SUBJECT CATHODE SPRAYING PROCESSES
(Hand and Machine)

This standardizing notice describes the spraying of cathodes and includes cathode coating schedules in which are specified the conditions for producing sprayed coatings in various forms.

Since it has been found that the volumetric density of cathode coating is an important factor in lowering emission shrkge., the schedules listed in this notice have been set up to obtain the desired densities. In general, the use of a low density coating is advantageous in types critical for emission and when chipping is involved and a high density coating is advantageous where sputtering and close spacing of electrodes are involved.

Due to the numerous variables involved in spraying, no rigid schedules can be set up. Those listed in this notice are intended primarily as guides to indicate the approximate conditions the spraying operator should observe under normal conditions of temperature (70-80°F) and relative humidity (20-50%).

The schedules in this notice are for Fact. #1 hand and machine spraying. For other schedules refer to 14-5-3. Latter schedules will be included eventually in this notice.

1. EQUIPMENT

a. Bars for supporting cathodes so that only the portion of each cathode to be coated is exposed to the spray.

NOTE: While the principle of design of bars for most types of cathodes is the same, the construction of bars must be based on such consideration as cathode diameter, length, shape (whether round or otherwise), and whether cathodes must be sprayed to leave both ends bare, both ends and an intermediate portion bare, or the entire length bare except at one end. Bars furnished by the Equipment Dev. Dept. are designated under the general Model No. 788 - and letter affixes to distinguish between variables in hole diameters, etc. All bars must be supplied with rubber strips at contact areas. Distance between cathodes should be at least 1 1/2 times diameter of coated cathode.

b. A spraying chamber connected to a blower of sufficient capacity so that no odor or dust can be detected outside of the chamber during spraying.

c. A removable spray stand for supporting a cathode bar in a horizontal position.

d. A DeVilbiss Areon Type CV spray gun, preferably equipped with a glass jar for convenience in observing when to refill.

or

A DeVilbiss spray finishing system, type QM, 5 or 10 gallon pressure tank equipped with a type QS air driven agitator and the necessary rubber hose, gages, valves, type CV gun, etc. The type CV gun requires the use of a No. 90 air cap and a letter F fluid tip and needle. This gun is for hand spraying.

e. High pressure air source.

1. EQUIPMENT (Cont'd)

f. Air transformer capable of delivering 60 psi with air filter in line before transfo ner.

g. Electric circulating air oven in which a uniform temperature of 90-110°C can be maintained.

h. A device to roll bottles of spray mixture.

i. Motor driven brush for cleaning cathode bars. For this purpose a 3-section brush consisting of a Newark Brush Co., 8" dia., 3" hub, .006" brass wire, safety section between two Newark Brush Co. 8" dia. Union Fiber safety brushes has been used and found satisfactory.

j. Hand brush (such as a paint brush of suitable size) for cleaning dust out of cavities in cathode holders.

k. Torsion balance-200 mg. capacity
l. Precision torsion balance - 0-15 mg. capacity
m. Small bristle brush for removing coating from gun nozzle.
n. Spray Machine Mod. No. 788-AE

2. MATERIAL

Coating preparation as specified on cathode assembly. During working hours, bottles from which material is used, must be kept rolling continuously **and no material used without having a minimum of 8 hours rolling. On each bottle mark time and date of each start on the rollers.

NOTE 1- Due to age and exposure to light and heat, some yellow or brown discoloration may occur. Nominal discoloration will have no deteriorating effect on spray application or emissive properties. Nevertheless, obtain approval from cathode engineer before using such material.

NOTE 2- From experience it has been learned that during the winter months the lower the temperature at which the spray material has been stored, the longer the rolling time before carbonate is thoroughly dispersed.

3. FACTORS AFFECTING DENSITY OF COATING

a. Gun Pressure- The lower the air pressure on spray gun, the greater the density.

b. Gun Opening - The greater the gun opening, the denser the coating.

c. Distance of Gun to Assly - The closer the gun, the denser the coating.

d. Rate of Passes - The slower the speed, the greater the density.

e. Temperature - The higher the temperature, the lower the density.

f. Condition of Gun (Wear on Nozzle)- The older (in use) the gun, the higher the density.

3. FACTORS AFFECTING DENSITY OF COATING (Cont'd)

g. Binder in Coating - The quicker the drying, the less dense the coating.

h. Humidity - The greater the humidity, the lower the density.

i. Rate of Exhaust in Booth - The greater the exhaust, the higher the density.

j. Particle Size of Carbonate Material - The greater the size, the lower the density.

k. Tank Pressure - The higher the tank pressure, the higher the density.

l. Spreader Opening - The greater the opening, the lower the density.

m. Amount of Material in Spray Jar or Feed Tank - The greater the amount, the higher the density.

NOTE - Each of the above factors tends to produce the stated change, only if all of the other factors remain constant.

4. COMPENSATIONS TO BE MADE FOR UNCONTROLLABLE FACTORS

Density of coating is dependent on numerous factors and of these temperature and humidity are uncontrollable. When such factors change from normal conditions, experience has shown that there is an optimum sequence of changes to compensate for these variations in order to obtain the desired density in hand spraying and also in machine spraying.

Hand Spraying

1st - Change distance of gun to assembly.
2nd - Change rate of passes.
3rd - Change pressure on gun.
4th - Change the number of passes.

Machine Spraying

1st - Change spreader opening.
2nd - Change gun (atomizing) pressure.
3rd - Change distance.
4th - Change number of passes.
5th - Change rate of passes.

NOTE - The direction of each change can be determined by referring to "Factors Affecting Density of Coating" but the degree of each change must be determined by experience.

4A. DENSITY CURVES AND STANDARD WEIGHTS FOR CATHODE COATING

For purposes of control the texture of the coating can be expressed in terms of the apparent coating density. This is accomplished in round cathodes by measuring the weight and thickness of the coating and then reading the density from the following charts which have been calculated for all of the standard round cathodes.

In order to make these curves applicable to cathodes of any coated length, the volume of coating for any bare cathode diameter was calculated from one mm length. The apparent density of coating is then equal to the weight per unit volume which may be expressed as grams/cm^3 or its equivalent mg/mm^3.

1. Round Cathodes

The coating density for round cathodes is obtained as follows:

Divide the weight of the coating by the coated length to obtain mg/mm length. The single thickness of the coating is measured in mils. Then by referring to the curve for the corresponding bare cathode diameter, the coating density may be read in mg/mm^3.

Where the bare diameter is an odd size, the density of the coating may be calculated as follows:

Obtain the weight of the coating in terms of mg/mm of coated length.

From Fig. 3 or 4 read the volume of the coating/mm length for the desired thickness of coating in mils.

The density is then the ratio of the two:

$$\frac{\text{Weight/mm length}}{\text{Volume/mm length}} = mg/mm^3$$

2. Flat Cathodes

A flat cathode can be treated like a round cathode having the same surface area. The density of the coating is then obtained as for a round cathode with a minimum of calculation. For the different sizes of flat cathodes, there is a conversion chart (Fig. 2.) giving the round cathode equivalents. The full diagonal line gives the same bare cathode surface area/mm length for a round cathode as the calculated area of an equivalent rectangular cathode. However, in practice where a round cathode is flattened to give a rectangular cathode, a round cathode is used which is 5 mils smaller in diameter than is required to give the calculated rectangular shape specified. This difference is shown by the dotted line. The inference here is that either the shape of the cathode is not a perfect rectangle or else the round cathode is stretched during the shaping process.

4A. DENSITY CURVES AND STANDARD WEIGHTS FOR CATHODE COATING (Cont'd)

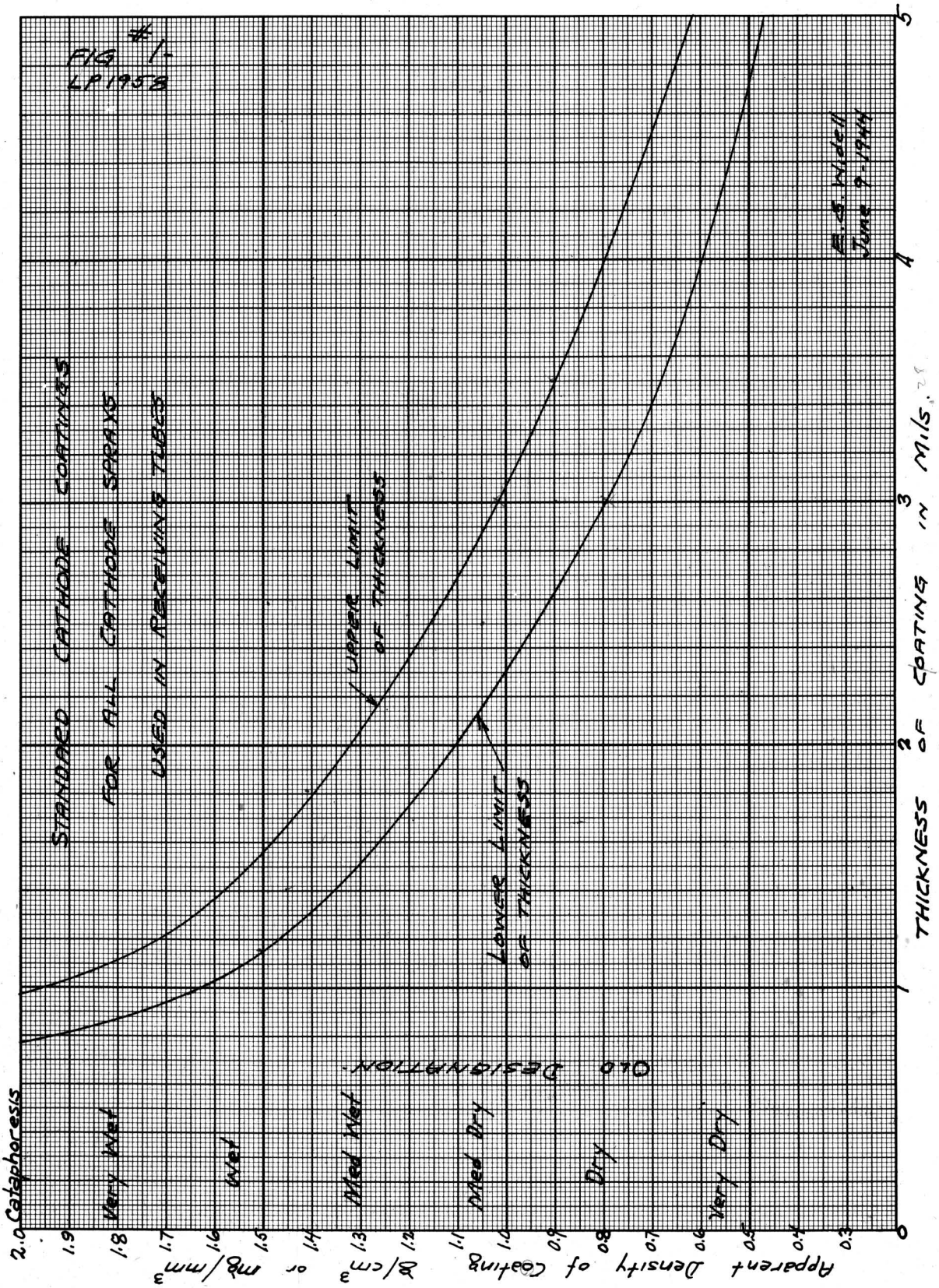
2. Flat Cathodes (Cont'd)

The density of coating can also be determined from the weight in mg/cm^2 and the measured thickness of coating. Fig. 2 mentioned above gives the surface area in mm^2/mm length for the various sizes of cathodes, assuming that they are perfect rectangles. Dividing by 100 gives the area in cm^2/mm length. The ratio of the coating weight in mg/mm length of coating and the surface area in cm^2/mm length gives the weight of coating in mg/cm^2. Knowing the thickness of coating in mils, the density can be then read from Fig. 5 or 6.

Flat cathodes sprayed on the sides only will have to be treated individually and the density calculated from measurements.

These curves can also be used for design purposes. The use of the tube should determine the required density of coating. Close-spaced rectifiers where arcing is a factor call for a high density coating. Cathode ray tubes and tubes with extremely close spacing also require a cathode with a very smooth surface which can be obtained most easily with high density coatings. On the other hand, demands for very high emission require low density coatings. High density coatings help to prevent vaporization of barium onto grids and other parts of tube; also, high density coatings are less subject to poisoning effects than low density coatings. But high density coatings require longer time for decomposition than low density coatings of the same weight. Compromises in density have to be made in order to obtain as many as possible of the desired characteristics and therefore intermediate densities are used.

Having decided on the density required, the thickness of the coating is read from Fig. 1. Then knowing the density and thickness of the coating, the weight of coating can be read from the curves for flat or round cathodes.



☆ INDICATES A CHANGE ☆☆ INDICATES AN ADDITION

RADIO CORPORATION OF AMERICA
RCA VICTOR DIVISION
STANDARDIZING SEC., ENG. DEPT.
HARRISON, N. J., U. S. A.

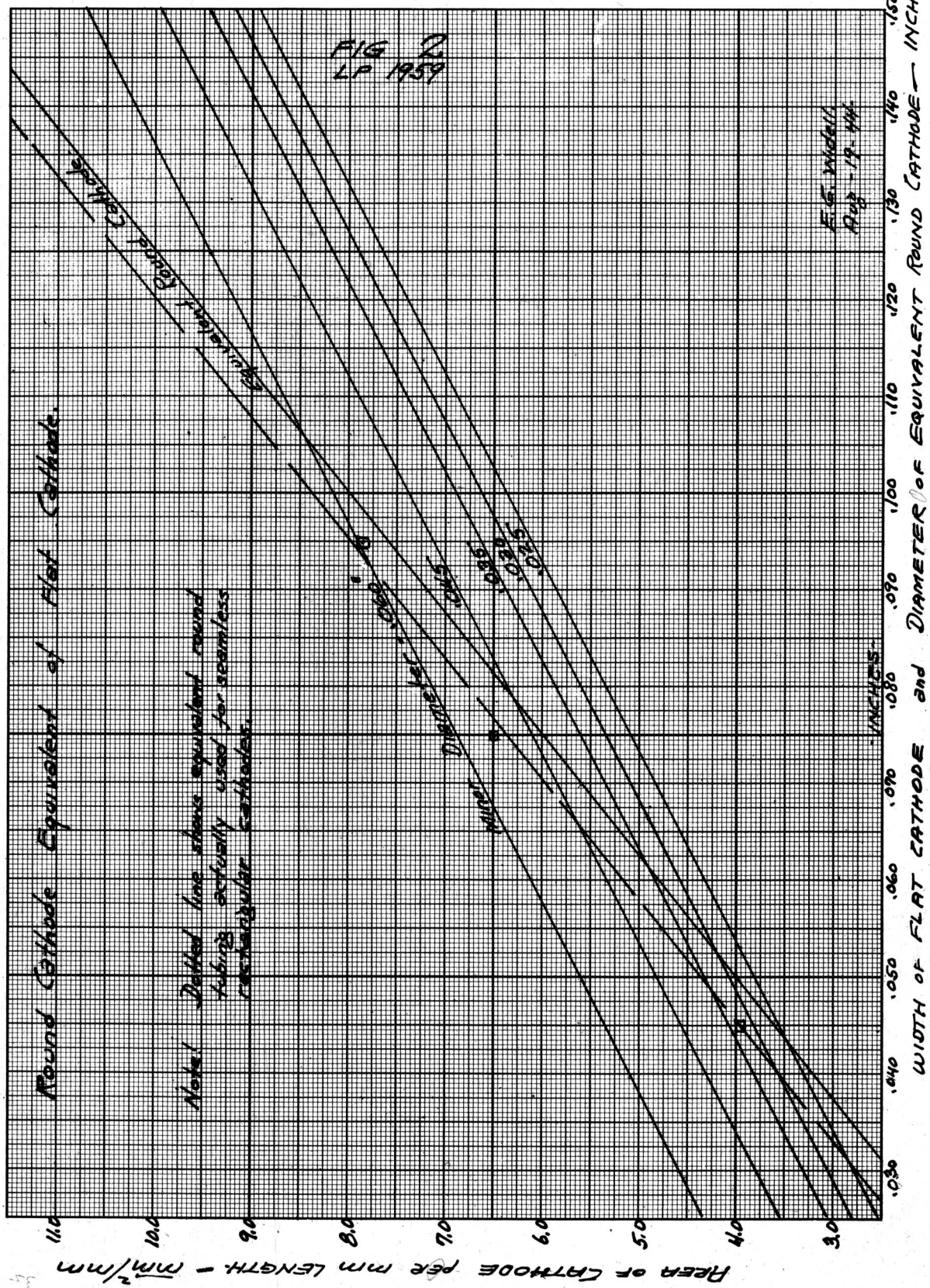
PRS12s34567D

DATE Oct. 29, '45 PAGE 3d

STANDARDIZING NOTICE 34-14-5A

SUBJECT CATHODE SPRAYING PROCESSES (Hand & Machine)

