Life and Efficiency test of the Tantalum Lamp

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Outline

1 Purpose of Test

2 Method of Test

Electrical Measuring Instruments

Photometer

3 Data and Curves

(a) Efficiency to volts

(b) Efficiency to current

(c) Candle Power to efficiency

(d) Candle Power to volts

(e) Resistance to volts

(f) Candle Power tp current

(g) Candle Power to hours

(h) Candle Power to total watts

4 Advantageous points of each

5 Conclusions

Data

Tantalum -2- (after burning 1000 hours)

Candle Power	Volts	Current	Watts	Watts per candle power
1.9	62	.23	14.26	7.5
2.32	65	.24	15.8	6.8
3.21	68	.245	17.3	5.4
4.2	74	.255	20	4.76
6.24	81	.27	22.8	3.66
8.5	86	.282	25.4	3
10.95	92	.295	28.9	2.65
14.97	98	.315	32.4	2.17
17.25	101	.33	33.8	1.97
19.85	104	.335	86.4	1.83
23	107.5	.35	38.8	1.69
23.15	110	.364	39	1.61
27.8	111.5	.365	40.7	1.47
29.2	115	.372	42.7	1.46

Carbon Lamp

1.3	76	.31	23.6	18
2.14	81	.33	26.7	12.5
3.5	86	.36	31	8.8
5.02	92	.38	35	7
8.15	99	.41	40.5	5
10.22	103	.43	44.2	4.3
13.27	107	.45	48.1	3.6
17.95	111	.48	53.2	2.3
22.3	116.5	.5	58.4	2.6
27	120	.51	61	2.3

Data

Vertical Candle Power

Tantalum -2- (new)	Tantalum -1- (after burning 300 hours)	Tantalum -1- (after burning 1000 hr's)	Carbon -1- (new)	Degrees
26.15	17.2	15	16	0
20.6	15.85	13.5	13.8	30
14.4	9.4	9	10.4	60
4.15	3.1	3.2	6.75	90
12.6	9.105	7.7	9.75	120
20	14.5	13.5	14.	150
25.6	17	14.4	16.1	180
21.65	13.65	12.8	14.3	210
10.3	6.105	6.5	9.7	240
0	0	0	0	270
8.7	7.05	5.55	9.4	300
20	15.45	13.1	14.5	330

Data

Tantalum -1-
(after burning 1000 hours)

Candle Power	Volts	Current	Watts	Watts per candle power
1.75	70	.21	14.7	8.4
3.35	80	.23	18.4	5.5
4.7	85	.24	20.4	4.35
6.1	90	.25	22.5	3.69
7.7	95	.26	24.7	3.2
9.9	100	.27	27	2.7
12.4	105	.285	29.9	2.4
15.1	110	.295	32.4	2.15
17.2	115.5	.31	35.8	2.08

Resistance

Tantalum -2- (new)

Volts	Res.
62	269
65	271
68	278
74	290
81	300
86	305
92	312
98	312
101	306
104	310
107.5	308
111.5	306
115	309
110	3.3

Carbon (new)

76	245
81	245
86	239
92	241
99	241
103	240
107	238
111	232
116.5	233
120	235

Tantalum -1- (after burning 1000 hours)

Volts	Res.
70	333
80	348
85	255
90	360
95	367
100	370
105	371
110	374
115.5	374

German manufacturers are producing a lamp for which they claim a longer life with greater efficiency than the ordinary carbon lamp possesses. Only a few of these have been introduced into this country and these chiefly for testing purposes. If these tantalum filament lamps are all that is claimed for them there would result a great saving.

To compare the relative merits of these a carbon lamp, one new tantalum and a tantalum that had burned 300 hours were tested at stated intervals. The old tantalum was burned 1000 hours.

The instruments used were as follows :

Weston Direct Current Voltmeter No. 13520 (0 - 150)

Jewell " " Ammeter No. 1476 (0 - 1.5) (0 - 15)

Standard lamp No. 902 (16 candle power at 108.4 volts)

The tests were all made on a Queen Standard Photometer fitted with a Lummer Brodhun screen. The scale extends the full length of the photometer bar and is arranged to read in centimeters from each end and also when the standard is a 16 candle power lamp to read directly in candle power.

The Lummer Brodhun screen was devised by two German electricians. for use in the Reichsanstatt laboratory. The screen is of plaster of Paris, receiving light from either side. It is diffused upon mirrors on each side of the screen and from there it passes through two prisms to a lens where it is observed by the eye. One lamp will throw a circle in the center while around it with well defined edges the other lamp will throw its light. When the two shades are equal the spot will almost disappear and the relative intensity of the two lights will be inversely as the squares of their distances from the screen.

