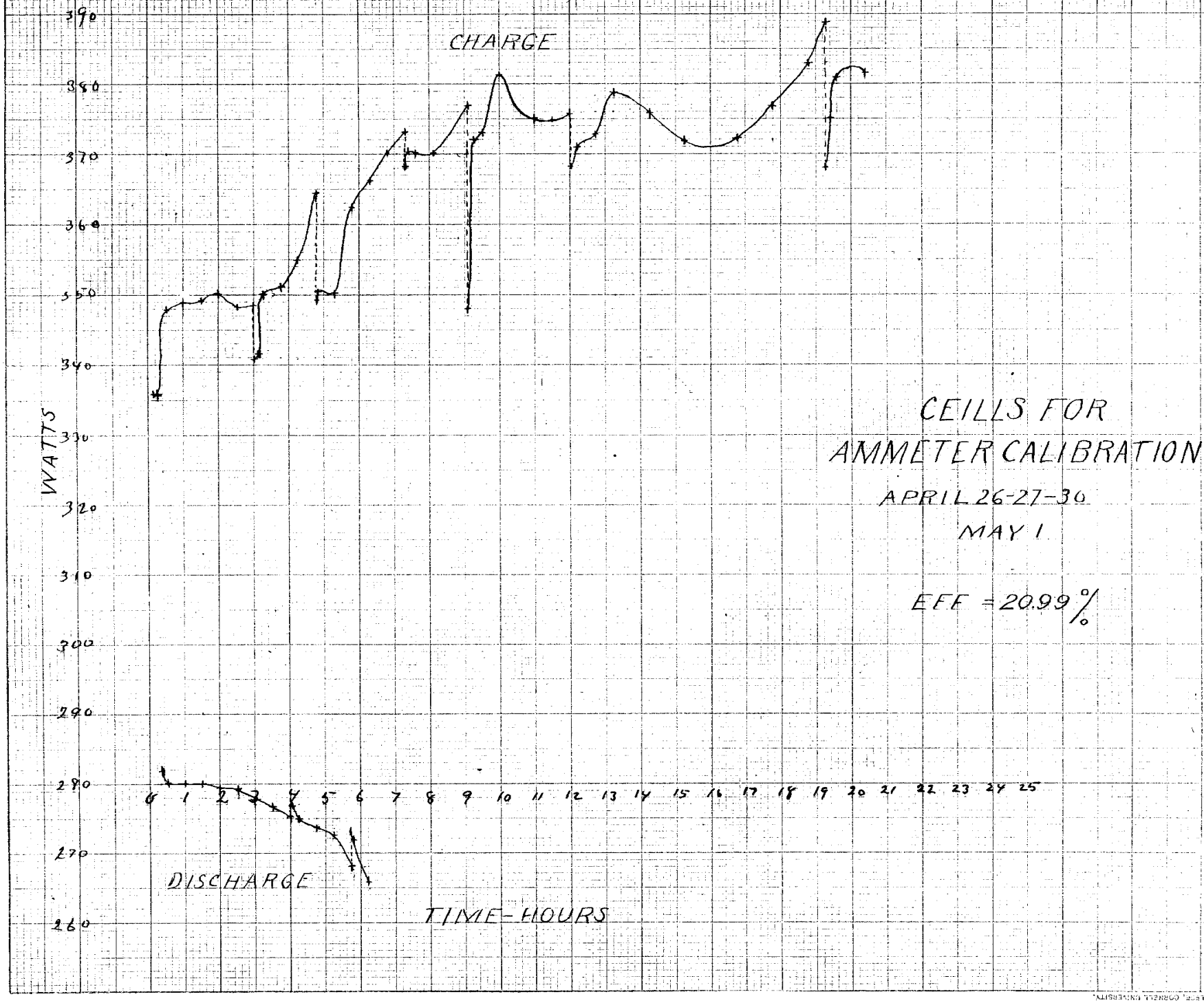
T	A	V	W	WM
9.32				
9.35	9.41	35.7	335.9	1679.0
9.39	9.22	36.4	335.6	4363.0
10.00	9.53	36.5	347.8	8695.0
10.30	9.53	36.6	348.8	10464.0
11.00	9.54	36.6	349.2	10476.0
11.30	9.59	36.6	350.3	10509.0
12.00	9.49	36.7	348.3	10449.0
12.30	9.42	37.0	348.5	5227.0
2.15	9.69	36.2	340.8	10224
2.20	9.49	36.6	341.6	2391.2
2.30	9.49	36.9	350.2	7004.0
3.00	9.49	37.0	351.1	10533.0
3.30	9.54	37.2	354.9	10647.0
4.00	9.49	38.4	364.4	5466.0
9.55				
9.58	9.44	37.6	349.3	1397.2
10.00	9.42	37.2	350.4	5606.4
				104929.2

Charge

T	A	V	W	WM
10.30	9.29	37.7	350.2	10506.0
11.00	9.49	38.2	362.5	10875.0
11.30	9.54	38.4	366.3	10989.0
12.00	9.59	38.6	370.1	11103.0
12.30	9.59	38.8	373.1	5597.0
2.16				
2.18	9.74	37.8	368.2	1472.8
2.21	9.59	38.6	370.2	2221.2
2.30	9.49	39.0	370.1	7032.0
3.00	9.49	39.0	370.4	16654.0
4.00	9.59	39.3	376.9	11307.0
9.05	9.99	31.7	348.0	1740.0
9.15	9.54	39.0	372.0	4836.0
9.30	9.54	39.1	373.0	8206.0
10.00	9.69	39.4	381.2	17154.0
11.00	9.52	39.5	375.1	16880.0
11.30	9.49	39.5	374.9	11247.0
12.00	9.49	39.6	375.8	5637.0
				153457.0

Cells for Ammeter Calibration

Charge					Charge				
T	A	V	W	WM	T	A	V	W	WM
2.15	9.79	37.6	368.1	2944.8	11.00	9.49	40.2	381.5	11445.0
2.30	9.49	39.6	375.8	8267.6	11.05				
3.00	9.49	39.7	376.7	8664.1					114450
4.15	9.49	39.7	376.7	22636.9					193941.5
9.10									153457.0
9.15	9.49	39.0	370.1	4811.3					104929.2
9.30	9.49	39.3	371.9	8181.8					463762.7
10.00	9.44	39.5	372.9	11187.0					
10.30	9.55	39.6	377.7	16996.0					
11.30	9.49	39.6	375.8	22548.0					
12.30	9.39	39.6	371.8	27885.0					
2.00	9.42	39.5	372.1	27907.0					
3.00	9.54	39.5	376.8	22608.0					
4.00	9.54	39.6	382.8	17226.0					
4.30	9.79	39.6	388.7	5830.0					
9.55	9.79	37.5	367.1	1101.3					
10.00	9.52	39.4	375.1	2625.7					
10.10	9.59	39.7	380.7	11421.0					
				193941.5					



CEILLS FOR
AMMETER CALIBRATION

APRIL 26-27-30
MAY 1

EFF = 20.99 %