SUPERSEDED DATE



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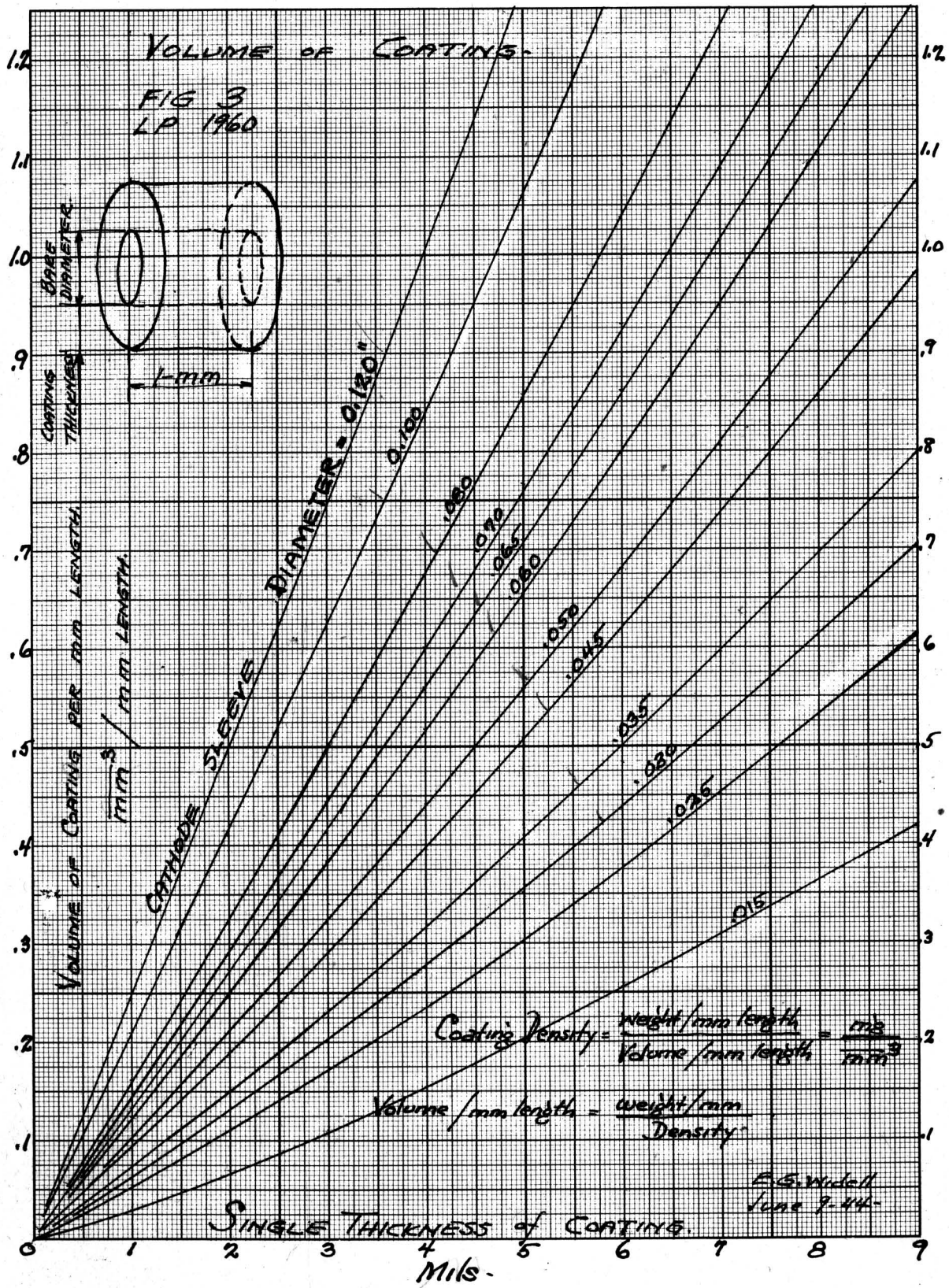
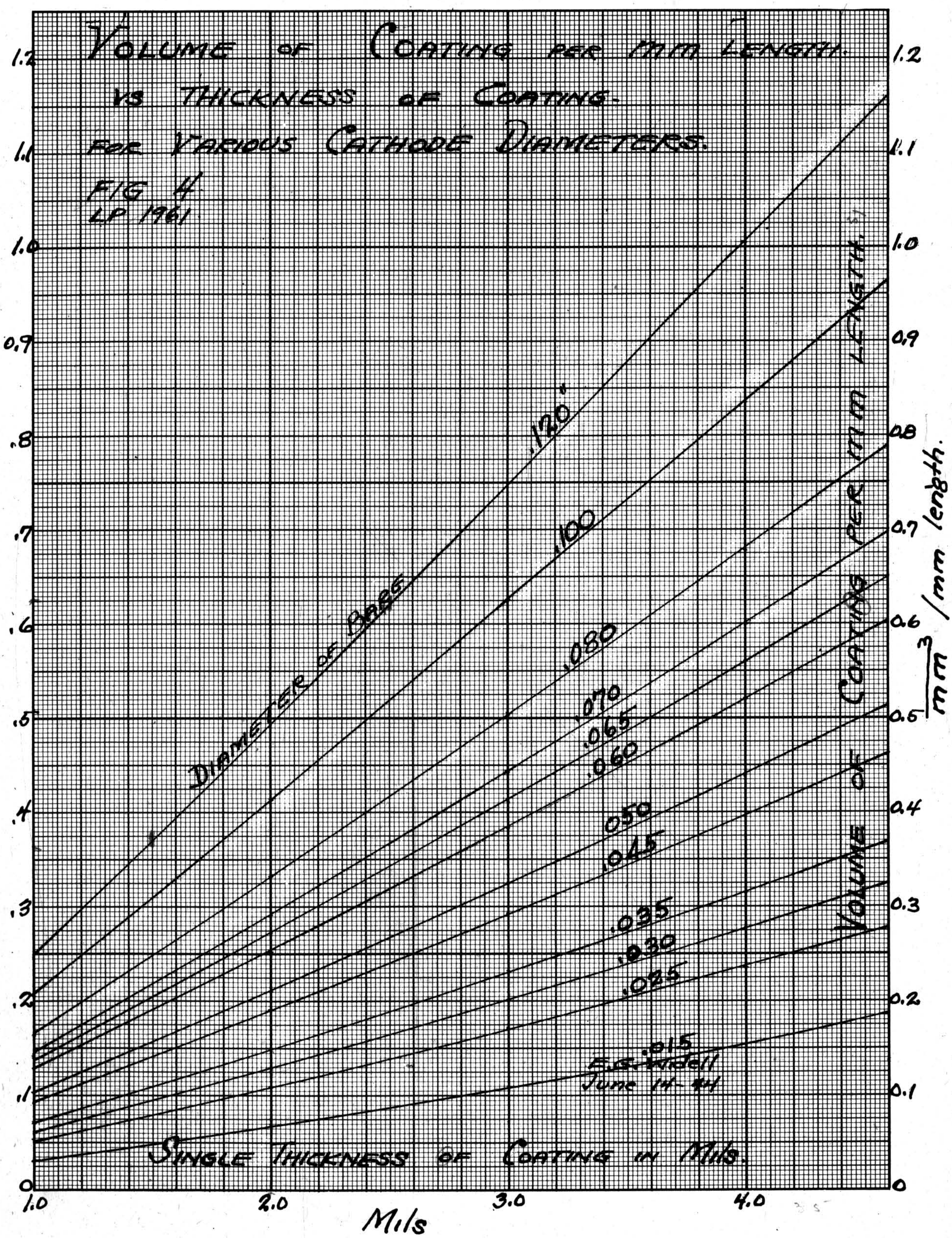
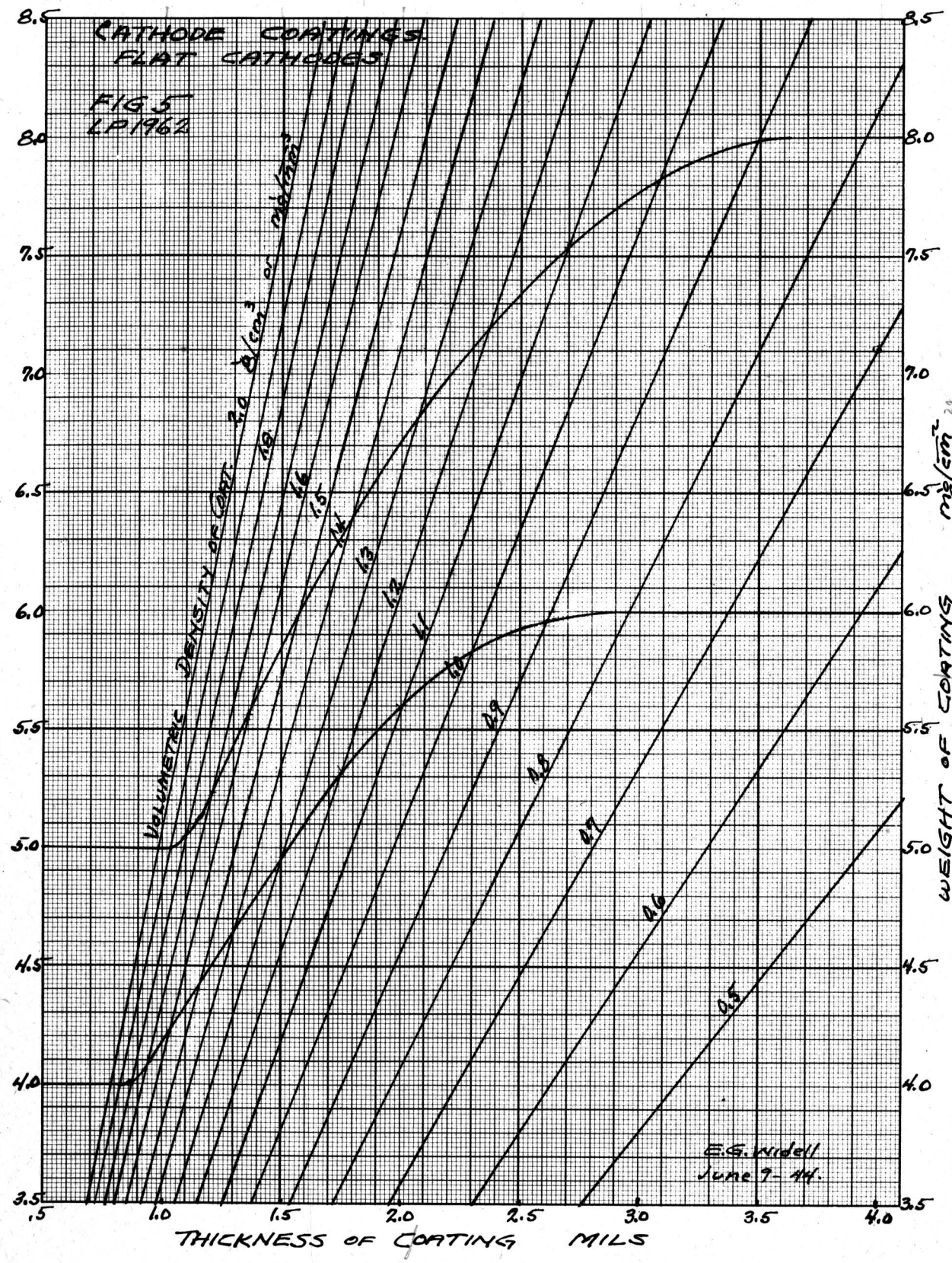

VOLUME OF COATINGS-
FIG 3
LP 1960
BASE DIAMETER
COATING THICKNESS
L-mm
CATHODE SLEEVE DIAMETER = 0.120"
0.100
.090
.080
.070
.065
.060
.050
.045
.035
.030
.025
.015
VOLUME OF COATING PER mm LENGTH.
mm³ / mm LENGTH.
Coating Density = weight/mm length / Volume/mm length = mg / mm³
Volume/mm length = weight/mm / Density
E.S. Wade
June 7-44-
SINGLE THICKNESS of COATING.
Mils-
0 1 2 3 4 5 6 7 8 9
.1 .2 .3 .4 .5 .6 .7 .8 .9 1.0 1.1 1.2


VOLUME OF COATING PER MM LENGTH
VS THICKNESS OF COATING
FOR VARIOUS CATHODE DIAMETERS.
FIG 4
LP 1961
DIAMETER OF BASE
.120"
.100
.080
.070
.065
.060
.050
.045
.035
.030
.025
.015
E.S. Widell
June 14-44
SINGLE THICKNESS OF COATING IN MILS.
VOLUME OF COATING PER MM LENGTH
mm³/mm length
Mils
1.0
2.0
3.0
4.0
0
.1
.2
.3
.4
.5
.6
.7
.8
0.9
1.0
1.1
1.2



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HARRISON, N. J., U. S. A.

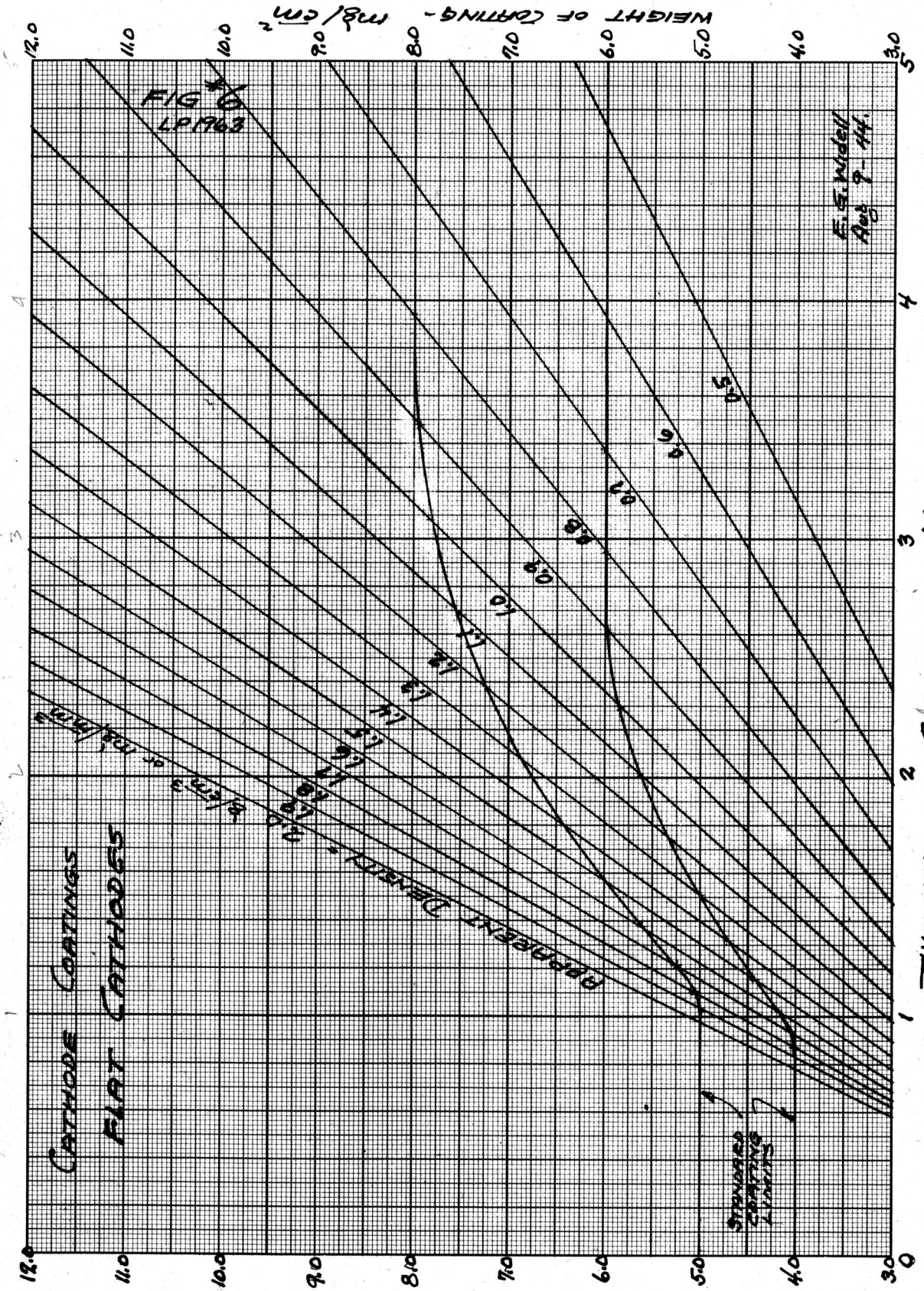
PRS12s34567D

DATE Oct. 29, '45 PAGE 3h

STANDARDIZING NOTICE 34-14-5A

SUPERSEDED DATE

SUBJECT CATHODE SPRAYING PROCESSES
(Hand & Machine)



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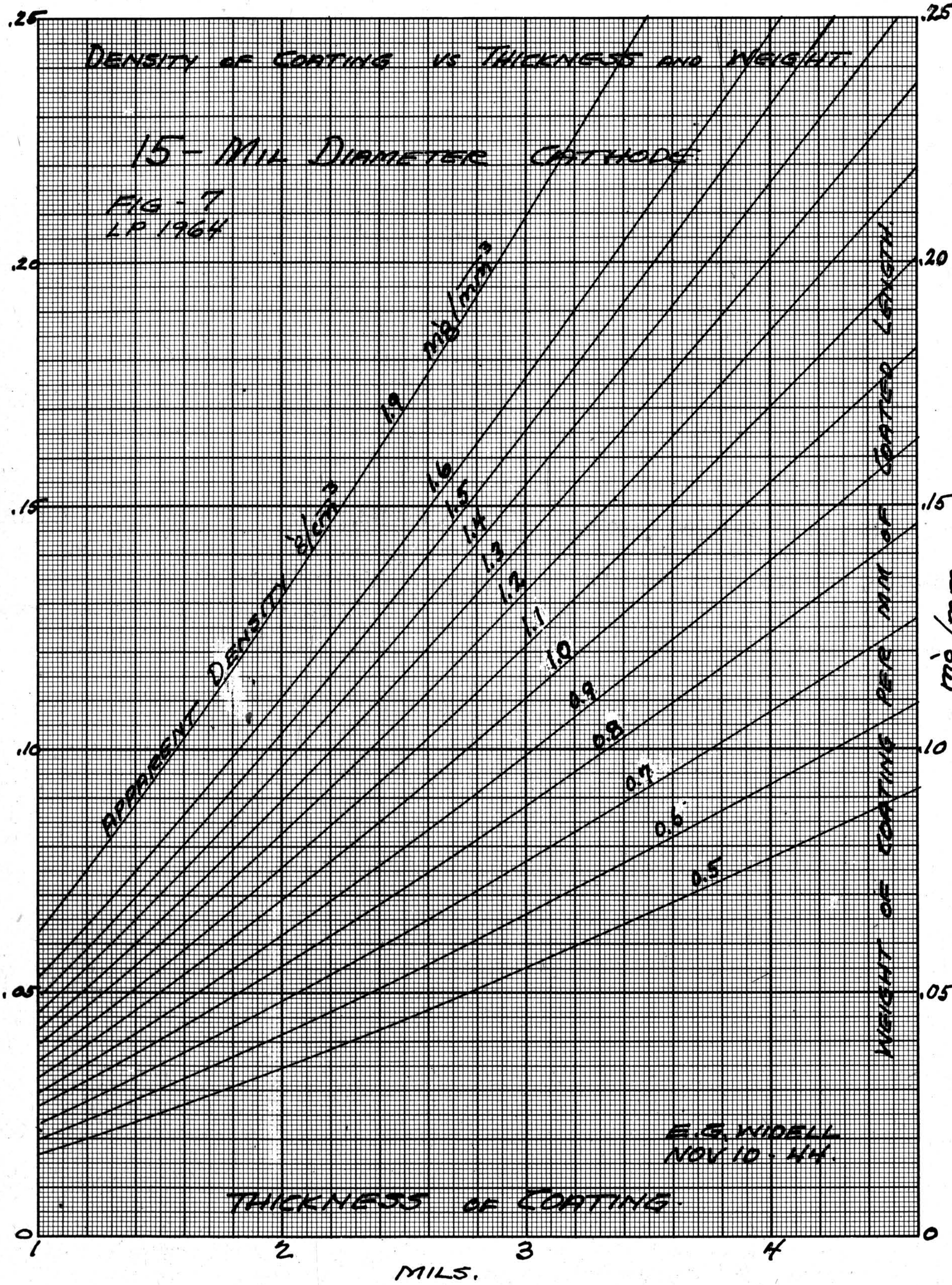
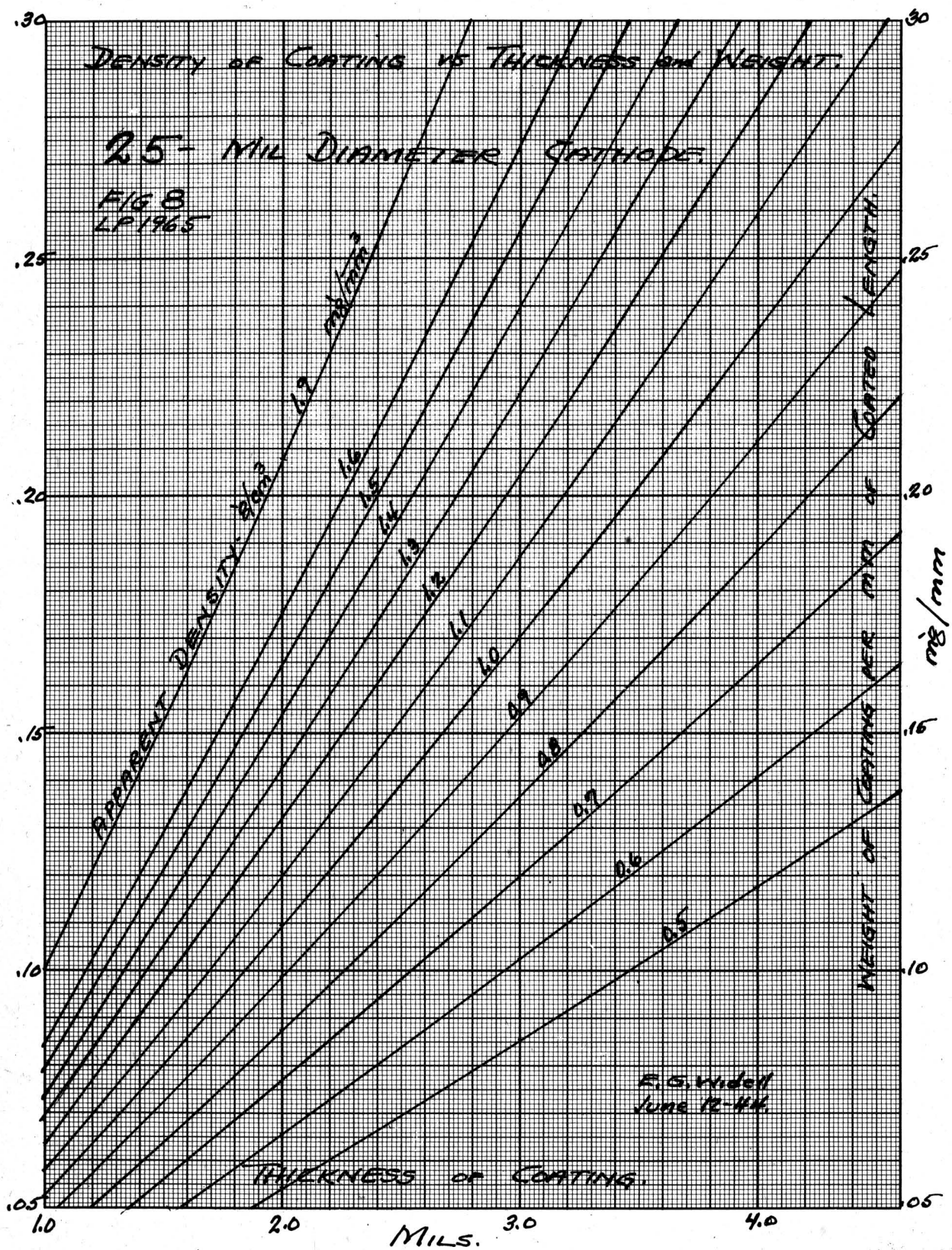