The standard lamp used was No.902 giving 16 candle power at 108.4 volts. It was burned no longer than was necessary so that the candle

power of it would not fall. Almost ideal current was furnished for the lamps by the use of a storage battery of 60 cells. The voltage was adjusted by means of rheostats placed in series with the lamps. The accompanying curves show clearly the relation between the two lamps. For the new carbon lamp only the greatest candlepower in maximum position are plotted.

The vertical candlepower plotted to polar coordinates (1) shows the relative distribution of the candlepower of the lamps. The carbon lamp sends much more light downward than the tantalum. Tantalum No.2 was a 25 candle power lamp while the carbon and tantalum no.1 were each 16 candlepower. It will be seen that the tantalum at 300 hours gives more horizontal candle power than the new carbon while the carbon diffuses more light downward than the tantalum. Almost all of the light from the tantalum is given out horizontally. The horizontal candlepower of the tantalum is nearly constant for all points around the lamp so that the horizontal candlepower is not plotted.

Owing to the difficulty of getting a spring which would rotate the lamp no rotating readings were taken. The candle power of the carbon lamp was invariably read in the maximum position so that while the readings of the tantalum were practically the mean candlepower, the carbon mean candle power would be considerably below that plotted. This should be kept in mind when reading the accompanying diagrams.

The diagram of efficiency to volts (2) shows that for any voltage the tantalum lamp will take much less current per candlepower than the carbon . The new tantalum takes at 110 volts just onehalf what the new carbon lamp does, while the tantalum after burning 1000 hours takes only about two thirds of the current the new carbon does. The diagram shows that a slight drop in voltage will not change the efficiency of the tantalum

nearly as much as that of the carbon. Thus a 110 volt tantalum lamp could be run at 104 volts without much change in efficiency.

Variation of efficiency with candlepower (3) For this diagram the new tantalum is much greater than that of the carbon. It is of course understood that of the efficiency of a lamp is the Watts it consumes per candlepower. From the diagram of volts and candlepower (4) it can be seen that the new carbon and the new tantalum each have much the same shape of curve while in the old tantalum the rise is not in the same proportion as in either of the other two.

The curve plotted to resistance and volts (5) shows that for any increase of voltage in the carbon the resistance is decreased. In the tantalum lamps an increase of voltage increases the resistance. This shows that for any increase in voltage the current consumed will be proportionately less than that of the carbon for the same raise . This will be a protection to the lamp and it would not be likely to burn out at as low voltage as the carbon lamp.

The curve plotted to candlepower and volts shows that for new lamps the candlepower of the lamps increases in about the same ratio but the current consumption of the tantalum for any increased voltage would be proportionately less than that of the carbon. The old tantalum does not increase in candlepower as the new lamps do but rises more slowly with the volts. The current consumption however is less so that the efficiency of the tantalum after burning 1000 hours is still greater than that of the new carbon.

The diagram showing the relation of current to candlepower (6) shows that the carbon lamp takes much more current than either of the tantalums. The old tantalum gives more candlepower with less current. This seems

strange but when we consider that the pressure to give the same current through the old tantalum lamp is greater than the corresponding pressures of the new carbon and tantalum it is explained.

The candlepower to hour diagram (7) of the old tantalum was started at 300 hours. The curve shows a drop in candlepower from 340 to 600 hours of about 2 candlepower after which the decrease in candlepower is very gradual dropping from 600 hours 1000 hours only .4 of a candlepower.

The curve showing the relation of candlepower to watts (8) shows that at any point from 2 candlepower to over rated candlepower the tantalum lamp takes much less energy than the carbon at 8 candlepower the watts required are as 5:8 while at 16 candlepower the ratio is 6.9:10.2 . This shows a remarkable saving of energy for we should consider that the carbon is new. The other burned 1000 hours at the rated voltage.

The carbon lamp diffuses much of its light downward while the tantalum distributes nearly all the light horizontally. In most lighting the lamp is placed somewhat higher than the space which it is desired to illuminate. To do this it is necessary with the tantalum to use a reflector.