DENSITY OF COATING VS THICKNESS AND WEIGHT.
15-MIL DIAMETER CATHODE
FIG-7
LP 1964
APPARENT DENSITY g/cm3
mg/mm3
1.9
1.6
1.5
1.4
1.3
1.2
1.1
1.0
0.9
0.8
0.7
0.6
0.5
WEIGHT OF COATING PER MM OF COATED LENGTH.
mg/mm
E.G. WIDELL
NOV 10 - 44.
THICKNESS OF COATING.
MILS.
.25
.20
.15
.10
.05
0
1
2
3
4



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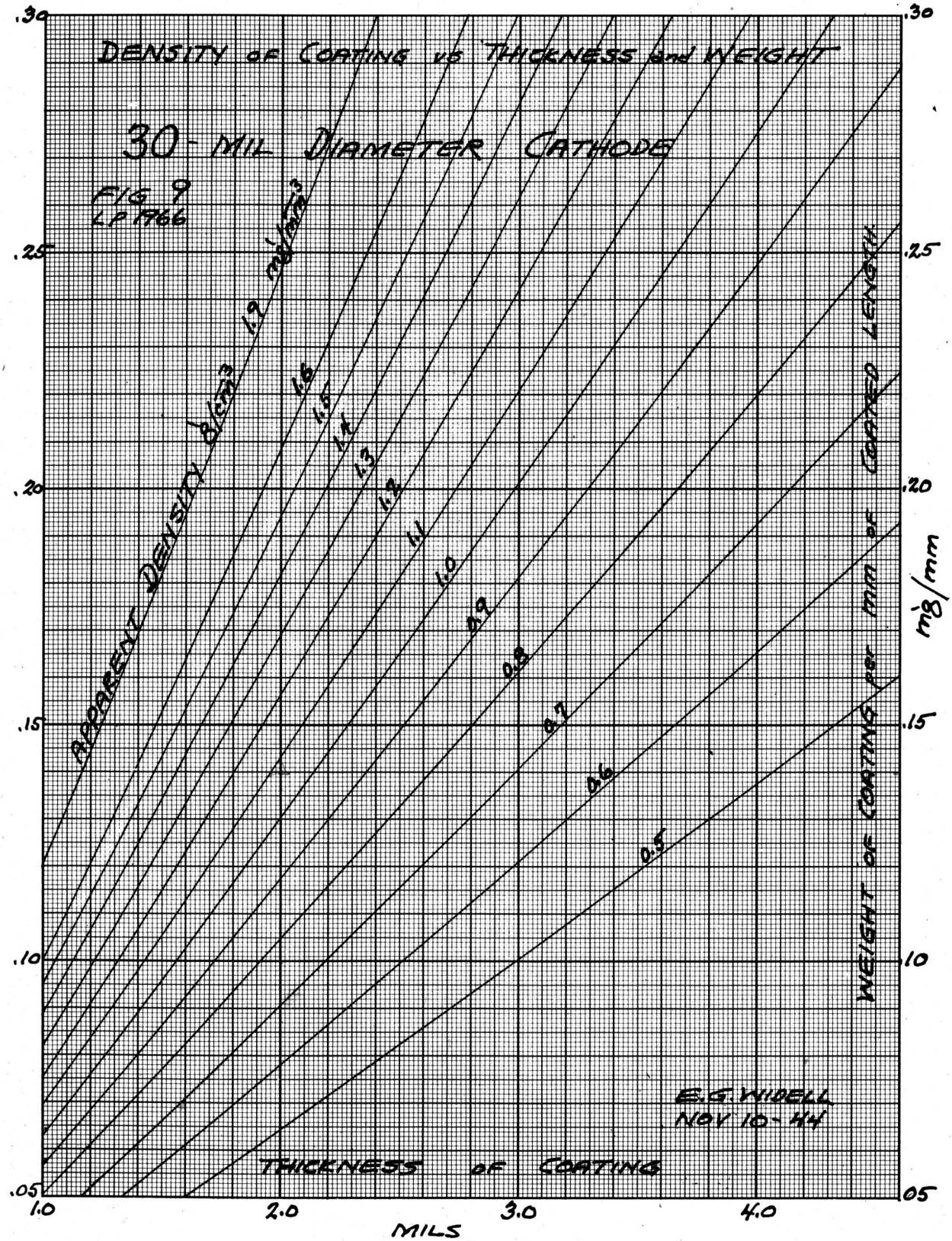
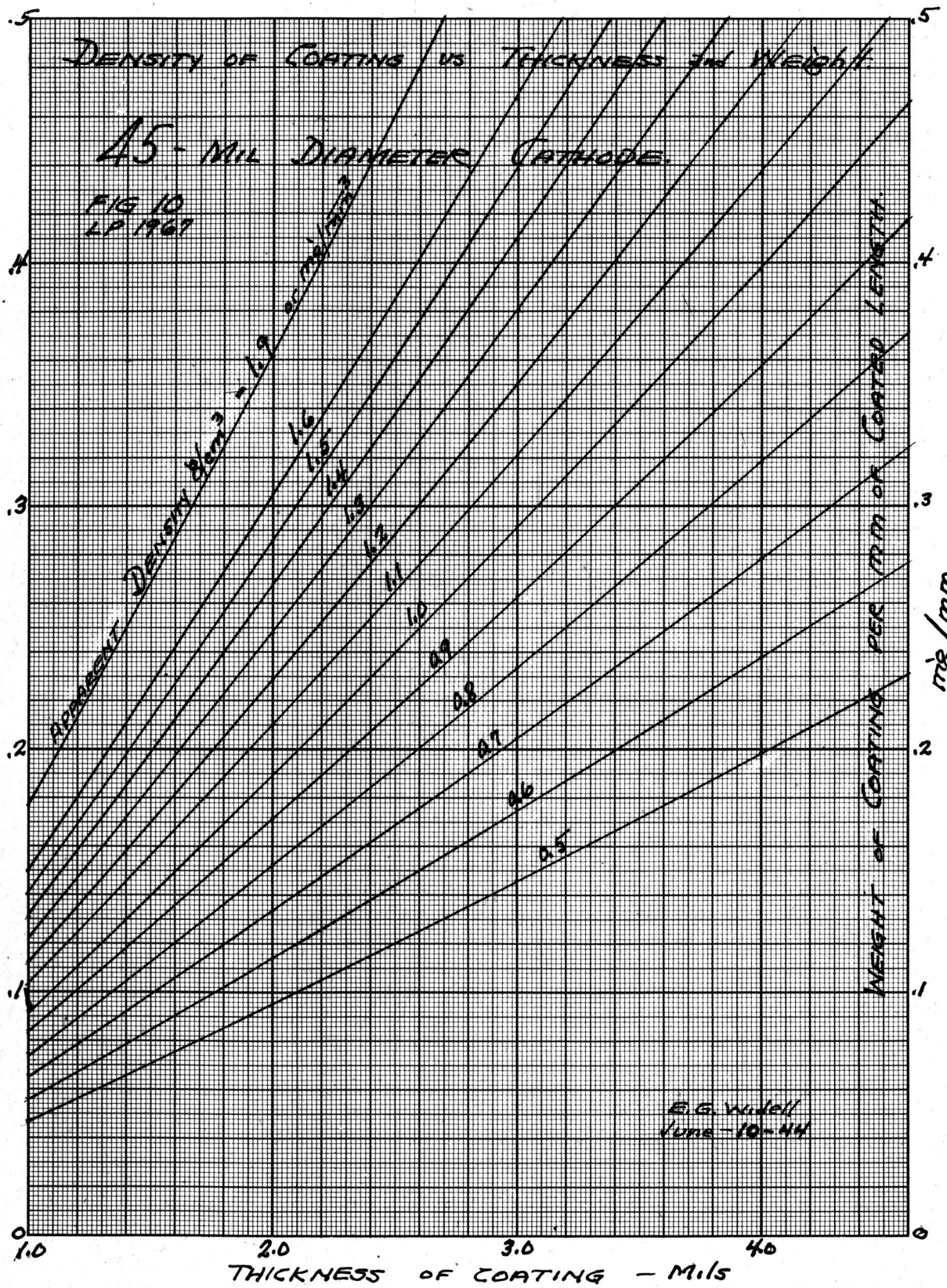
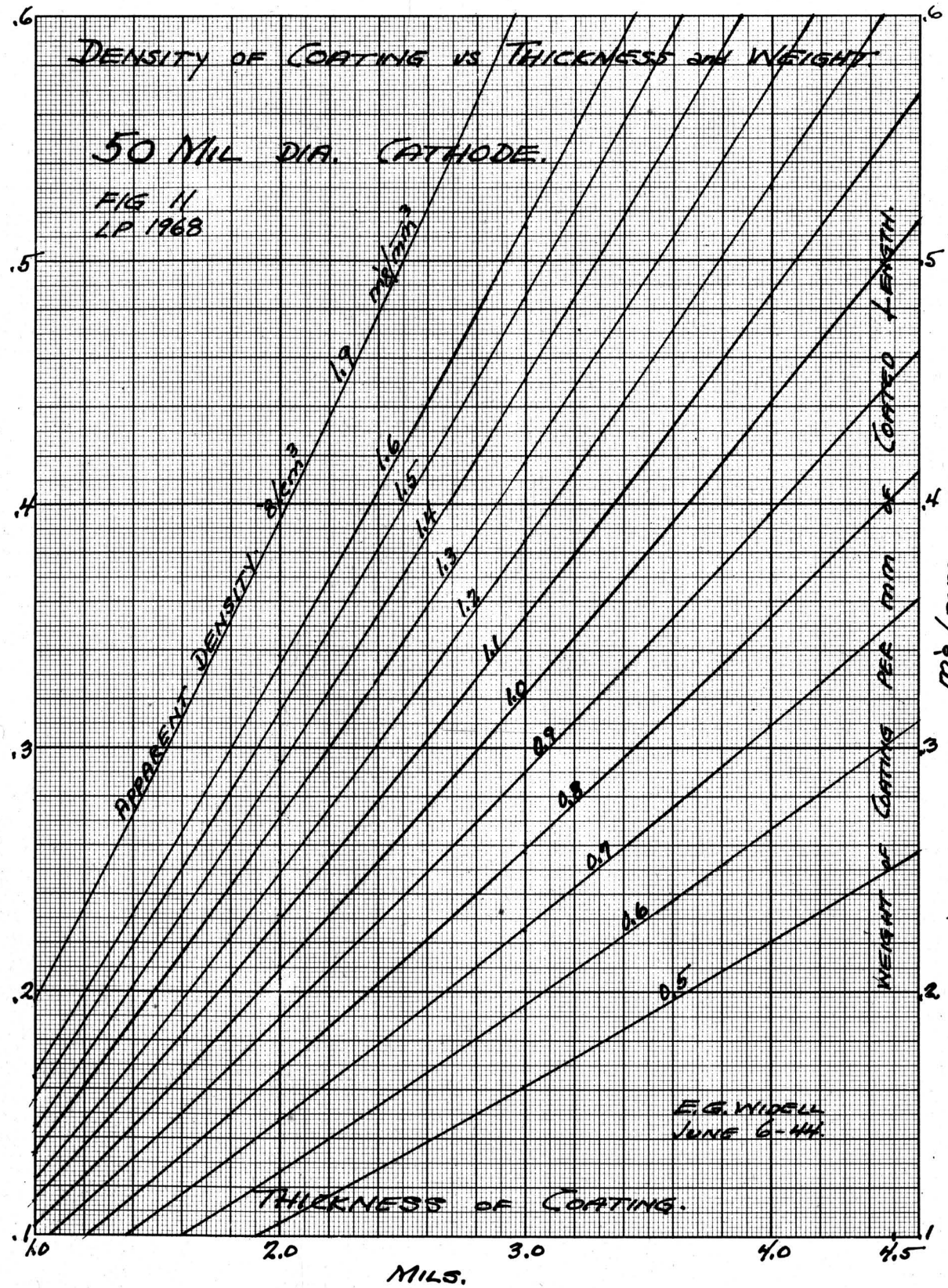

DENSITY of COATING vs THICKNESS and WEIGHT
30 - MIL DIAMETER CATHODE
FIG. 9
LP 1766
APPARENT DENSITY gm/cm³
1.9
1.8
1.6
1.4
1.3
1.2
1.1
1.0
0.9
0.8
0.7
0.6
0.5
WEIGHT of COATING per mm of CORED LENGTH
mg/mm
.30
.25
.20
.15
.10
.05
1.0
2.0
3.0
4.0
MILS
THICKNESS of COATING
E.G. WIDELL
NOV 10-44


Density of Coating vs Thickness and Weight
45 - Mil Diameter Cathode.
FIG 10
LP 1967
Apparent Density gm/cm³
1.9
1.8
1.7
1.6
1.5
1.4
1.3
1.2
1.1
1.0
0.9
0.8
0.7
0.6
0.5
Weight of Coating per mm of Coated Length mg/mm
.5
.4
.3
.2
.1
0
1.0
2.0
3.0
4.0
THICKNESS OF COATING — Mils
E.G. Widell
June-10-44


DENSITY OF COATING VS THICKNESS and WEIGHT.
50 MIL DIA. CATHODE.
FIG 11
LP 1968
PRESENT DENSITY
gm/cm³
1.9
1.6
1.5
1.4
1.3
1.2
1.1
1.0
0.9
0.8
0.7
0.6
0.5
WEIGHT OF COATING PER MM OF COATED LENGTH.
mg/mm
E.G. WIDELL
JUNE 6-44.
THICKNESS OF COATING.
MILS.
.6
.5
.4
.3
.2
.1
1.0
2.0
3.0
4.0
4.5
5
4
3
2
1

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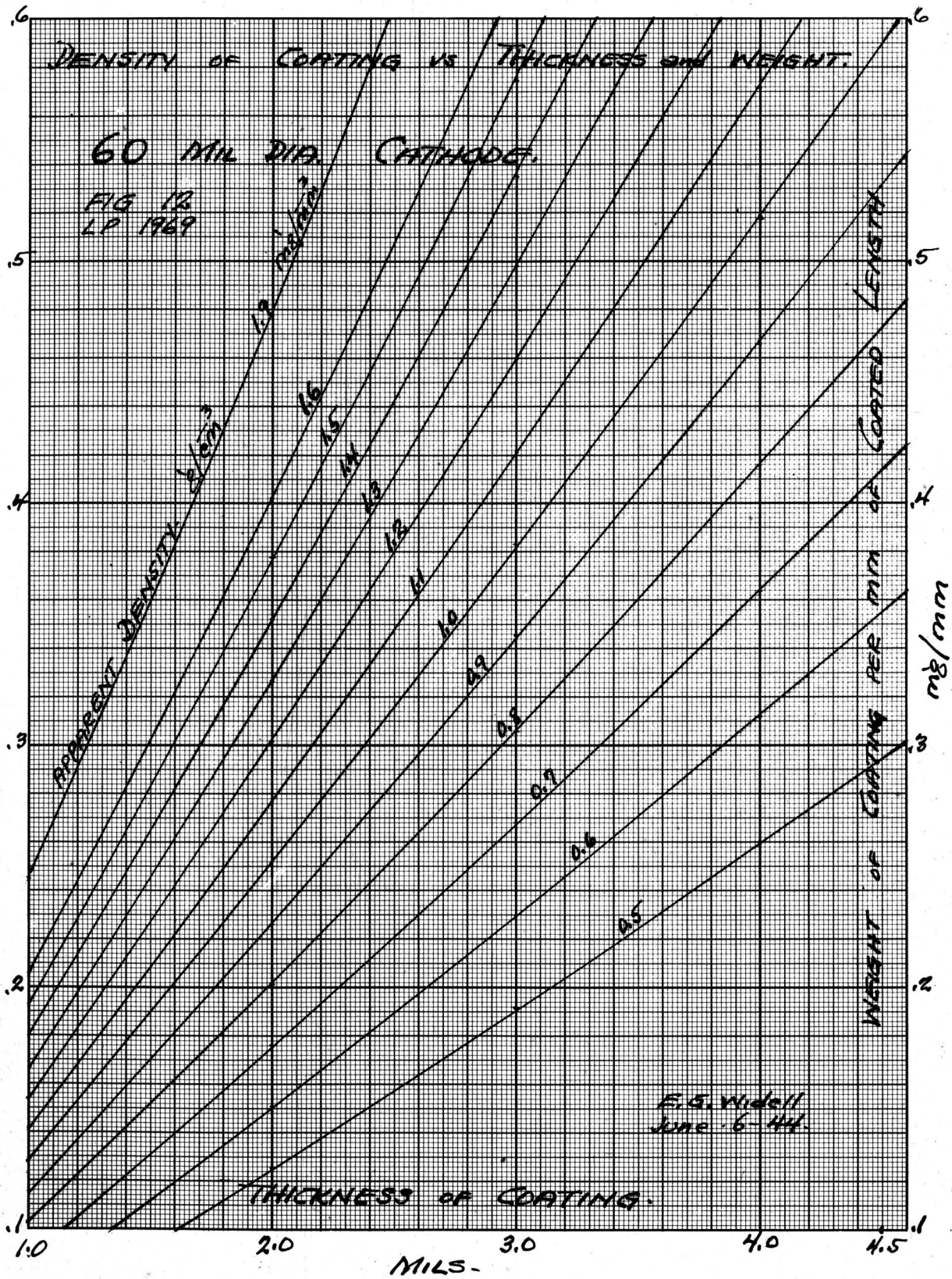
SUBJECT CATHODE SPRAYING PROCESSES
(Hand & Machine)



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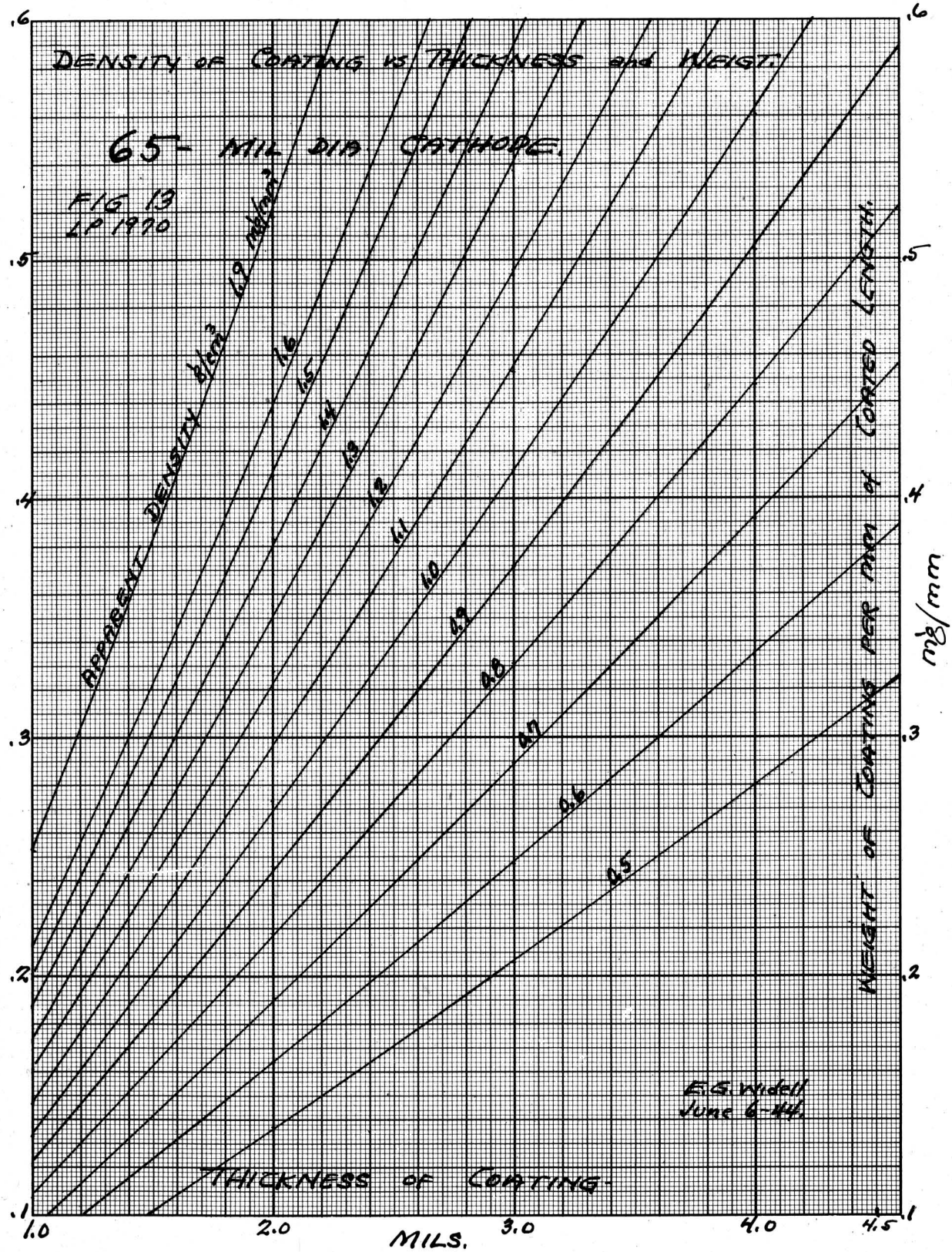
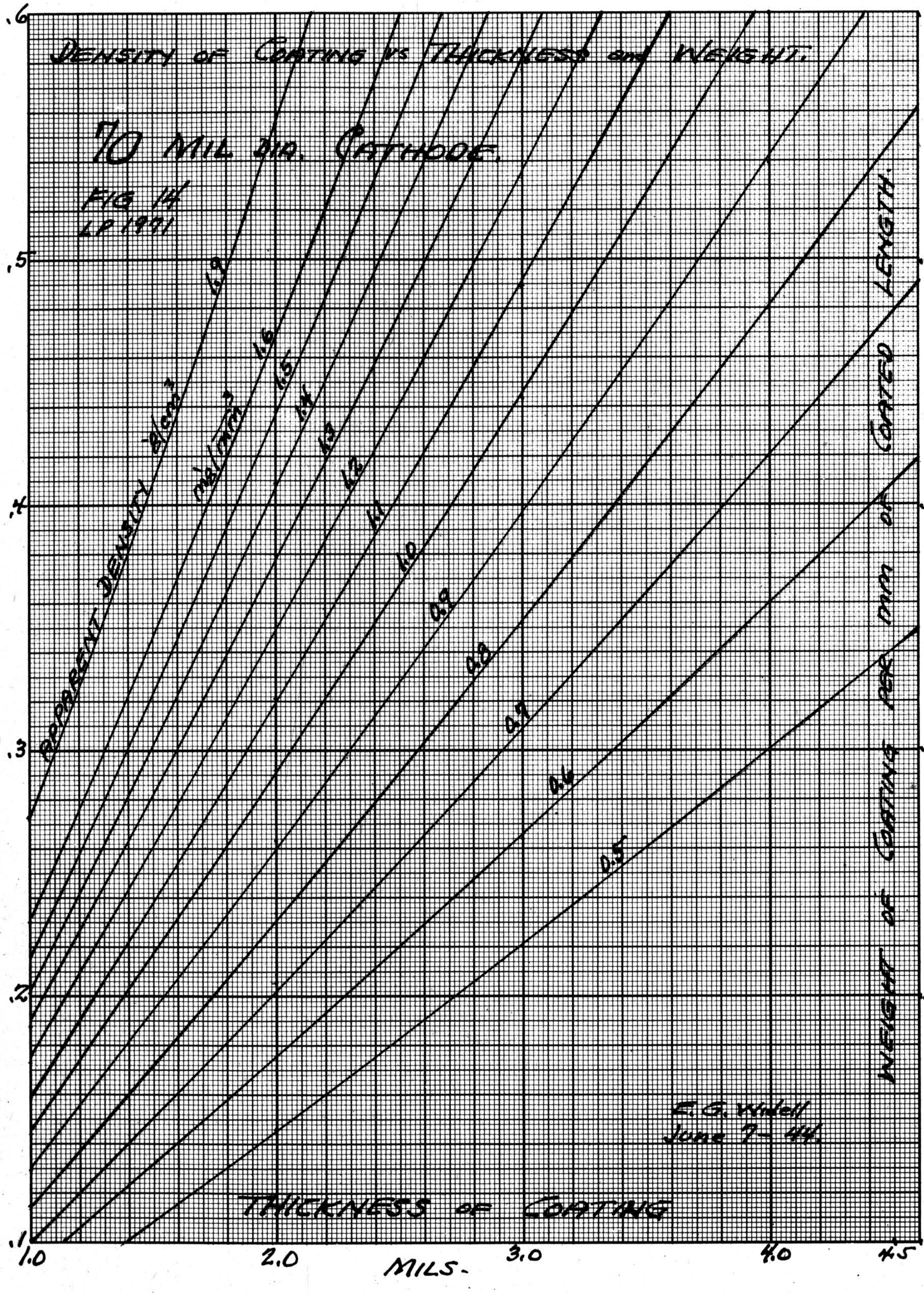
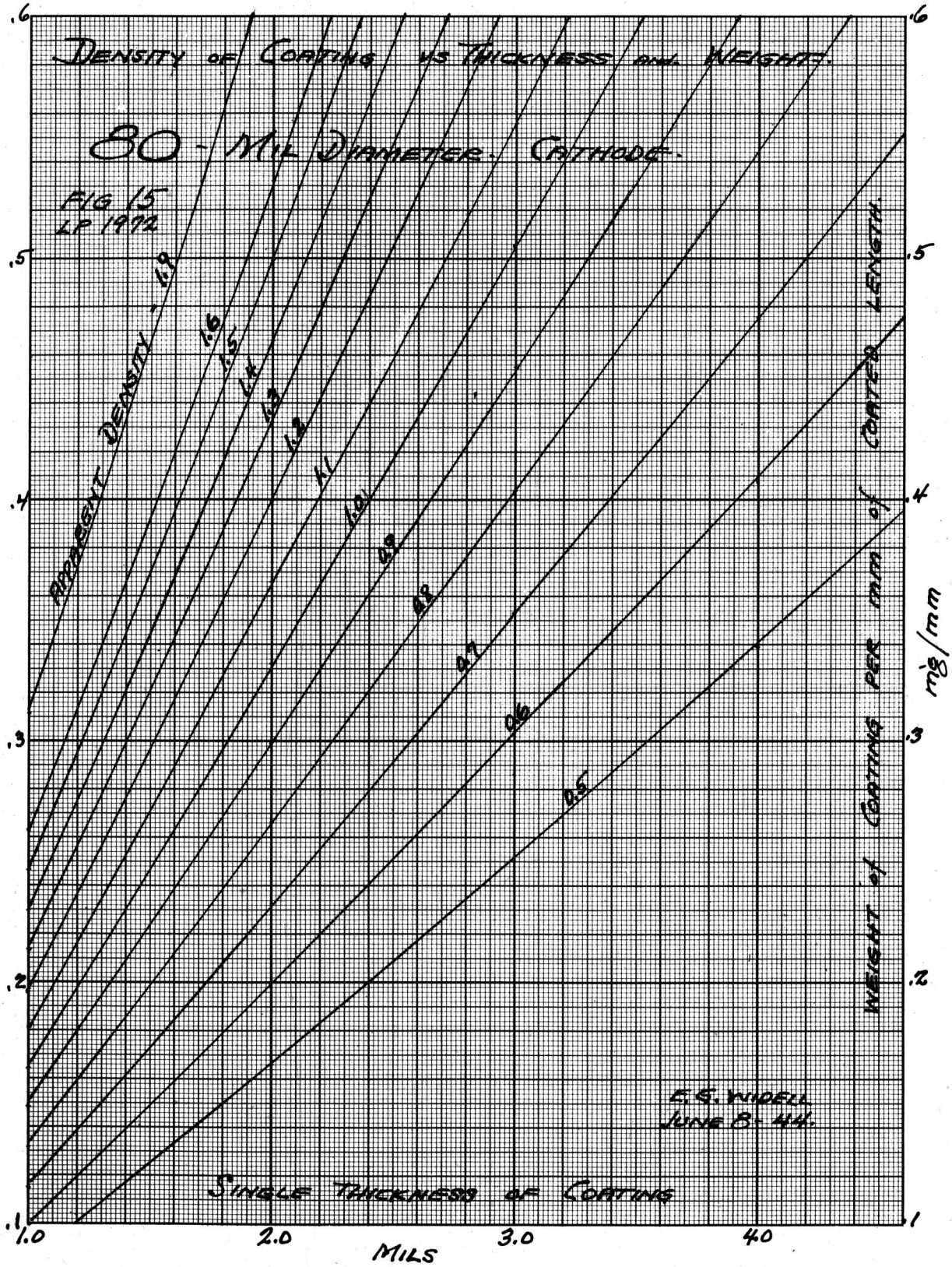
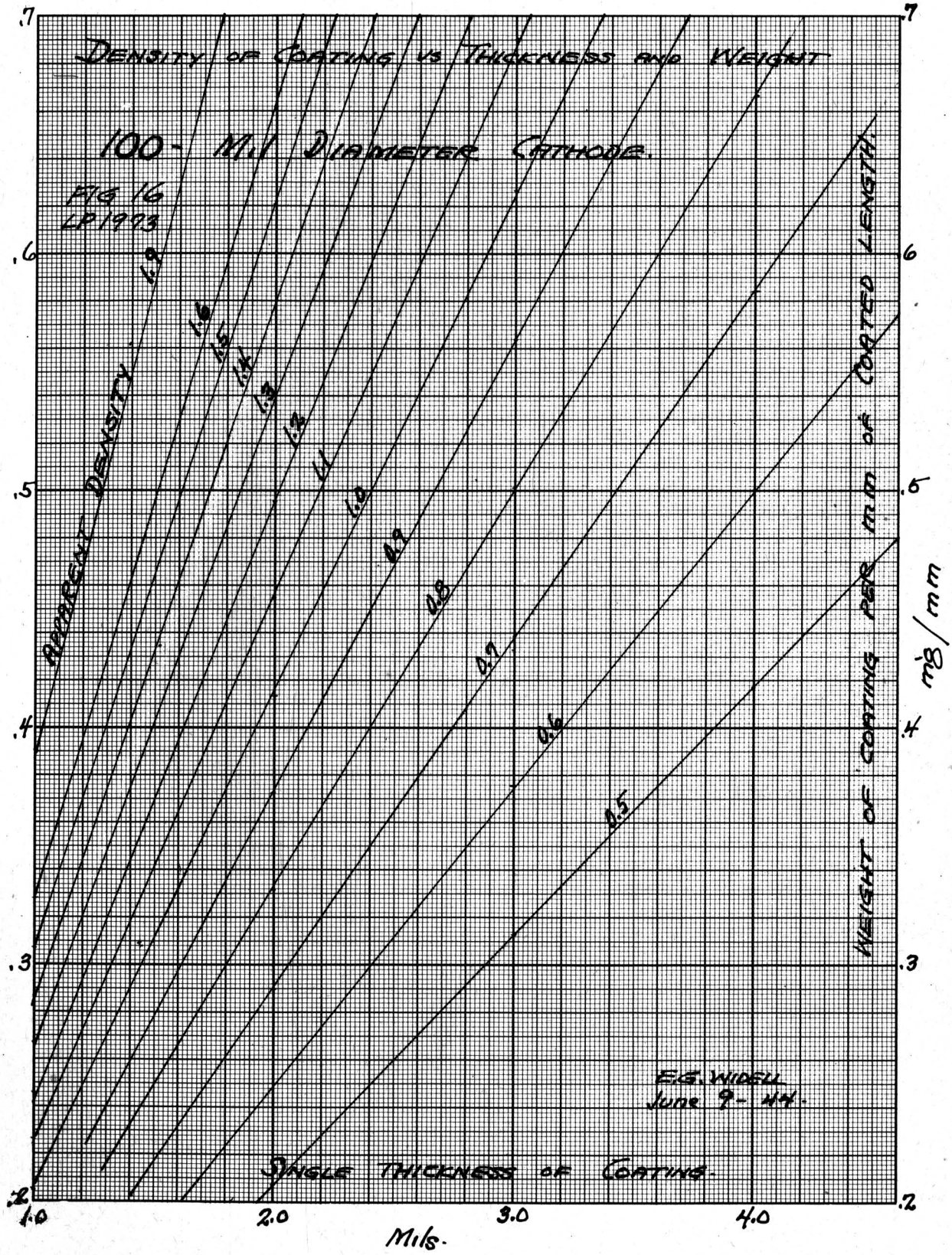

DENSITY of COATING vs THICKNESS and WEIGHT.
65- MIL DIA. CATHODE.
FIG 13
LP 1970
APPARENT DENSITY gm/cm³
1.6
1.5
1.4
1.3
1.2
1.1
1.0
.9
.8
.7
.6
.5
WEIGHT OF COATING PER INCH of CORED LENGTH.
mg/in
.6
.5
.4
.3
.2
.1
E.G. Widell
June 6-44.
THICKNESS of COATING.
1.0
2.0
3.0
4.0
4.5
MILS.


DENSITY OF COATING VS THICKNESS AND WEIGHT.
70 MIL DIA. CATHODE.
FIG 14
LP 1991
APPARENT DENSITY - g/cm³
mg/mm³
6.2
1.6
1.5
1.4
1.3
1.2
1.1
1.0
0.9
0.8
0.7
0.6
0.5
WEIGHT OF COATING PER MM OF COATED LENGTH
mg/mm
THICKNESS OF COATING
MILS.
1.0
2.0
3.0
4.0
4.5
.1
.2
.3
.4
.5
.6
1
2
3
4
5
6
E.G. Widell
June 7- 44.


DENSITY OF COATING VS THICKNESS AND WEIGHT.
80 - MIL DIAMETER CATHODE.
FIG 15
LP 1972
APPARENT DENSITY
1.9
1.8
1.7
1.6
1.5
1.4
1.3
1.2
1.1
1.0
0.9
0.8
0.7
0.6
0.5
WEIGHT of COATING PER mm of LENGTH
mg/mm
.6
.5
.4
.3
.2
.1
1.0
2.0
3.0
4.0
MILS
SINGLE THICKNESS OF COATING
E.S. WIDELL
JUNE 8-44.


Density of Coating vs Thickness and Weight
100 - Mil Diameter Cathode.
Fig 16
LP1993
Apparent Density
1.9
1.8
1.6
1.4
1.3
1.2
1.1
1.0
0.9
0.8
0.7
0.6
0.5
Weight of Coating per mm of Coated Length
mg/mm
.7
.6
.5
.4
.3
.2
1.0
2.0
3.0
4.0
Mils.
Single Thickness of Coating.
E.G. Widell
June 9 - 44.

RADIO CORPORATION OF AMERICA
R C A VICTOR DIVISION
STANDARDIZING SEC., ENG. DEPT. P3PA
LANCASTER, PA., U. S. A.

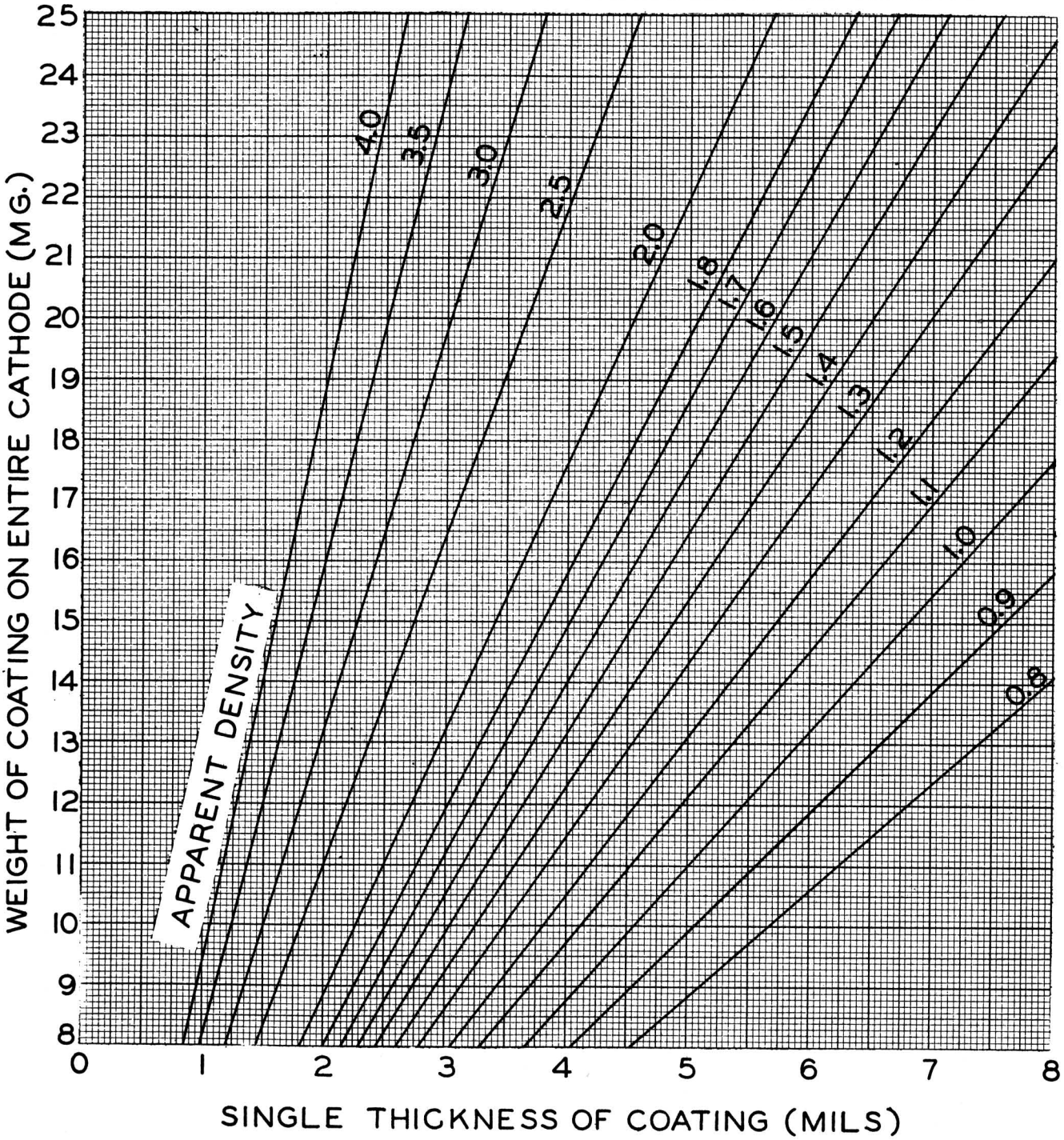
SUBJECT CATHODE SPRAYING PROCESSES
(HAND & MACHINE)

STANDARDIZING NOTICE 34-14-5A

SUPERSEDED DATE

INITIALLY FOR TYPE 5588

DENSITY OF COATING VS THICKNESS AND WEIGHT



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DWG. Nº 91-310
MBL-121119

5. SPRAY TERMINOLOGY

A. Terms Used in Spraying

1. Shot - Any motion of the spray stream partially traversing the length of the spray bar and used with the intention of building up spray material on a single end of a spray bar, where cathodes are observed to be unsuitably coated, is designated as a "shot".

2. Pass - A complete traverse of the spray stream from two or three inches from one end of the spray bar to a similar distance beyond the other end of a spray bar, on one side of the bar only, is designated as a "pass".

3. Covering - A "covering" is equivalent to a completion of the specified spraying cycle, i.e., the number of passes required thru a 360° rotation of the spray bar, times the number of directions, with respect to elevation, at which the spray is applied.

4. Complete Coating - A "complete coating" on a cathode comprises the spray material which is applied to the specified weight or diameter by the application, in the proper sequence, of the required number of passes.

5. Gun Setting - On spreader adjustment valve - marked 0-20. To vary the spread or shape of the spray stream, the numbered dial may be set at either of two marks which are 180° apart on the stationary part of the valve or between these marks.