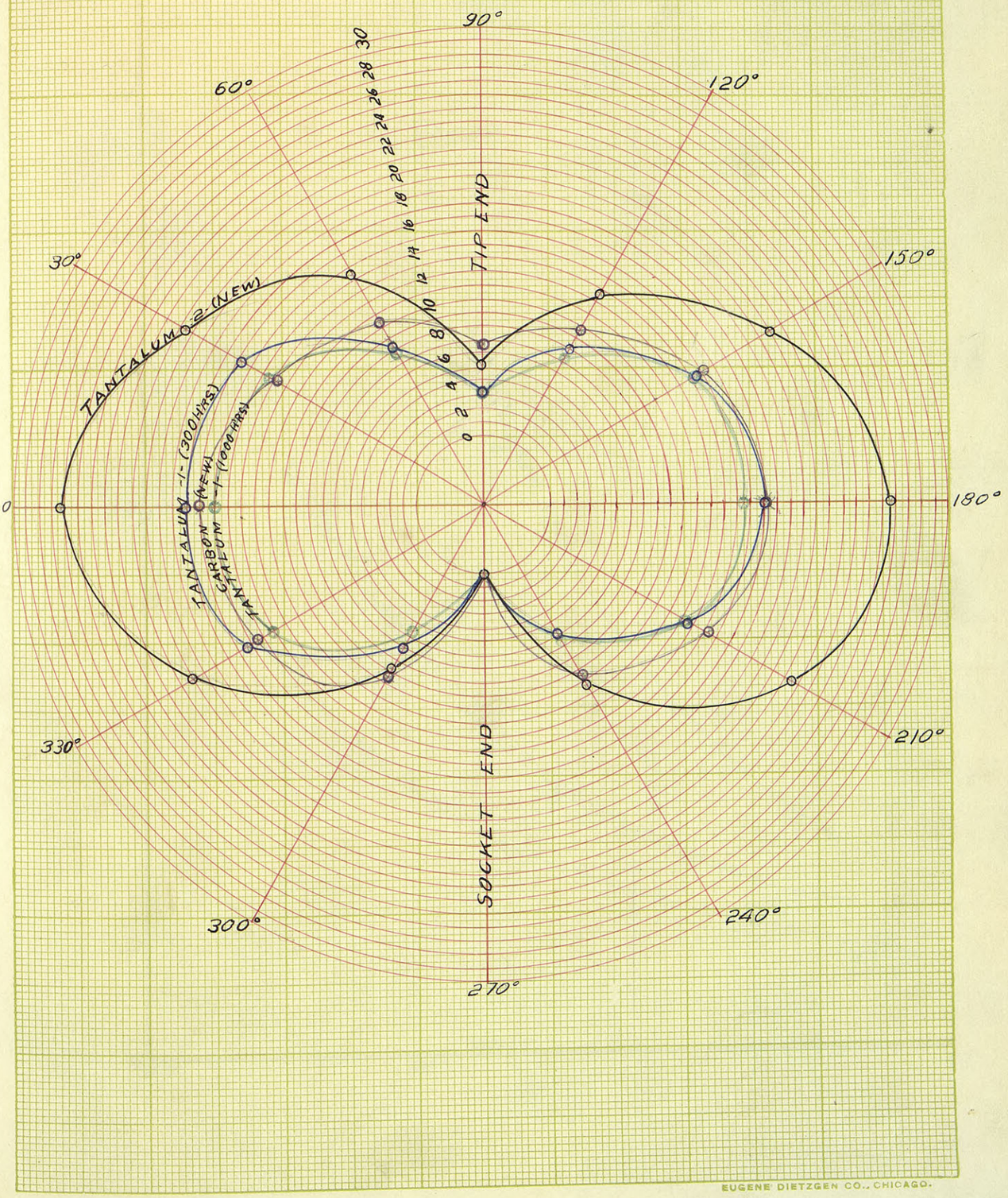
The carbon lamp is less easily injured by rough handling than the tantalum. The filament of the tantalum is made very small and is of considerable length being wound on supports lengthwise of the lamp. Entering at one point it is wound back and forth in the lamp globe passing out very close to the point of entrance. This gives a very good horizontal distribution of candlepower because there are about 30 loops in all giving a very uniform light. A slight variation of voltage is not as conspicious in the tantalum lamp as it is in the carbon lamp. And as its efficiency has less change with change of voltage at 100 to 115 volts it would be better for use on circuits of varying voltage than the carbon.

The chief objections to the tantalum lamp are its high cost, the price at the present time is about $ 1.50 per lamp ; its fragility is the other chief disadvantage.