   Spray forms in relation to the gun settings, as determined by the form of the spray coating when applied on a flat surface held at right angles to the direction of the spray stream, are as follows:

Form of Spray	Gun Dial Setting
Round	0-5
Horizontal Ellipse	15-20 (With air cap holes in a vertical plane)
Vertical Ellipse	15-20 (With air cap holes in ahorizontal plane)

Notes: 1. Between the above geometric extremes in form of spray stream are an infinite number of gradual variations, starting with a faintly suggested oval at a setting of 6 and progressing thru a decided oval to an ellipse, and finally to a somewhat flattened ellipse at 15. For spraying cathodes, the air cap is generally set to produce a spray with the longer axis in a vertical direction in hand spraying and in a horizontal plane in machine spraying.

2. When pattern is distorted and gun has just been cleaned, fluid tip and needle must be changed.

5. SPRAY TERMINOLOGY (Cont'd)

A. Terms Used in Spraying (Cont'd)

6. Gun Opening - is expressed as the back turns of the screw which moves fluid needle from its foremost position in the fluid tip.

a. Depending on the abrasive action of emission materials in spray preparations, a corresponding amount of wear takes place on the fluid tip and fluid needle. In time the orifice of the fluid tip becomes enlarged, allowing the fluid needle to extend farther and farther out of the end of the gun, and the diameter of the fluid needle becomes reduced, thus making the effect more pronounced, i.e., the coating becomes denser. The ball of the tip of the fluid needle also wears off, finally leaving the end sharply pointed.

b. Fluid tips and fluid needles must be changed when the fluid needle protrudes more than 0.5mm. from the end of the fluid tip, when in the closed position, otherwise two undesirable conditions may result:

1. If the fluid needle is worn on one side it will cause a fine mist of spray at the edge of the spray stream proper.

2. If the fluid needle clears the orifice at all points and the ball at the tip is worn off, no delicate adjustment of the spray stream will be possible and a single turn of the knurled nut at the back of the gun will give approximately the same fluidity as four or five turns.

7. Volumetric density refers to the weight per unit volume of coating after coating has dried.

B. Character of Spray

NOTE - The information presented in this section "Character of Spray" is carried as a matter of record for the spraying department and is not intended to be used as a basis for specifying coating textures by design or factory type engineers. Wherever possible, such coating textures should be specified by volumetric density, i.e., by denoting coating weight, sprayed length and coated cathode diameter.

1. The character of spray, during application, may be classified according to its degree of wetness, by the following terms.

Wet -)
Medium Wet -) Designated as wet

Medium -)
Medium Dry -) Usually designated as 'Regular'

Dry
Extra Dry

5. SPRAY TERMINOLOGY (Cont'd)

B. Character of Spray (Cont'd)

2. The above classification includes spray over its entire workable range, i.e., up to the limit of permissible wetness and to the other extreme of permissible dryness.

   The limit of permissible wetness is exceeded when spray coating on cathodes runs down, bulges, or is blown out of position by the force of the spray stream.

   The limit of permissible dryness is exceeded when the adherence of the coating on the cathodes is insufficient to withstand handling within the practical limits of carefulness.

3. As a general rule it may be said that the adhering qualities of sprayed coatings are in proportion to the degree of wetness of spray during application, i.e., a coating applied wet will adhere more firmly than a coating which is applied dry as a result of a less fluid spray.

4. A wet spray normally results in a smooth, hard, or "egg shell" finish. The coating is decidedly adherent and will withstand appreciably severe handling without being damaged. The coating on being removed from the cathode sleeve, with a finger nail, tends to chip off rather than come off in a powder form. If cathode is held by its tab about 1/16" from end of sleeve and coating is rubbed lightly with a finger, none of the coating may come off or only a faint white line may be left on the finger.

5. As herein classified a medium wet spray closely approaches a 'wet' spray and the smoothness and adhering qualities of the coating are slightly reduced.

6. A medium spray results in a finish which is sufficiently rough to be seen without the aid of magnification. The coating adheres quite firmly and should withstand normal handling during mounting. A pronounced white line will be left on the finger if it is rubbed lightly over the coating. If a cathode is dropped 2-3" on to a flat surface, the coating will not come off as a powder. Coating material removed from the cathode with a finger nail will come off as a powdery deposit. The drop test should preferably be made on a glass plate with a black surface underneath, to make the coating powder more visible.

7. For finish and character of coating applied "medium dry" interpolate between "medium" and "dry" sprayed coatings. The coating may be sufficiently firm so that little or no powder will fall off when cathodes are dropped 2-3" on a flat surface.

8. Dry spray will normally produce a decidedly rough coating. Cathodes dropped as above described may shed an appreciable quantity of powder. During mounting, cathodes with such a spray coating must be handled very carefully, but the use of tweezers is not required.

5. SPRAY TERMINOLOGY (Cont'd)

C. Character of Finish

1. As stated before, the appearance and condition of sprayed coatings, after they are thoroly dry, is largely dependent on the fluidity or wetness of the spray during application, i.e., a wet spray normally results in a smooth coating and a dry spray in a rough coating.

2. For purposes of comparison, but not for specifying textures, coatings may be classified as follows:

Extra rough
Rough
Medium rough
Slightly rough
Medium smooth
Smooth

This classification covers a range of coating finishes from a surface as smooth as it can be made, with existing spray materials, and processes, to a surface as rough as normal handling conditions will permit.

6. PROCEDURE FOR HAND SPRAYING

A. Spraying

1. Roll bottle until carbonate is thoroly dispersed into binder.

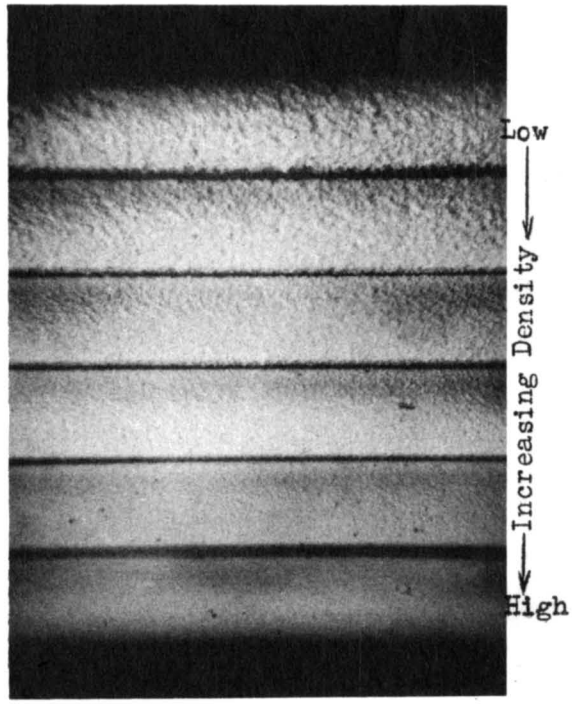
2. Immediately pour preparation into spray cup or tank and continue rolling remainder in bottle until bottle is emptied.

3. Regulate air pressure on tank
4. " " " " gun
5. Adjust nozzle dial setting
6. " gun opening (fluid needle)
7. Spray at distance
8. Spray at speed
9. Apply passes

(As specified in Cathode Coating Sched.)

Comments

a. Pressure gages must be read correctly at all times. It is recommended that gages be tested and calibrated as often as necessary to be assured of their accuracy. For low pressure work, the gages should be such that pressure will register near the middle of the scale.



Magnification 7 times

6. PROCEDURE FOR HAND SPRAYING (Cont'd)

Comments (Cont'd)

b. Bottle partially emptied and left over night or over a week end must be thoroly dispersed before using.

c. If spray gun is to be idle for one-half hour or more, the cup must be emptied into one of the bottles being rolled.

d. The spray material remaining in tank must be emptied into bottles at the end of each day, these bottles to be rolled and the contents then added to the next day's batch. Before emptying the tank it is advisable to speed up the agitator for a few minutes. The tank must be cleaned out with methanol at the end of each day.

e. To prevent clogging, the hose connecting the spray gun to the tank must be cleaned daily. This may be done by forcing clean methanol thru the hose and gun with air pressure.

f. If gun stands idle any length of time, the nozzle must be cleaned.

g. In cleaning gun, do not immerse gun into solvent.

h. Filter in air transformer must be renewed at least once a month.

B. Drying

Sched. 1 - Dry coating at 90-100°C for 3 min. - in an oven with forced circulation in heating chamber, or at 100-110°C for 3 min. - in an air oven without air circulation.

Sched. 2 - (For Fact. No. 2 cathodes when cathode coating schedule number is followed by suffix letter 'A')
Dry coating at 40-50°C in heated bus for 18 hrs. min. or at - 100-125°C in air oven for 30 to 60 min.
This drying removes a certain amount of moisture to improve emission and chipped coating.
Remove parts from oven, unload into trays and inspect.

C. Inspection

1. Inspect and reject coated cathodes for the following details:

a. Smashed ends
b. Chipped coating
c. Thick, uneven coating
d. Thin or streaked coating
e. Foreign particles or spots
f. Bowed cathodes
g. Bent tabs
h. Non-uniform coating

Discard bowed cathodes and cathodes with smashed ends or dents that cannot be straightened without damaging the coating.

6. PROCEDURE FOR HAND SPRAYING (Cont'd)

C. Inspection (Cont'd)

2. Check weight of coating and diameter of coated cathodes. When no diameter limits are specified, the diameter should not vary by more than .002" from the smallest to the largest diameter.

Check 1 cathode per bar, preferably selecting the cathode from near the end of bar. If coating is out of limits on the top side, reject all cathodes in bar. Apply more passes to cathodes rejected because of light coating and small diameter.

**Note (Lancaster): Two cathodes from each spray bar shall be selected instead of one, one from the middle and one from the end of the bar.

D. Salvaging - Cathodes on which the coating is too heavy or otherwise defective shall be reclaimed as specified in 34-14-5G.

E. Packing - Unless otherwise specified on cathode assembly, pack coated cathodes into cathode boxes #1 or #2, depending on size.

F. Cleaning, Checking & Loading Bars

1. Cleaning Bars
Bars and clips must be cleaned thoroly with a motor driven brass brush under a hood with a forced draft as follows:

a. For bars for cathodes with close coating tolerances:
Brush each bar thoroly each time after it has been used twice. On starting up in the morning, brush all bars, even if they have been used only once. If necessary, clean cavities of bar by washing with acetone or by cleaning with a hand brush.

b. For bars for cathodes with normal coating tolerances:
Brush each bar thoroly after it has been used 5 or 6 times. Clean cavities, when necessary, as described above.

2. Checking Bars for Cathode Spray Length

a. After each cleaning, cathode holders must be checked in three places along each adjustable bar, at the center and at each end to determine if there has been any change in the position of the bars; and the latter should be readjusted, if necessary, as any shifting of bars due to rough handling at cleaning will change the uncoated length of cathode ends. Spring clips which are used on holders to reinforce the grip of holders should be strong enough to hold their position through ordinary handling.

b. When unloading cathodes from bar, the bar should be checked for spraying length, preferably near the ends of bar.

6. PROCEDURE FOR HAND SPRAYING (Cont'd)

F. Cleaning, Checking & Loading Bars (Cont'd)

3. Loading Bars

Cathodes shall be loaded into the bars so that the distance between cathodes shall be not less than 1 1/2 times the diameter of coated cathode. Load only 100/bar for .045" cathodes used in metal tubes and 50/bar for .080" cathodes.

G. Special Precautions

a. For Keeping Coating Material from Ends of Cathodes

When it is essential that the ends of cathodes be kept free from coating material, the latter should be prevented from getting on the cathode ends: (1) by the use of thoroly cleaned cathode holders (2) by loading the holders completely so that coating cannot deposit in empty holes, and (3)by replacing worn cathode bars.

(Continued on next page)

7. HAND SPRAYING SCHEDULES

SCHEDULE #1 (For High Density Coating)

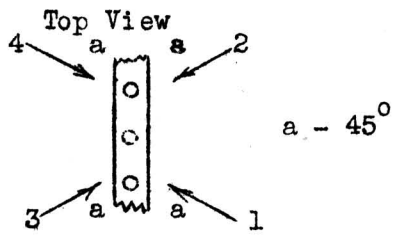
Initially used for the following types:

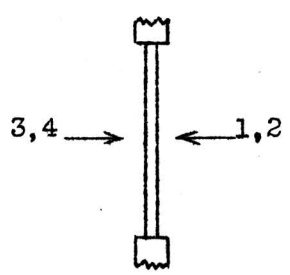
1-v	25Z5	84	6X5-GT/G
25A7-G	25Z5-GT/G	117Z6-GT/G	45Z3
5V4-G	12Z3	117N7-GT	
5Z4	25Z6		

Spray Material	As specified on cathode assly.
Gun Pressure (psi)	30
Nozzle Setting (on dial)	20
Gun Opening (turns)	2
Distance Gun to Assly (in.)	3
Rate of Passes	1 1/2 sec./pass
Passes/covering	4
No. of Coverings	2
Major Axis of Spray Pattern	Vertical
Drying - Dry for 3 min. at 100°C in circulating air oven.	
Coating Appearance	Smooth

Refer to Notes under Sched. #1M.

SPRAY DIAGRAM





SCHEDULE #1A

Initially used on 117Z6-GT/G

Same as Sched. #1 except distance of gun to assly is 4 in. Coating appearance is a little less smooth than that in Sched. #1.

** SCHEDULE #1B

Initially used on 6AQ6

Same as Sched. #1 except that gun pressure is 50 psi. Coating appearance is slightly rough instead of smooth.

7. HAND SPRAYING SCHEDULES (Cont'd)

SCHEDULE #2 (For Low Density Coating)

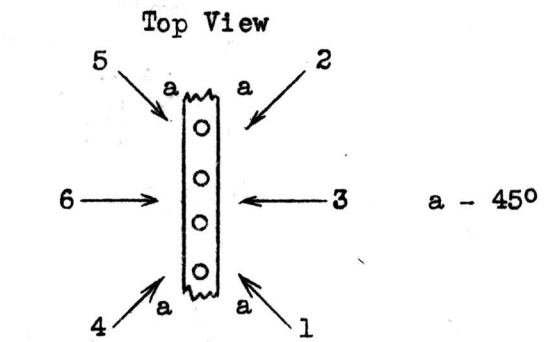
Initially used for following types:

6C8-G	6AB5	6AF6-G
6Z7-G	6AK5	

Spray Material	As specified on cathode assly.
Gun Pressure (psi)	50
Nozzle Setting (on dial)	20
Gun Opening (turns)	2
Distance Gun to Assly (in.)	12
Rate of Passes	1 sec./pass
No. of Passes/covering	6
No. of Coverings	12
Major Axis of Spray Pattern	Vertical
Drying - Dry for 3 min. at 100°C in circulating air oven	
Coating Appearance	Rough

Refer to Notes under Sched. #1M.

SPRAY DIAGRAM



7. HAND SPRAYING SCHEDULES (Cont'd)

SCHEDULE #2A (For Low Density Coating)

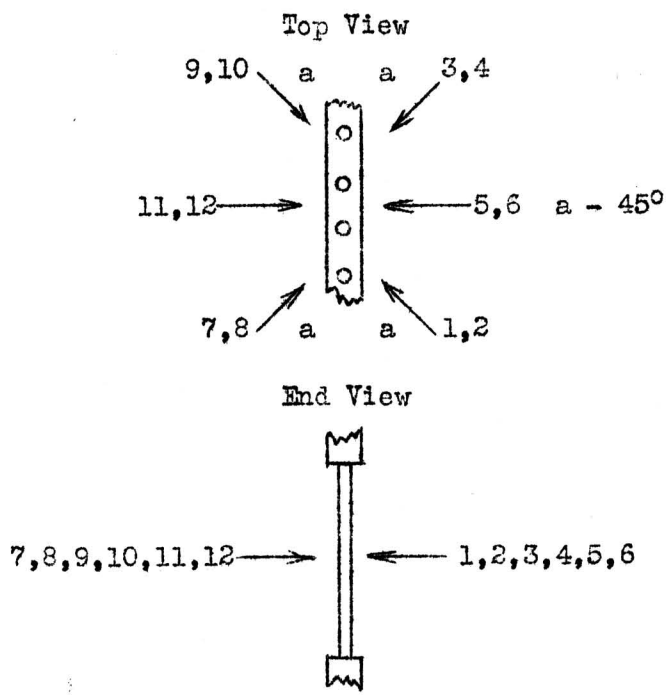
Initially used for the following types:

6BA6 6AU6 26A6

Spray Material	As specified on cathode assly.
Gun pressure (psi)	50
Nozzle Setting (on dial)	20
Gun Opening (turns)	2
Distance Gun to Assly (in.)	10-12
Rate of Passes	1 sec./pass
No. of Passes/covering	12
No. of Coverings	4
Major Axis of Spray Pattern	Vertical
Drying - Dry for 3 min. at 100°C in circulating air oven	
Coating Appearance	Rough

Refer to Notes under Sched. #1M.

SPRAY DIAGRAM



7. HAND SPRAYING SCHEDULES (Cont'd)

SCHEDULE #3 (For High plus Low Density Coating)

Initially used for the following types:

6S7	6U5/6G5
1629	843

Spray Material	As specified on cathode assly.	
Applications	1st	2nd
Gun Pressure (psi)	30	50
Nozzle Setting (on dial)	20	20
Gun Opening (turns)	2	1 1/2
Distance Gun to Assly (in.)	3	12
Rate of Passes	1 1/2 sec./pass	1 sec./pass
Passes/covering	4	6
No. of Coverings	1	10
Major Axis of Spray Pattern	Vertical	Vertical

Drying - Dry for 3 min. at 100°C after 1st covering and after 11th covering.

Refer to Notes under Sched. #1M.

SPRAY DIAGRAM

Spray 1st application as in Sched. #1 and 2nd application as in Sched. #2.

7. HAND SPRAYING SCHEDULES (Cont'd)

* SCHEDULE #4

Initially used for 1A3

Spray Material — As specified on cathode assly.

Applications	1st	2nd
Gun Pressure (psi)	30	50
Nozzle Setting (On dial)	20	20
Gun Opening (Turns)	2	2
Distance Gun to Assly (in.)	3	12
Rate of Passes	1 1/2 sec./pass	1 sec./pass
Passes/covering	4	6
No. of coverings	1	5
Major Axis of Spray Pattern	Vertical	Vertical

Drying - Dry for 3 min. at 100°C in circulating air oven after each application.

Coating Appearance — Smooth

Refer to Notes under Sched. #1M.

SPRAY DIAGRAM

1st application as in Sched. #1
2nd application as in Sched. #2

7. HAND SPRAYING SCHEDULES (Cont'd)

SCHEDULE #5

Initially used for Lighthouse Tubes

Spray Material — As specified on cathode assly.

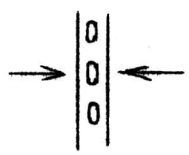
Spray Application	
Type Spray	Med-Wet
Gun Pressure (psi)	40
Nozzle Setting (on dial)	20
Gun Opening (turns)	2
Distance Gun to Assly (in.)	4
Rate of Passes	1 sec./pass
Passes	16

Drying – Dry for 3 min. at 100°C in circulating air oven after spray application.

Remarks– 4 passes on one side, 4 passes on the outside and then repeat. Refer to Notes under Sched. #1M.

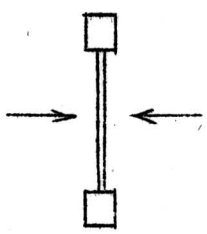
SPRAY DIAGRAM

Top View of Holder



Movement of gun in a plane parallel to plane of page.

End View of Holder



Movement of gun perpendicular to plane of page.

7. HAND SPRAYING SCHEDULES (Cont'd)

SCHEDULE #6 (For Medium Density Coating)

Initially used for following types:

6AU6 6BA6

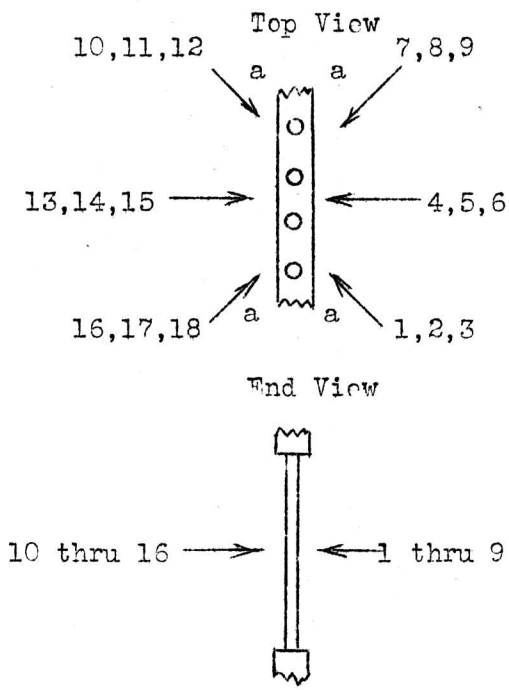
Spray Material	As specified on cathode assly.
Gun Pressure (psi)	50
Nozzle Seeting (on dial)	20
Gun Opening (turns)	1
Distance Gun to Assly (in.)	6-8
Rate of Passes	1 sec./pass
No. of Passes/covering	18
No. of Coverings	3
Major Axis of Spray Pattern	Vertical

Drying - Dry for 3 min. at 100°C in circulating air oven

Coating Appearance Medium-Rough

Refer to Notes under Sched. #1M.

SPRAY DIAGRAM



7. HAND SPRAYING SCHEDULES (Cont'd)

SCHEDULE #7

(Initially used for FKW30F16-1C & D for 6J4)

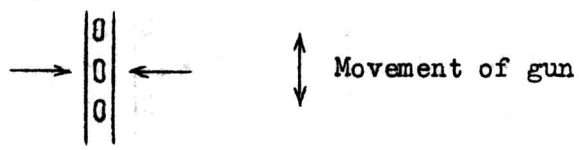
Spray Material	As specified on cathode assly.
Type Spray	Med. dry
Gun Pressure (psi)	40
Nozzle Setting (on dial)	20
Gun Opening (turns)	1 1/4
Distance Gun to Assly.	2-3"
Rate of Passes	1 sec/pass
Number of passes	48-56

Remarks - 8 passes on one side, 8 passes on the other side, and then 4 passes on alternate sides until sufficient passes have been made.

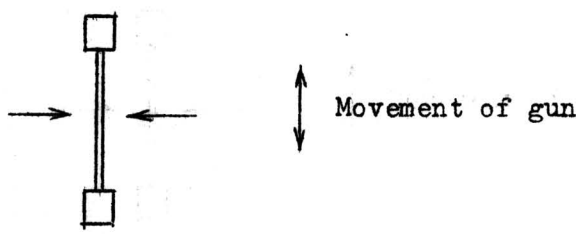
Refer to Notes under Sched. #1M.

SPRAY DIAGRAM

Top View of Holder



End View of Holder



7. HAND SPRAYING SCHEDULES (Cont'd)

SCHEDULE #8

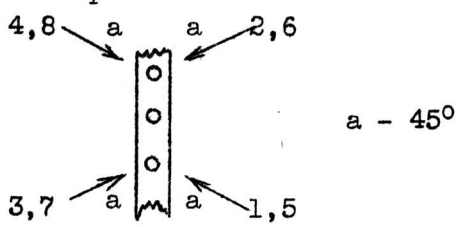
(Initially used for FK25R13-4B & FK25R13-11B & C in Acorn and Midget Tubes)

	Spray Material	As specified on FKW assly.
***		
→	Gun Pressure (psi)	*40
	Nozzle Setting (on dial)	20
	Gun Opening (turns)	1 1/2
→	Distance Gun to Assly.	*5"
	Rate of Passes (sec/pass)	1
	Number of Passes	16

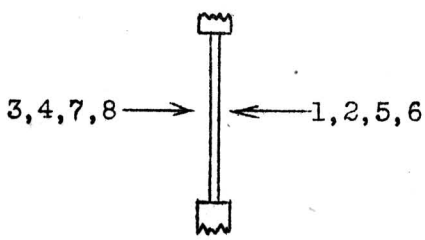
Refer to Notes under Sched. #1M

SPRAY DIAGRAM

Top View



End View



***Reference to type of spray omitted.

7. HAND SPRAYING SCHEDULES (Cont'd)

SCHEDULE #9

Initially used for 6J6

Spray Material — As specified on cathode assly.

Spray Application	Med-Wet
Type Spray	
Gun Pressure (psi)-	40
Nozzle Setting (on dial)	20
Gun Opening (turns	1 1/2
Distance Gun to Assly (in.)	3
Rate of Passes	1/2 sec./pass
Passes	52

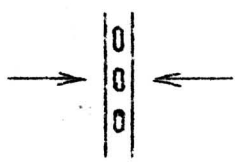
Drying - Dry for 3 min. at 100°C in circulating air oven after spray application.

Remarks - 6 passes on each side repeated 4 times, then 2 passes on each side once.

Refer to Notes under Sched. #1M.

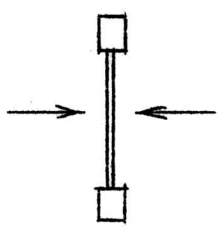
SPRAY DIAGRAM

Top View of Holder



Movement of gun in a plane parallel to plane of page.

End View of Holder



Movement of gun perpendicular to plane of page.

SCHEDULE #9A

Initially for 6AG5

Same as Sched. #9, except as follows:

32 passes
Dry as above
Then 16-20 passes

7. HAND SPRAYING SCHEDULES (Cont'd)

SCHEDULE #10

Initially used for 6F4 & 6L4

Spray Material — As specified on cathode assly.

Spray Application

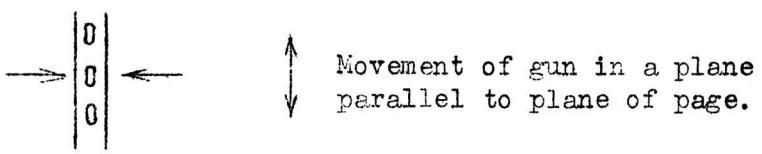
Type Spray	Med-Wet
Gun Pressure (psi)	40
Nozzle Setting (on dial)	20
Gun Opening (turns)	1 1/2
Distance Gun to Assly (in.)	2-3"
Rate of Passes	1 sec./pass
Passes	12

Drying - Dry for 3 min. at 100°C in circulating air oven after spray application.

Remarks - 4 passes on one side, 4 passes on the outside and then 2 passes on each side.
Refer to Notes under Sched. #1M.

SPRAY DIAGRAM

Top View of Holder



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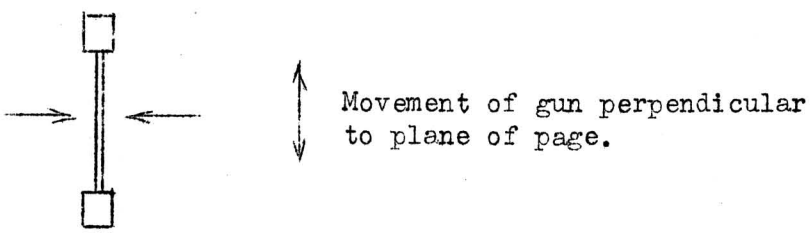


** SCHEDULE #10A
Initially used for 6J4

Same as Schedule #10, except that there are 36 passes with a preliminary drying after the 18th pass.

35/EG

7. HAND SPRAYING SCHEDULES (Cont'd)

SCHEDULE #11

Initially used for 6J6

Spray Material — As specified on cathode assly.

Spray Application

Type Spray	Med-Dry
Gun Pressure (psi)	40
Nozzle Setting (on dial)	20
Gun Opening (turns)	1 1/2
Distance Gun to Assly (in.)	5
Rate of Passes	1 sec./pass
Passes	48

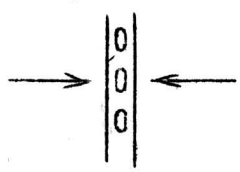
Drying - Dry for 3 min. at 100°C in circulating air oven after spray application.

Remarks -6 passes on each side repeated 4 times.

Refer to Notes under Sched. #1M.

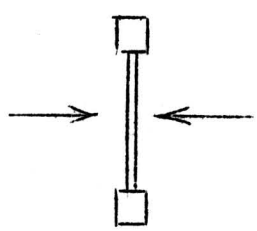
SPRAY DIAGRAM

Top View of Holder



Movement of gun in a plane parallel to plane of page.

End View of Holder



Movement of gun perpendicular to plane of page.

7. HAND SPRAYING SCHEDULES (Cont'd)

SCHEDULE #12

Initially used for 6S7

Spray Material — As specified on cathode assly.

Spray Application

Gun Pressure (psi)	50
Nozzle Setting (on dial)	20
Gun Opening (turns)	1 1/2
Distance Gun to Assly (in.)	5
Rate of Passes	1 sec./pass
Passes/covering	6
Coverings	3
Major axis of spray pattern	Vertical

Drying - Dry for 3 min. at 100°C in circulating air oven after spray application.

Remarks- 3 passes on each side repeated 3 times.

Refer to Notes under Sched. #1M.

SPRAY DIAGRAM

Same as Schedule #2

SCHEDULE #13

Initially used for 6AS7G

Spray Material — As specified on cathode assly.

Spray Application

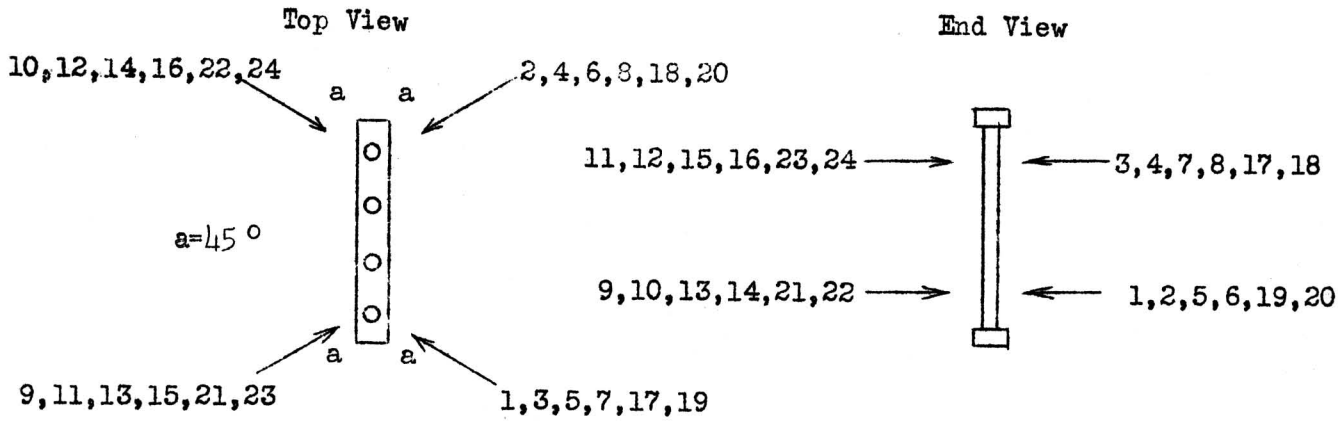
Gun Press (psi)	40
Nozzle Setting (on dial)	20
Gun Opening (turns)	2
Distance Gun to Assly (in.)	5-6
Rate of Passes	2 sec./pass
Passes	24
Major axis of spray pattern	Vertical

Drying - Dry for 3 min. at 100°C in circulating air oven after spray application.

Remarks -

Refer to Notes under Sched. #1M.

SPRAY DIAGRAM



SCHEDULE #13A

Initially for 6AS7G & 26A7GT

Same as Sched. #13, except as follows:

16 passes (2 sec./pass)
Dry as above
Then 8 passes (1sec./pass)

SCHEDULE #14

Initially used for 25Z5, 25Z6GT, 50Y6GT, 5V4G and 83V.

Spray Material — As specified on cathode assly.

Spray Application

Gun Press (psi)	40
Nozzle Setting (on dial)	20
Gun Opening (turns)	3
Distance Gun to Assly (in.)	3
Rate of Passes	2 passes/sec.
Passes	4
Major axis of spray pattern	Horizontal

Drying - Dry for 3 min. at 100°C in circulating air oven after spray application.

Remarks - Coating appearance must be smooth.

Refer to Notes under Sched. #1M.

SPRAY DIAGRAM

Same as Schedule #1.

7. HAND SPRAYING SCHEDULES (Cont'd)

SCHEDULE No. 15

Initially used for the following typesL

6B7
2B7
6B8G

Spray Material	As specified on cathode assly.	
Applications	1st	2nd
Gun Pressure (pse)	40	40
Nozzle Setting (on dial)	20	20
Gun Opening (turns)	2	2
Distance Gun to Assly (in.)	8-10	8-10
Rate of Passes	1/2 sec./pass	1/2 sec./pass
Passes/covering	4	4
No. of Coverings	3	6
Major Axis of Spray Pattern	Horizontal	Horizontal

Drying - Dry for 3 min. at 100°C after 3rd covering and after 9 th covering.

Refer to Notes under Sched. #1M.

SPRAY DIAGRAM

Same as in Schedule #1.

SCHEDULE #17

Initially used for 6F4.

Spray Material — As specified on cathode assly.

Spray Application

Gun Press (psi)	40
Nozzle Setting (on dial)	20
Gun Opening (turns)	2
Distance Gun to Assly (in.)	8-9
Rate of Passes	2 passes/sec.
Passes/covering	4
Coverings	6
Major axis of spray pattern	Horizontal

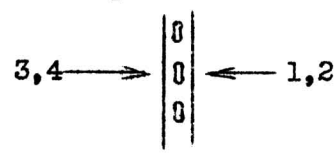
Drying - Dry for 45 sec. at 100°C in circulating air oven after 16th pass and for 2 min. after 24th pass.

Remarks - Coating appearance must be rough.

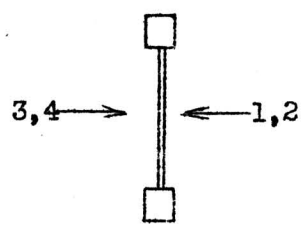
Refer to Notes under Sched. #1M.

SPRAY DIAGRAM

Top View of Holder



End View of Holder



7. HAND SPRAYING SCHEDULES (Cont'd)

SCHEDULE #18 (For Medium Density Coating)

Inially used for following types:

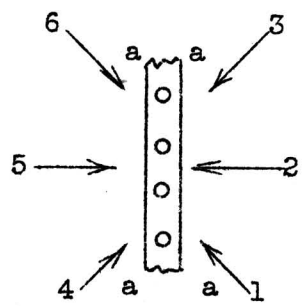
35W4 117Z3

Spray Material	As specified on cathode assly.
Gun pressure (psi)	50
Nozzle Setting (on dial)	18-20
Gun Opening (turns)	1-1/2-2
Distance Gun to Assly (in.)	6-8
Rate of Passes	1 Sec./pass
No. of Passes/covering	6
No. of Coverings	3
Major Axis of Spray Pattern	Vertical
Drying - Dry for 3 min. at 100°C in circulating air oven.	
Coating Appearance	Medium-Rough

Refer to Notes under Sched. #1M.

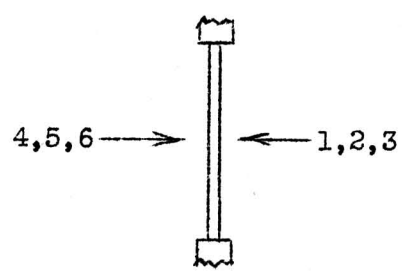
SPRAY DIAGRAM

Top View



a = 45°

End View



7. HAND SPRAYING SCHEDULES (Cont'd)

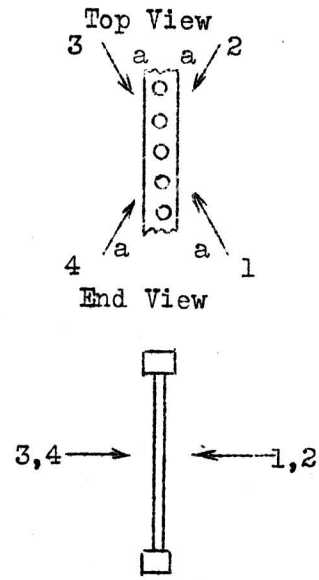
SCHEDULE #19

(Initially used for 6F6G and 43)

Applications	1st	2nd
Gun Pressure (psi)	40	40
Nozzle Setting (on dial)	20	20
Gun Opening (turns)	2-1/2	2-1/2
Distance Gun to Assly(in.)	5-7	5-7
Rate of Passes	1/sec.	1/sec.
Passes/Covering	4	4
Coverings	3	4
Major Axis of Spray Pattern-Horizontal		Horizontal

Drying - Dry for 3 min. at 300°F after each application.

SPRAY DIAGRAM



7. HAND SPRAYING SCHEDULES (Cont'd)

SCHEDULE #20 (For Medium Density Coating)

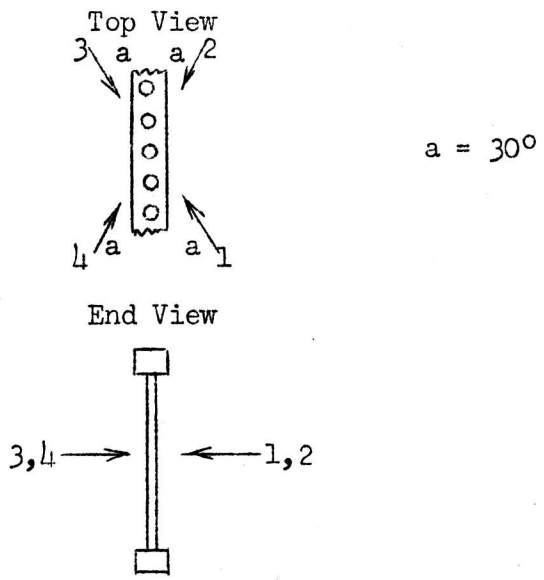
Initially used for following type :

26A6 26C6 26D6

Spray Material	As specified on cathode assly.
Gun Pressure (psi)	40
Nozzle Setting (on dial)	20
Gun Opening (turns)	1-1/2 - 2
Distance Gun to Assly (in.)	6-8
Rate of Passes	1 sec./pass
No. of Passes/covering	4
No. of Coverings	6
Major Axis of Spray Pattern	Vertical
Drying - Dry for 3 min. at 100°C in circulating air oven after 16th and 24th passes.	
Coating Apperance	Medium-Rough

Refer to Notes under Sched. #1M

SPRAY DIAMGRAM



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☆ INDICATES A CHANGE ☆☆ INDICATES AN ADDITION

7. HAND SPRAYING SCHEDULES (Cont'd)

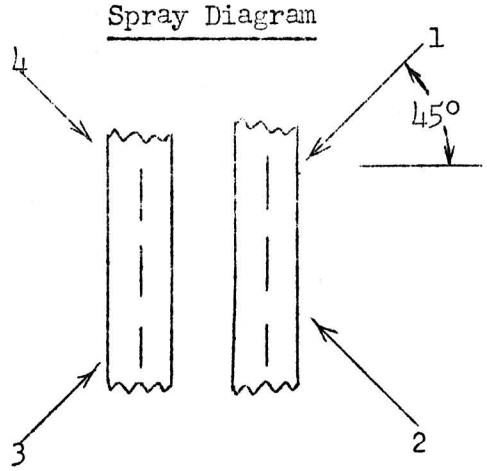
SCHEDULE No. 21

Initially used for 41 and 6K6GT

Application	First	Second
Type of spray	Dry	Dry
Gun Pressure	40 p.s.i.	40 p.s.i.
Nozzle setting (on dial)	20	20
Gun Opening (turns)	2	2
Major axis of spray pattern	Vertical	Vertical
Spacing of cathodes in spray bar	3/16"	3/16"
Angle of spray bar with front of booth	45 deg.	45 deg.
Distance of the gun from the spray bar	About 12"	About 12"
Rate of passes	1 sec.	1 sec.
Total number of passes per application	8	32
Passes per covering	8	8
Number of coverings	1	4
Dry temperature	300 deg. F.	300 deg. F.
Drying time	3 min.	3 min.
Coating finish	Medium rough	Medium rough

Spray Diagram

Operation #1



Operation #2 - Interchange spray bar A with spray bar B on holder when 1/2 of the passes in each application are completed so that sides not sprayed will be faced outward and repeat operation #1.

Operation #3 - Place loaded bars in the air oven at 300 deg. F. for 3 minutes.