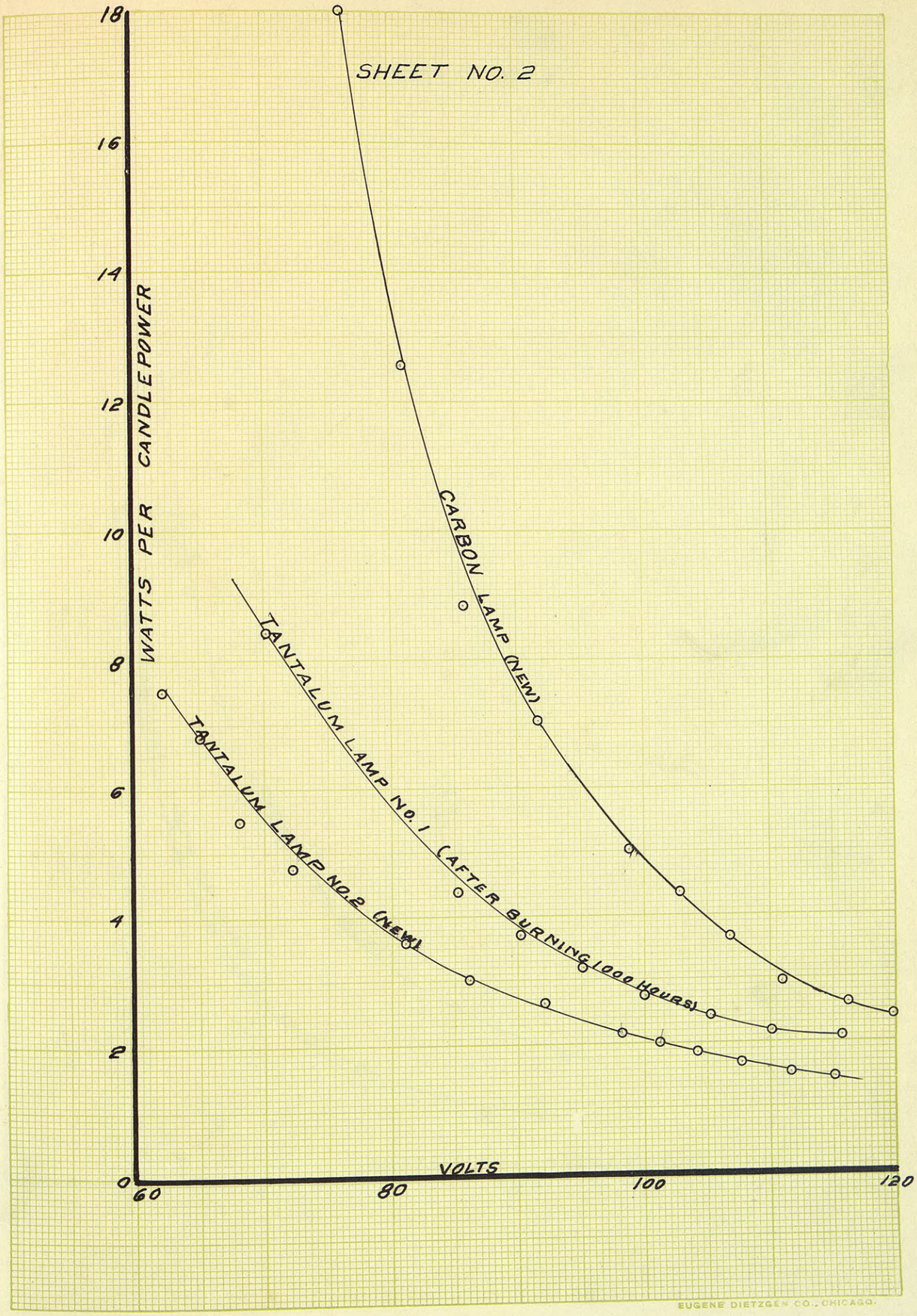
The favorable points are good horizontal distribution of light and high efficiency. The watts used per candlepower being only slightly greater for a new lamp than onehalf of the consumption of a corresponding candlepower new carbon lamp. The tantalum lamp after burning 1000 hours still shows a saving of about 1/3 over the new carbon.

Since the carbon lamp is at its best when new and the watts consumed per candlepower increases till an old lamp may consume as high as 6 watts per candlepower.It can readily be seen that the tantalum may take only 1/3 of the energy consumed by the carbon after running the same number of hours. The tantalum lamp can be used with great saving in total expence in places of no vibrations or jars. Such a place would be the rosetts or pendants in public buildings. Its liability to rupture from shocks renders it poorly adapted for use in dwelling houses where the lamp is suspended by a cord from the ceiling of the room. If the tantalum lamp can be made less fragile or a cheaper way of preparing the filament discovered the carbon incandescent lamp it would seem will be superseded by the tantalum lamp.

SHEET NO. 1



EUGENE DIETZGEN CO., CHICAGO.