7. HAND SPRAYING SCHEDULES (Cont'd)

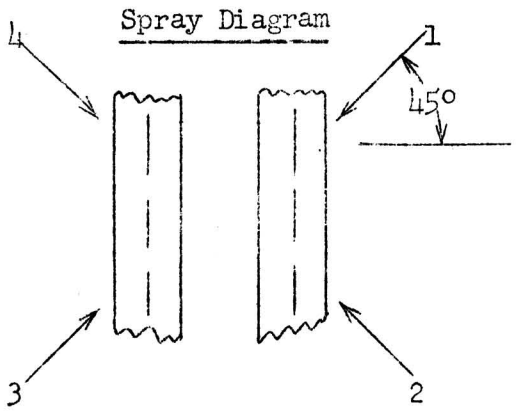
SCHEDULE No. 22

Initially used on 6F6G, 42 and 2A5

Application	First	Second
Type of spray	Dry	Dry
Gun pressure	40 p.s.i.	40 p.s.i.
Nozzle setting (on dial)	20	20
Gun opening (turns)	2	2
Major axis of spray pattern	Vertical	Vertical
Spacing of cathodes in spray bar	3/16"	3/16"
Angle of spray bar with front of booth	45 deg.	45 deg.
Distance of the gun from the spray bar	about 12"	about 12"
Rate of passes	1 sec.	1 sec.
Total number of passes per application	24	24
Passes per covering	8	8
Number of coverings	3	3
Dry temperature	300 deg. F.	300 deg. F.
Drying time	3 min.	3 min.
Coating finish	Medium rough	Medium rough

Spray Diagram

Operation #1



Operation #2 - Interchange spray bar A with spray bar B on holder when 1/2 of the passes in each application are completed so that sides not sprayed will be faced outward and repeat operation #1.

Operation #3 - Place loaded bars in the air oven at 300 deg. F. for 3 minutes.

7. HAND SPRAYING SCHEDULES (Cont'd)

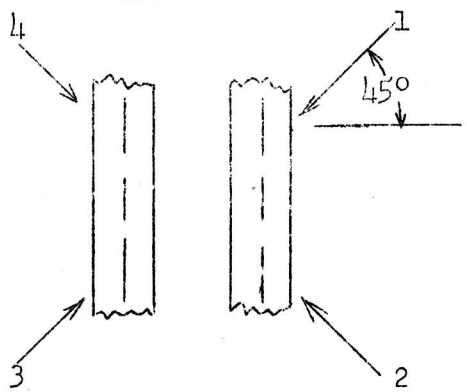
SCHEDULE No. 23

Initially used for 35Z4-GT, 35Z5-GT and 43.

Application	First	Second
Type of spray	Dry	Dry
Gun Pressure	40 p.s.i.	40 p.s.i.
Nozzle setting (on dial)	20	20
Gun opening (turns)	2	2
Major axis of spray pattern	Vertical	Vertical
Spacing of cathodes in spray bar	3/16"	3/16"
Angle of spray bar with front of booth	45 deg.	45 deg.
Distance of the gun from the spray bar	About 12"	About 12"
Rate of passes	1 sec.	1 sec.
Total number of passes per application	16	16
Passes per covering	8	8
Number of coverings	2	2
Dry temperature	300 deg. F.	300 deg. F.
Drying time	3 min.	3 min.
Coating finish	Medium rough	Medium rough

Spray Diagram

Operation #1



Operation #2 - Interchange spray bar A with spray bar B on holder when 1/2 of the passes in each application are completed so that sides not sprayed will be faced outward and repeat operation #1.

Operation #3 - Place loaded bars in the air oven at 300 deg. F. for 3 minutes.

7. HAND SPRAYING SCHEDULES (Cont'd)

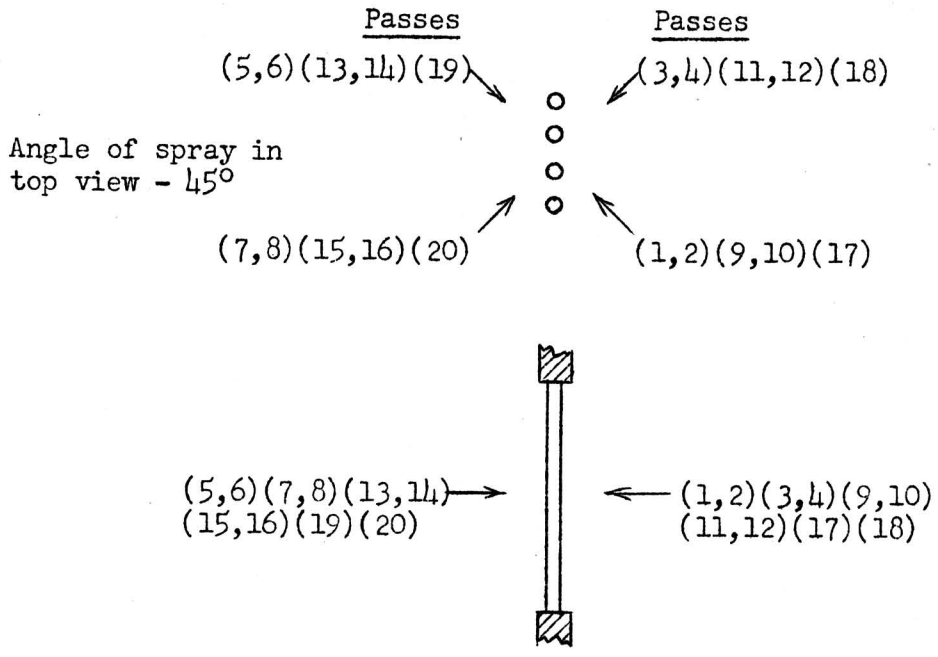
SCHEDULE No. 25

Initially used for 6J5-GT

Spray material	As specified on Cathode Assly.
Gun Pressure (psi)	40
Nozzle Setting (on dial)	15
Gun Opening (turns)	2-1/4
Distance gun to Assly (in.)	10-12
Rate of passes	1-1/2 sec./pass
Number of passes	20
Major axis of spray pattern	Vertical

Dry for 3 min. at 100°C in circulating air oven

Spray Diagram



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STANDARDIZING

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7. HAND SPRAYING SCHEDULES (Cont'd)

SCHEDULE NO. 26 & §26A

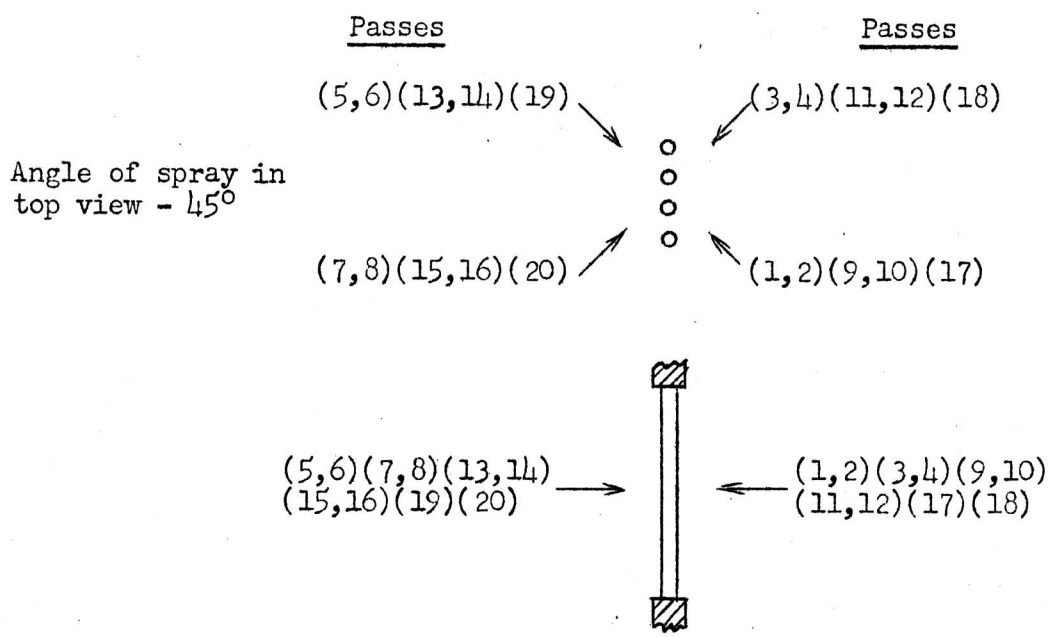
(Formerly #2 & 2A of 14-5-3)

Used on FK25R2-5B for 6T7-G

Type Spray	Medium Dry
Gun Pressure (psi)	38-40
Nozzle Setting (On Dial)	7-8
Gun Opening (Turns)	1-1/4
Distance - Gun to Cath.	6-8"
Rate of Passes (Sec./pass)	3/4
Number of Passes	20
Coating Finish	Medium Rough

§Schedule 26A is the same as 26 except coating shall be dried in a bus at 40°-50°C for 18 hr. (min.) or in an air oven at 100°-125°C for 30 to 60 min. This drying removes a certain amount of moisture to improve emission and chipped coating.

Spray Diagram



7. HAND SPRAYING SCHEDULES (Cont'd)

SCHEDULE NO. 27 & §27A

(Formerly #18 & 18A of 14-5-3)

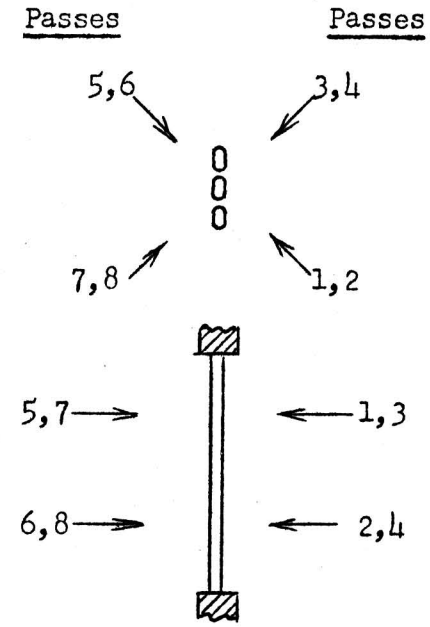
Used on FK25F9-1A for A2316

Type Spray	Medium Wet
Gun Pressure (psi)	38-40
Nozzle Setting (On Dial)	20
Gun Opening (Turns	3/4
Distance - Gun to Cath.	2"
Rate of Passes (sec./pass)	1-1/2
Number of Passes	40
Coating Finish	Medium Smooth

§Schedule 27A is same as 27 except coating shall be dried in a bus at 40°-50°C for 18 hr. (min.) or in air oven at 100°-125°C for 30 to 60 min. This drying removes a certain amount of moisture to improve emission and chipped coating.

Spray Diagram

Angle of spray in top view - 45°



7. HAND SPRAYING SCHEDULES (Cont'd)

SCHEDULE NO. 28 & 28A

(Formerly #26 & 26A of 14-5-3)

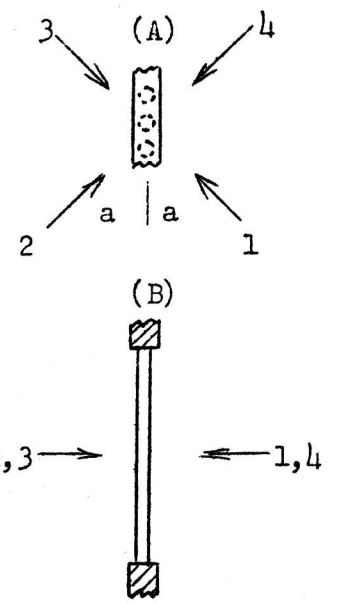
Used on FK25R13-12A for 1650

Type Spray	Medium Dry
Gun Pressure (psi)	38-40
Nozzle Setting (On Dial)	10
Gun Opening (Turns)	1/4
Distance - Gun to Cathode	3"
Rate of Passes (Sec./Pass)	3
Number of Passes	4
Coating Finish	Medium Rough

Schedule 28A is same as 28 except coating shall be dried in a bus at 40°-50°C for 18 hr. (min.) or in an air oven at 100°-125°C for 30 to 60 min. This drying removes a certain amount of moisture to improve emission and chipped coating.

Spray Diagram

Passes Passes



Angle 'a' of spray in top view - 45°

(A) Top view holder and cathodes
(B) End " " " "

7. HAND SPRAYING SCHEDULES (Cont'd)

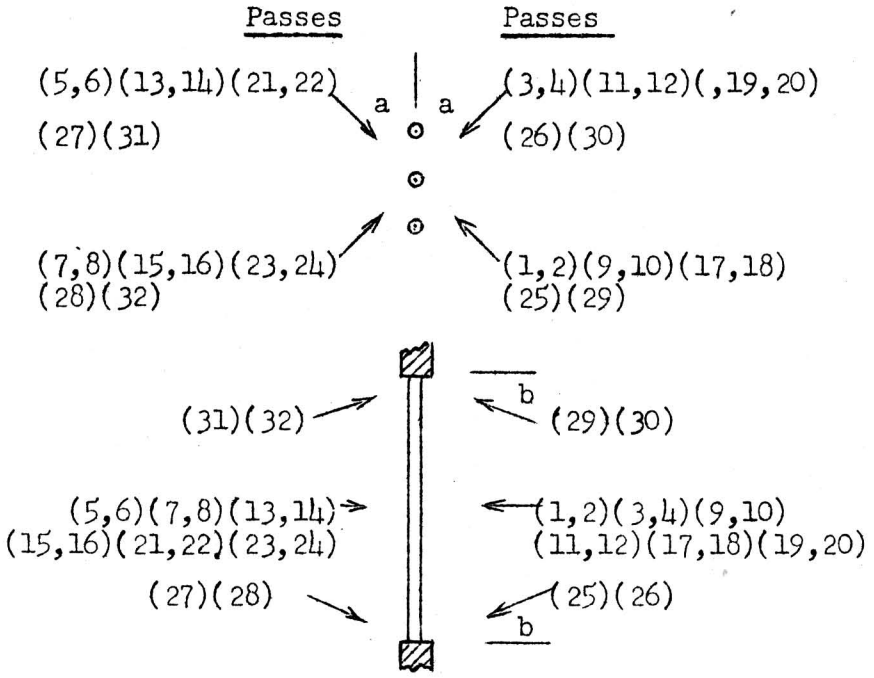
SCHEDULE NO. 29

(Formerly #21 of 14-5-3)

Used on FKW50R2-1D for 6AC5-GT

Type Srpay	Extra Dry
Gun Pressure (psi	38-40
Nozzle Setting (On Dial)	20
Gun Opening (Turns)	2-1/2
Distance - Gun to Cath. Inches	14
Rate of Passes (Sec/pass)	3/4
Number of Passes	32
Drying - Dry for 3 min. at 100°C in circulating air oven.	
Coating Finish	Very rough

Spray Diagram



Angle a - 45°
" b - 30°

7. HAND SPRAYING SCHEDULES (Cont'd)

SCHEDULE NO. 30 &§30A

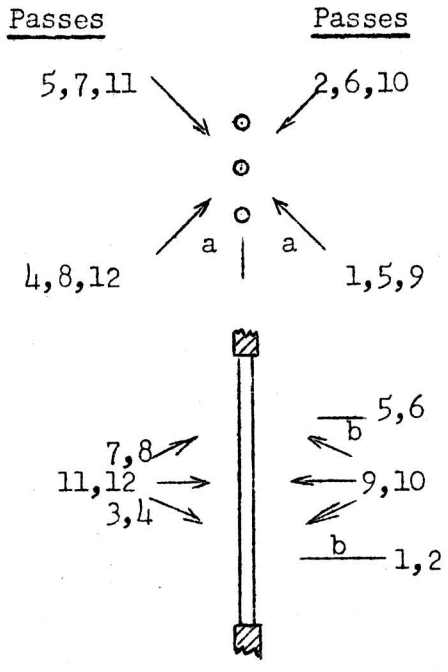
(Formerly #23 & 23A of 14-5-3)

Used on FKW50R3-3 for 1626

Type Spray	Medium
Pressure (psi)	38-40
Gun Opening (Turns)	1/2
Nozzle Setting (On dial)	20
Distance - Gun to Cathode	4"
Rate of Passes (Sec/pass)	1
Number of Passes	12
Coating Finish	Slightly Rough

§ Schedule 30A is same as 30 except coating shall be dried in a bus at 40°-50°C for 18 hr. (min.) or in an air oven at 100°-125°C for 30 to 60 min. This drying removes a certain amount of moisture to improve emission and chipped coating.

Spray Diagram



Angle a - 45°
" b - 30°

7. CATHODE COATING SCHEDULES (Cont'd)

SCHEDULE NO. 31

(Formerly #40 of 14-5-3)

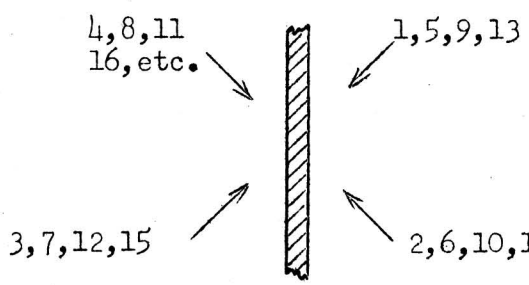
Used on the FKW50R4-3A for A4554

Applications	1st	2nd	3rd
Type Spray	Med.Dry	Med.Dry	Med.Dry
Gun Press (psi)	30	30	30
Nozzle Setting (On Dial)	20	20	20
Gun Opening (turns)	2-1/4	2-1/4	2-1/4
Dist. Gun to Assly	8-10	8-10	8-10
Rate of Passes	1	1	1
Number of Passes	12	8	12
Coating Finish	Med.Rough	Med.Rough	Med.Rough

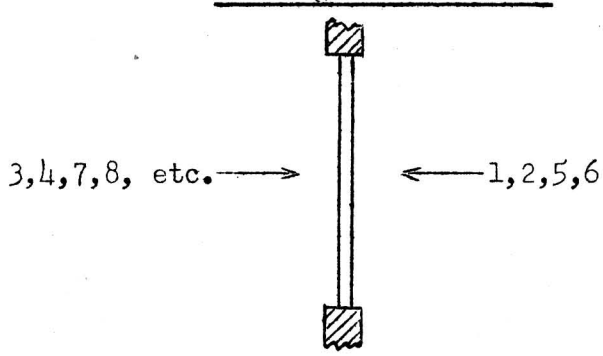
Remarks: Dry cathode for 3 min. in oven at 110°C after each application.

Spray Diagram

Looking down on assly



Looking at end of row



35/EG

SCHEDULE NO. 61

Initially used for 3D22

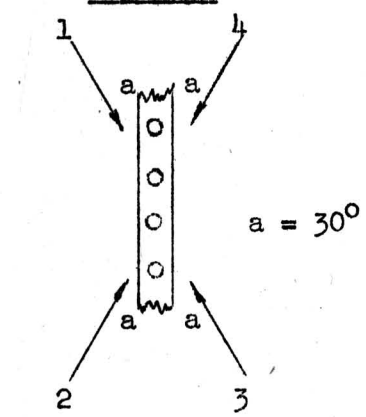
Applications	1st	2nd	3rd
Type of Spray	Dry	Dry	Dry
Coating Finish	Rough§	Rough	Rough
Gun Pressure (psi)	40	40	40
Nozzle Setting (on dial)	20	20	20
Gun Opening (turns)	1 1/4-1 1/2	1 1/4-1 1/2	1 1/4-1 1/2
Major Axis of Spray Pattern	Vertical	Vertical	Vertical
Spacing of Cathodes in Spray Bar	20 mm	20 mm	20 mm
Angle of Spray Bar with Front of Booth	45°	45°	45°
Distance of Gun from Spray Bar	6"-8"	6-8"	6-8"
Rate of Passes	1/sec.	1/sec.	1/sec.
Total No. of Passes/Application	16	32	32
Passes/Covering	4	4	4
No. of Coverings	4	8	8
Drying Temperature	225°F	225°F	225°F
Drying Time	3 min.	3 min.	3 min.

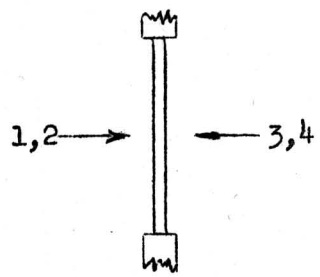
REMARKS: The spraying cycle as described below constitutes one covering. Repeat this cycle until the required number of coverings have been completed.