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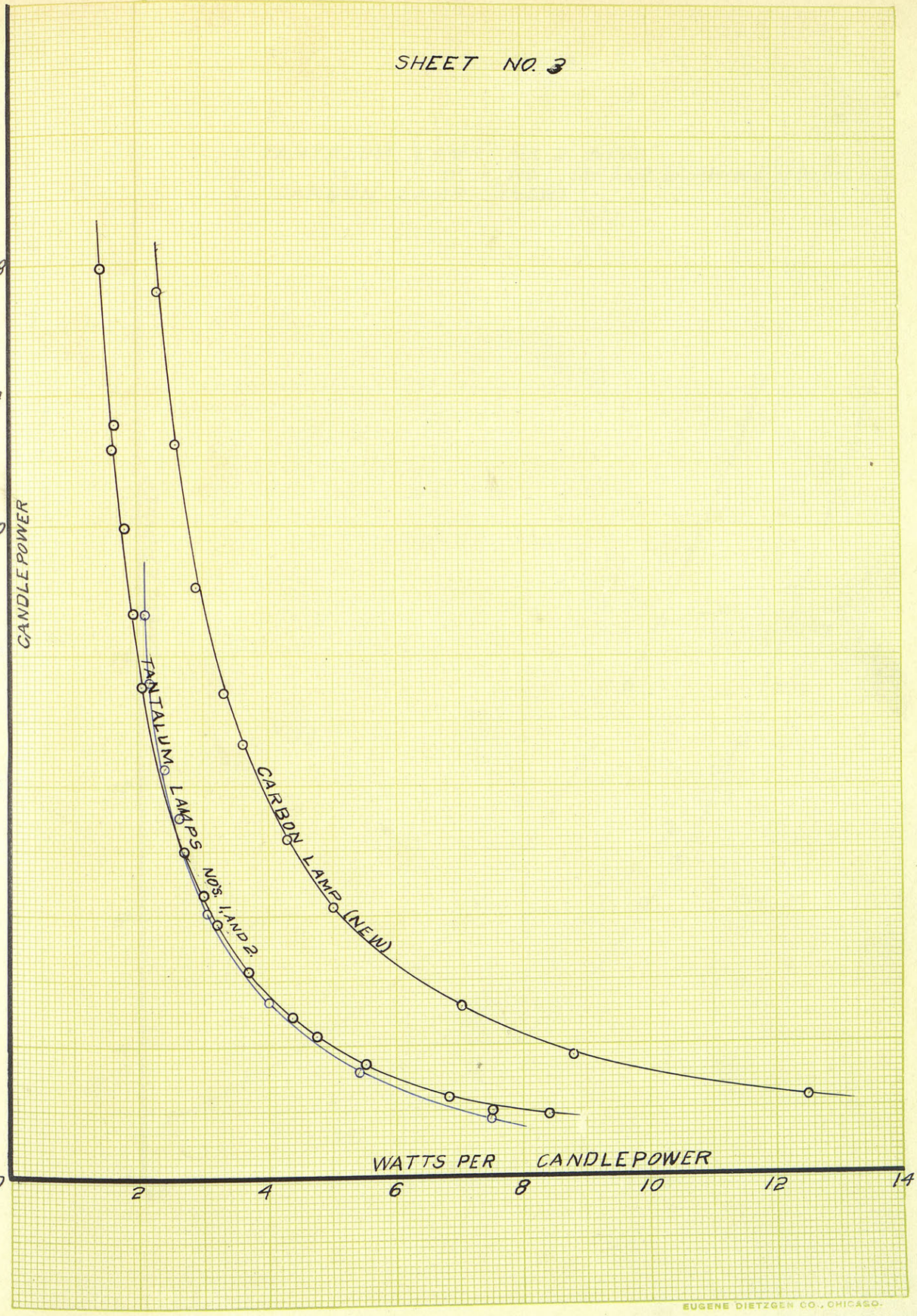
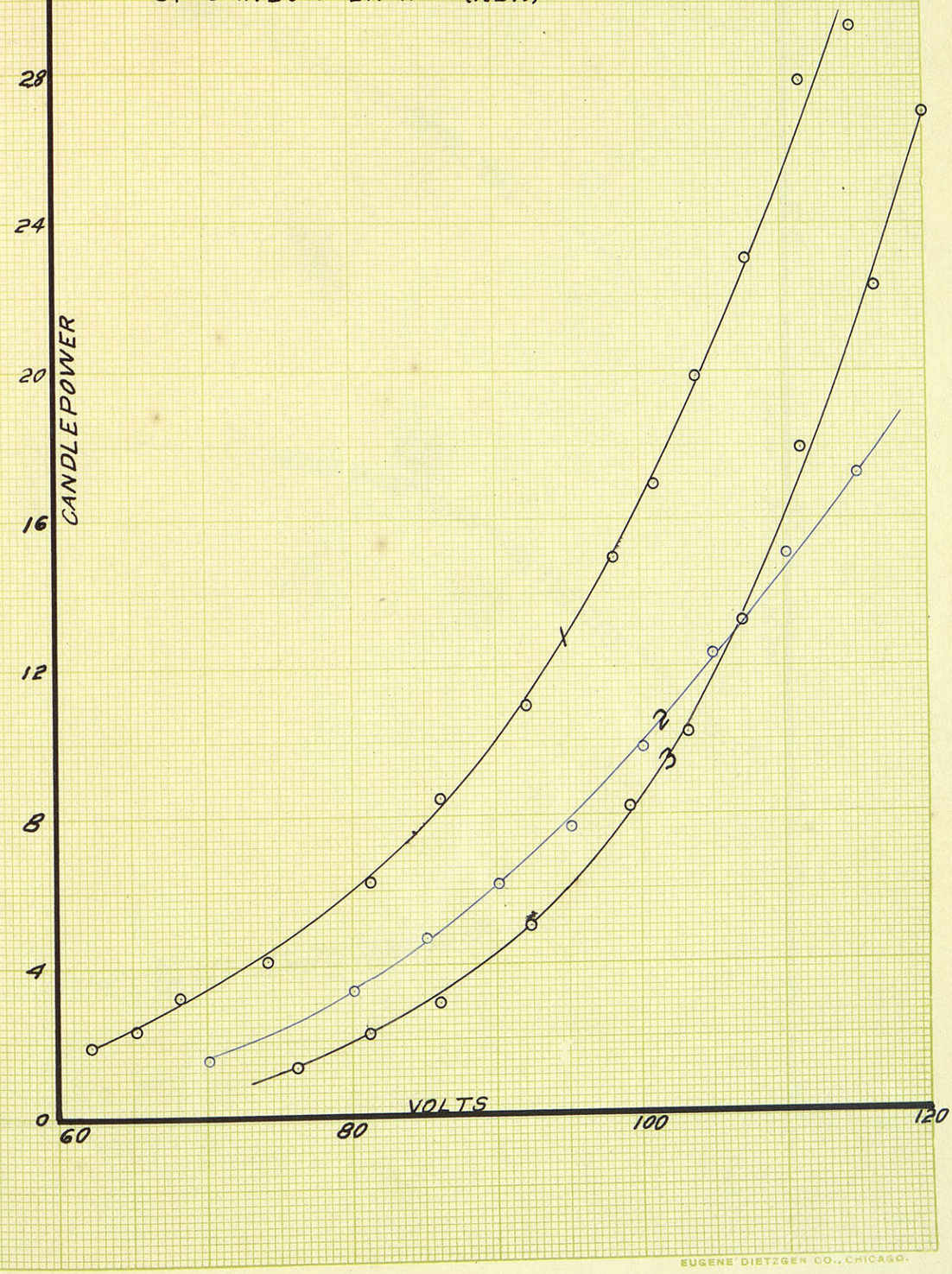


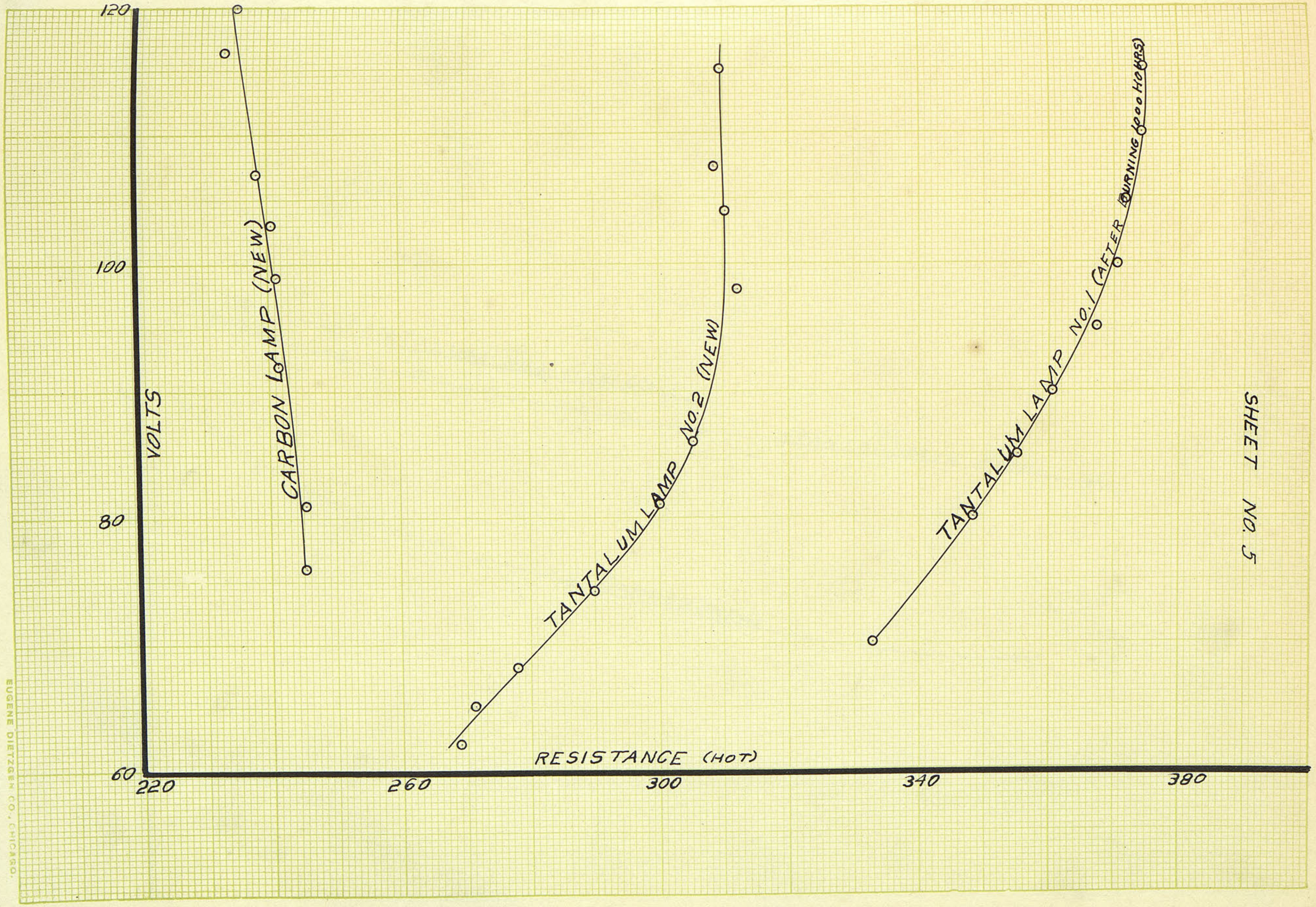
EUGENE DIETZGEN CO., CHICAGO.

SHEET NO. 4

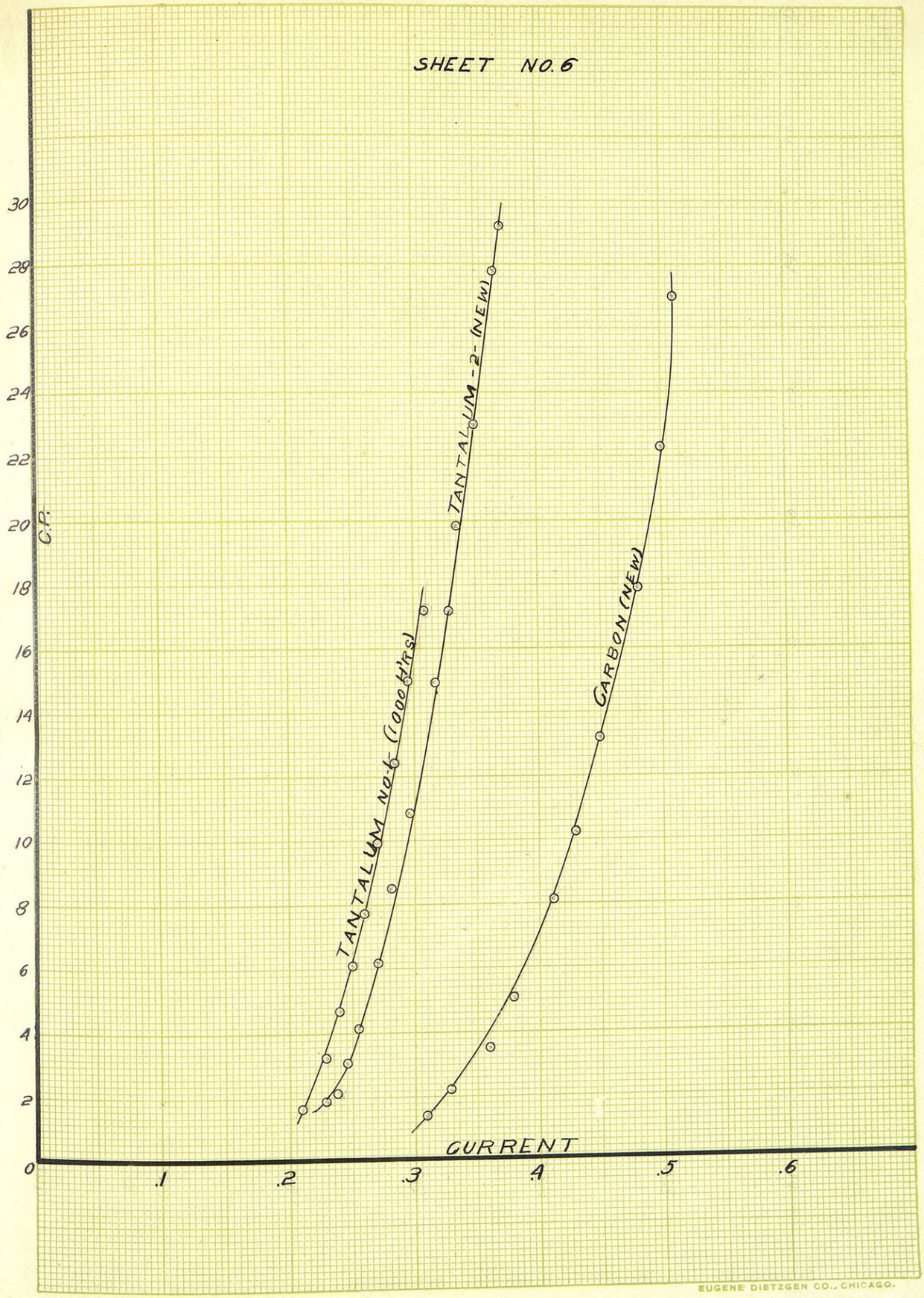
1. TANTALUM LAMP NO. 2 (NEW)
2. " " NO. 1 (AFTER BURNING 1000 HOURS)
3. CARBON LAMP (NEW)



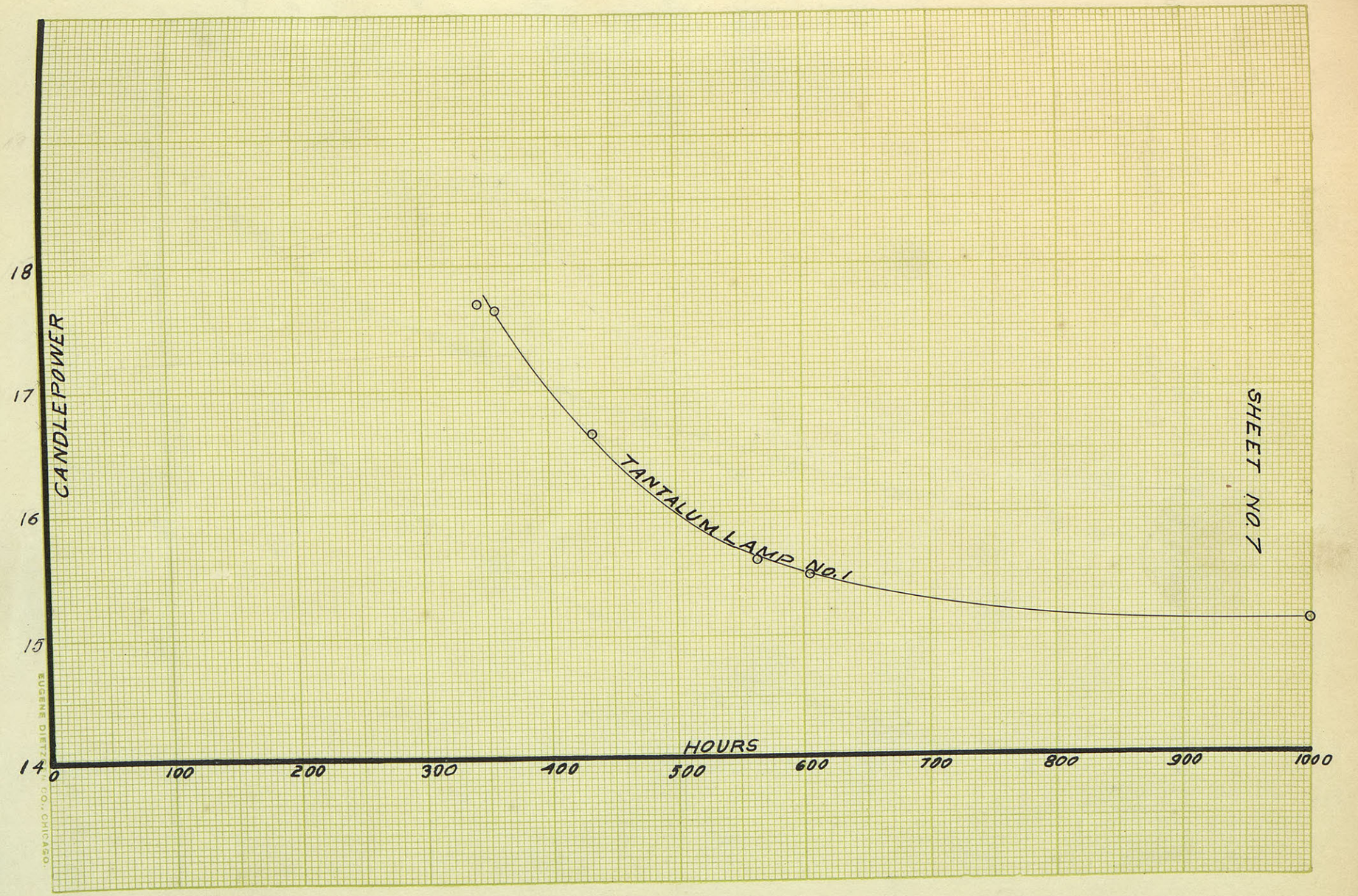
EUGENE DIETZGEN CO., CHICAGO.


VOLTS
120
100
80
60
RESISTANCE (HOT)
220
260
300
340
380
CARBON LAMP (NEW)
TANTALUM LAMP NO.2 (NEW)
TANTALUM LAMP NO.1 (AFTER BURNING 200 HOURS)
SHEET NO. 5
EUGENE DIETZGEN CO., CHICAGO.

SHEET NO. 6



EUGENE DIETZGEN CO., CHICAGO.


SHEET NO. 7
CANDLEPOWER
18
17
16
15
14
TANTALUM LAMP No. 1
HOURS
0
100
200
300
400
500
600
700
800
900
1000
EUGENE DIETZEN CO. CHICAGO