§ Density of Coating-0.75-1.00 g/cc

SPRAY DIAGRAM

Top View





End View

§§Supersedes 34-14-5A p.11-16 dated 11/21/46

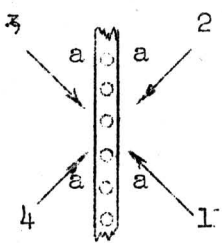
*Correction of page number

SCHEDULE NO. 62
(Initially used for type 802)

	Applications	1st.	2nd	3rd.	4th
→	Spray Material	* As specified on FKW coated cathode assly.			
	Coating Finish	Fluffy	Fluffy	Fluffy	Fluffy
	Gun Pressure (psi.)	40	40	40	40
	Nozzle Setting (on dial)	20	20	20	20
	Gun Opening (turns)	2	2	2	2
	Dist. Gun to Cathode (in.)	12	12	12	12
	Rate of Passes	1/sec.	1/sec.	1/sec.	1/sec.
	Total No. of Passes/Application	12	20	20	10
→	**Passes/covering	4	4	4	4
→	**No. of Coverings	3	5	5	21/2
→	**Drying Temperature (°F.)	300	300	300	300
→	**Drying Time (min.)	2	2	2	2

→ **NOTE: After fourth spray application take M.O.D. reading with micrometer by taking one reading in the center of each cathode checked. (One from center of spray bar and one from either end. Take a weight reading.

SPRAY DIAGRAM



a= 45° (angle of gun with spray bar)

7. HAND SPRAYING SCHEDULES (cont'd)

SCHEDULE NO. 63

Initially for 2E26 and 815

Application	First	Second
Type of Spray	wet	dry
Gun Pressure	40	40
Nozzle Setting, on dial	20	20
Gun Opening, turns	2	2
Gun to Cathode Distance	8"	8"
Number of Passes	16(8 each side)	40(20 each side)
Coating Finish	rough	rough
Drying Temperature	149°C. (300°F.)	149°C. (300°F.)
Drying Time	2 min.	2 min.

REMARKS: The number of passes in the second application will vary. The exact number of passes is determined by the diameter specification on the coated cathode.

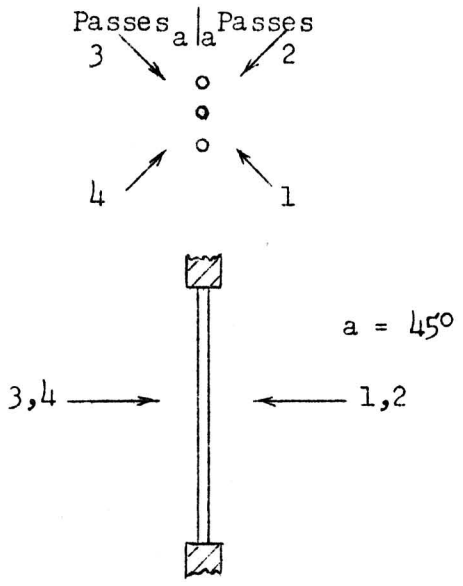
7. HAND SPRAYING SCHEDULES (Cont'd.)

SCHEDULE NO. 64

Initially for Type 836

Application	1st & 2nd
Type of Spray	Wet
Gun Pressure (psi.)	40
Nozzle Setting (on dial)	20
Gun Opening (turns)	2-1/2
Distance Gun to Cathode (in.)	3
Rate of Passes (sec./pass)	1/2
Total No. of Passes/Application	32
Passes/Covering	4
Number of Coverings	8
Drying Temperature (°F.)	300
Drying Time (min.)	3
Coating Finish	Smooth

Spray Diagram



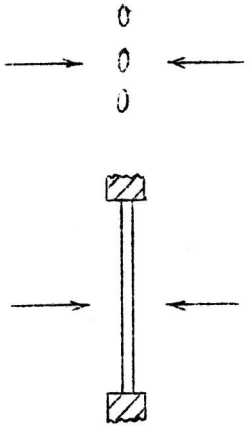
7. HAND SPRAYING SCHEDULES (Cont'd.)

SCHEDULE NO. 65

Initially for 3C33

Application	1st	2nd
Type Spray	Medium Wet	Medium Wet
Gun Pressure (psi.)	40	40
Nozzle Setting (on dial)	20	20
Gun Opening (turns)	1-1/2 to 2	1-1/2 to 2
Distance Gun to Cathode (in.)	9-12	9-12
Rate of Passes (sec./pass)	1-3/4	1-3/4
Total No. of Passes/Application	16	40
Passes/Covering	16	40
Number of Coverings	1	1
Drying Temperature (°F.)	300	300
Drying Time (min.)	3	3
Coating Finish	Rough	Rough

Spray Diagram



Note: Spray half of total number of passes; rotate spray bar 180°; spray remaining number of passes.

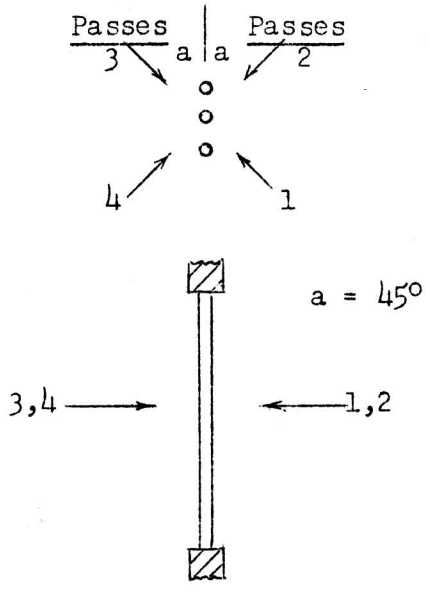
7. HAND SPRAYING SCHEDULES (Cont'd)

SCHEDULE NO. 66

Initially for 2X2A

Application	1st, 2nd, & 3rd.
Type Spray	Wet
Gun Pressure (psi.)	40
Nozzle Setting (on dial)	20
Gun Opening (turns)	1-1/4
Distance Gun to Cathode (in.)	3
Rate of Passes (sec./pass)	2
Total No. of Passes/Application	8
Passes/Covering	4
Number of Coverings	2
Drying Temperature (°F)	300
Drying Time (min.)	3
Coating Finish	Smooth

Spray Diagram



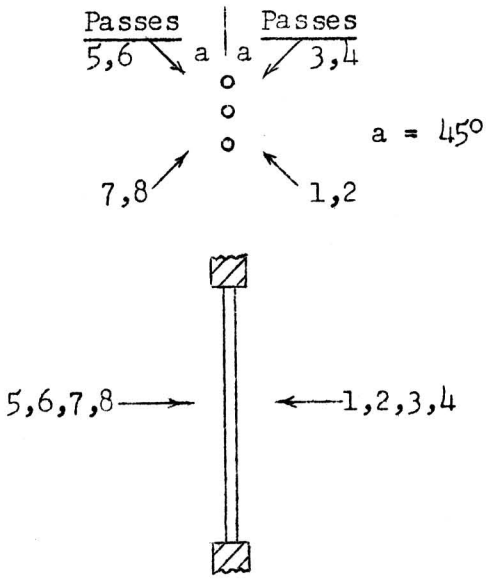
7. HAND SPRAYING SCHEDULES (Cont'd.)

SCHEDULE NO. 67

Initially for 843

Application	1st, 2nd, & 3rd.
Type of Spray	Medium
Gun Pressure (psi.)	40
Nozzle Setting (on dial)	20
Gun Opening (turns)	2 to 2-1/4
Distance Gun to Cathode	7-9
Rate of Passes (sec./pass)	3/4
Total No. of Passes/Application	16
Passes/Covering	8
Number of Coverings	2
Drying Temperature (°F.)	300
Drying Time (min.)	3
Coating Finish	Rough

Spray Diagram



8. MACHINE SPRAYING

The procedure for applying carbonate coating preparation with automatic spray machine Model No. 788-AE using a gun with No. 762 or 765 air cap and "G" fluid tip is outlined below.

Since only 33-C-132 carbonate preparation has been used in machine spraying, it should be remembered that the use of 33-C-132 material is implied in all machine spraying schedules.

PROCEDURE

A. Mixing Coating Preparation

Mix cathode coating material on a rolling mill until thoroly dispersed. During working hours, bottles from which material is used, must be kept rolling continuously.

B. Starting Up Spray Machine

1. Set time switch to a position corresponding to the number of times cathodes shall be coated before the spray machine is automatically stopped.

2. Open valve between the spray hood and the exhaust pipe to which it is connected.

3. Start the fan of exhaust system. Then close the main switch of spray machine to start the air heater and the blower for forcing hot air into the drying chamber at each end of the machine. To obtain the required temperature (between 75-125°C) in the cathode drying chamber at each end of the machine, the controller for regulating the temperature of heater should be set for 400°C (range of controller 50-600°C).

4. Pour 2 to 3 gallons of freshly mixed preparation into a 5 gallon tank or 5 to 8 gallons into a 10 gallon tank, close fluid hole in cover of tank, and start air motor to drive agitator. The agitator should be operated at a speed sufficient to keep the solids in the preparation in suspension but the speed should not be so fast as to cause the liquid to froth or foam, or be swirled over the top of the container inside of the tank. Within the above limitations, the rate of agitation is not critical, speeds of about 20 to 50 R.P.M. being used in practice.

5. Adjust air pressure on tank to 8 1/2 lb./sq.in.

6. Unless otherwise specified in schedule, the guns should be set to operate with the nozzle 10" from the cathodes in bars in the direction of the spray or the axis of the guns.

7. The guns should be set at such a level that their axis will be horizontally in line with centers of cathodes to be sprayed,

8. MACHINE SPRAYING (Cont'd)

PROCEDURE (Cont'd)

B. Starting Up Spray Machine (Cont'd)

8. Unless otherwise specified in schedule, the gun nozzle setting should be set at 20 with the air caps on guns so positioned that the major axes of the spray streams will be in a horizontal plane.

9. Adjust air pressure on guns to that specified in schedule.

10. Adjust gun openings to obtain discharge per gun per 4 revolusions as specified in schedule.

C. Spraying Operation

1. Start the machine by pushing starting button of index starting and stopping switch.

2. Allow empty heads to make about 2 complete circuits to allow the spray to be stabilized and be checked for uniformity. Then push stopping button of switch to bring two cathode bar heads to rest at center of machine. It is important that the spray from both guns be kept balanced in order to coat cathodes uniformly on all sides.

3. Clamp bars, loaded with cathodes, in two heads at center of machine and then push the button on the quarter revolution indexing switch to transfer the loaded heads into the drying chambers and at the same time move the other two heads to the center of the machine where they can be loaded.

4. After the heads are loaded press starting button on switch. At the expiration of the required number of cycles or complete circuits made thru the machine by each cathode holder the machine will automatically stop. During each cycle of the machine the cathodes are sprayed with 4 passes,, 2 passes on each side of the holder and at the angles as noted in schedules. Each application of 4 passes constitutes one coat or a complete covering on the cathode.

5. Check cathode coating weight by weighing one cathode per run, regardless of the number of cathodes sprayed during a run, i.e., whether 4 or a lesser number of cathode holders are used. (Capacity of cathode holders - 40 to 100 cathodes per holder, depending on size and shape of cathodes).

6. Cathodes which are deficient in weight should be sprayed with additional passes. Cathodes on which the coating is excessive must be reclaimed as specified in 34-14-5G.

7. To maintain uniformity of spray stream, clean ends of nozzle every 2 or 3 runs by brushing with a typewriter brush.

8. MACHINE SPRAYING (Cont'd)

PROCEDURE (Cont'd)

C. Spraying Operation (Cont'd)

8. Clean the cathode bars at least once per 5 runs, using a bronze wire brush wheel, altho it would be preferable to clean them each time after they have been used. Always check bars for spraying length in three places (at each end and at center) after each cleaning.

9. After a shut down of 1/2 hr. or more operate machine idly, allowing the heads to make 2 complete circuits to flush out the sticky spray material in the fluid hose.

10. Sputtering or spitting of the guns may be due to (1) clogged nozzles, (2) fluid tank being nearly empty or (3) air leaks.

D. Shutting Down Spray Machine

1. Close main switch, shutting down the air heater and blower. Shut down ventilating fan.

2. Remove cover from tank and pour any spray material remaining in the container into a bottle or bottles and place them on the bottle rolling mill.

3. Pour about one gal. acetone into tank and run machine for the duration of about 2 cycles until all spray material is flushed out of fluid hose.

4. Detach fluid hose from guns and blow out excess liquid with filtered high pressure air.

5. Remove acetone from tank.

NOTE: By allowing the spray material in the acetone to settle the latter can be used over and over with the addition of new acetone as required.

6. Clean and dry tank thoroly. Also wipe and clean paddle and feed pipe. If necessary, remove and clean screen on feed pipe. To avoid lint, silk or rayon should preferably be used for wiping the tank and other parts.

7. Dismantle the gun parts. Using acetone, clean nozzle (fluid tip and air cap) very thoroly with 1" flat paint brush and pipe cleaners and wipe off fluid needle with silk or rayon cloth. Reassmble guns, being sure that the leathers around pistons are well greased. Use white vaseline on the leathers. Clean the fine holes leading to air cap chamber. Do not immerse gun in solvent.

8. MACHINE SPRAYING (Cont'd)

PROCEDURE (Cont'd)

E. Maintenance of Spray Machine

1. Clean machine once a day, using methanol and a hand brush with bronze wire bristles to remove coating material from heads, spray chambers, etc., and then wipe with a cloth. After the spray chamber has been cleaned, the application of acetone on the surfaces makes cleaning easier the next time.

2. Twice a day, drain any oily water which may have collected in the trap in the air line ahead of the spray machine, in the large air filter below the machine, and in the air transformer.

3. Once a week, remove screens from the chambers of the dust collector and remove dust from screens by brushing with a hair brush or by blowing with air in a place where the dust particles can do no harm.

4. Once a week, change the cartridge in the air filter. Clean the removed cartridge, by washing in Blacosolv, and set it aside for later use.

5. Once a week, repack the air transformer with clean waste.

(Schedules continued on next page)

9. MACHINE SPRAYING SCHEDULES

Note - Schedules #1M thru #5M are with gunsheld at a 45° angle with respect to spray bar. Schedule #6M is with gun at a 90° angle to bar.

SCHEDULE #1M
(Initially used for types 6SF7, 6AQ6, 25A6, 6ST7 and 1644)

Spray Material	33-C-132
Gun Pressure (psi)	40
Tank Pressure(psi)	8 1/2
Nozzle Setting (on dial)	20
Distance Gun to Assly (in.)	10
Rate of Passes	45 sec. for 4 rev.
No. of Passes or Times Around Machine	16 passes (4 rev.)

Gun opened to obtain discharge of 15 cc per gun per 4 rev.

Major Axis of Spray Pattern — Horizontal

NOTES - 1. All spray schedules listed below are to be used under normal conditions of temperature and humidity which are defined as follows:

Temp. - - - - - - - - 70-80°F
Relative Humidity - 20-50%

2. For conditions other than normal refer to "Factors Affecting Density of Coating" and "Compensations to be made for Uncontrollable Factors".

** SCHEDULE #1MA
(Initially used on 6AQ6)

Same as Sched. #1M except that number of times around machine is 3 instead of 4, i.e., 12 passes instead of 16.

J.Mi,HGW-35/ML

9. MACHINE SPRAYING SCHEDULES (Cont'd)

SCHEDULE #2M

(Initially used for types 6SS7, 6N7-GT/G, 79, 59, 6H6-GT/G, 6H6, 6AL5, 6Q7, 6R7, 6B8-G, 6J7, 1620, 6A8, 6SA7, 6SF5, 6K7, 6SC7, 6SK7, 6L7-G, 6J5, 6SJ5, 6L7, 7193, 6C5, 6N7, 6SQ7, 6SR7, 802, 837, 25A7-G, 6AD7-G)

Spray Material	33-C-132
Gun Pressure (psi)	40
Tank Pressure(psi)	8 1/2
Nozzle Setting (on dial)	20
Distance Gun to Assly. (in.)	10
Rate of Passes	45 sec. for 4 rev.
No. of Passes or Times Around Machine	16 passes (4 rev.)

Gun opened to obtain discharge of 20 cc per gun per 4 rev.

Major Axis of Spray Pattern Horizontal

Refer to Note in Sched. #1M.

9. MACHINE SPRAYING SCHEDULES (Cont'd)

SCHEDULE #3M

Initially used for following types:

6AJ6	6V6
6L6	1625
807	6AG7
48	12A6
	6F6

Spray Material	33-C-132
Gun Pressure (psi)	40
Tank Pressure(psi)	8 1/2
Nozzle Setting (on dial)	20
Distance Gun to Assly (in.)	10
Rate of Passes	45 sec. for 4 rev.
No. of Passes or Times Around Machine	16 passes (4 rev.)
Gun opened to obtain discharge of	25cc per gun per 4 rev.
Major axis of spray pattern	Horizontal

Refer to Note in Sched. #1M.

** SCHEDULE #3MA

Initially used for 6C4

Same as Sched. #3M except that gun pressure is 10 psi lower.

9. MACHINE SPRAYING SCHEDULES (Cont'd)

SCHEDULE #4M

Initially used for following types:

6C4 6K8
6SG7 6SH7
6K8-G

Spray Material	33-C-132
Gun Pressure (psi)	40
Tank Pressure (psi)	8 1/2
Nozzle Setting(on dial)	20
Distance Gun to Assly. (in.)	8
Rate of Passes	45 sec. for 4 rev.
No. of Passes or Times Around Machine	16 passes (4 rev.)
Gun opened to obtain discharge	15 cc per gun per 4 rev.
Major Axis of Spray Pattern	Horizontal

Refer to Notes under Sched. #1M.

→ ** SCHEDULE #4MA

Initially used for 12BA6

Same as Schedule #4M, except that pressure is 10-15 psi higher and only 12 passes (3 revolutions) are made.

HGW-35/EG

9. MACHINE SPRAYING SCHEDULES (Cont'd)

SCHEDULE #5M

Initially used for following types:

6AB7	6AG7
1851	25
6AG5	35
1632	25L6
6AC7	50L6-GT

Spray Material	33-C-132
Gun Pressure (psi)	40
Tank Pressure (psi)	8 1/2
Nozzle Setting(on dial)	20
Distance Gun to Assly. (in.)	8
Rate of Passes	45 sec. for 4 rev.
No. of Passes or Times Around Machine	16 passes (4 rev.)
Gun opened to obtain discharge of	18 cc per gun per 4 rev.
Major Axis of Spray Pattern	Horizontal

Refer to Notes under Sched. #1M.

→ ** SCHEDULE #5MA

Same as Sched. #5M, except that coating shall be dried in a bus at 40°-50°C for 18 hr. (min.) or in an air oven at 100°C-125°C for 30-60 min.

9. MACHINE SPRAYING SCHEDULES (Cont'd)

SCHEDULE #6M

Note - This schedule is with gun perpendicular to spray bar.

Initially used with following types:

6AB7	6AG7		
6AC7	1619	(filament type)	
6AG5	25	35	50L6-GT
6SH7	6SG7		

Spray Material	33-C-132
Gun Pressure (psi)	40
Tank Pressure (psi)	8 1/2
Nozzle Setting(on dial)	20
Distance Gun to Assly (in.)	8
Rate of Passes	45 sec. for 4 rev.
No. of Passes or Times Around Machine	16 passes (4 rev.)
Gun opened to obtain discharge of	12cc per gun per 4 rev.
Major Axis of Spray Pattern	Horizontal

Refer to Notes under Sched. #1M

STANDARDIZING SECTION
ENGINEERING DEPT.

9. MACHINE SPRAYING SCHEDULES (Cont'd)

SCHEDULE #7M

Note - This schedule used with Fact. #2 automatic spraying machine Model No. 767D.

Initially used with following types

6SK7	1620
6SK7GT	6A6
12SB7	6N7GT
12R7GT	53

Spray Material	33-C-132
Gun Pressure (psi)	40
Tank Pressure (psi)	5
Nozzle Setting (on dial)	1 hole open
Distance Gun to Assly (in.)	9 ±1/2"
Rate of Passes	4.3 sec. per revolution
No. of Passes or Times Around Machine	*Setting 8-12 (equivalent to 32-48 passes)
Gun opened to obtain discharge of	- - -
Major Axis of Spray Pattern	Horizontal
Coating Finish	Medium Rough

Refer to Notes under Sched. #1M

SCHEDULE #7MA

Same as #7M except that 2 bars (side by side) are sprayed at the same time. At half cycle each bar is rotated 180°.

STANDARDIZING SECTION
ENGINEERING DEPT.

9. MACHINE SPRAYING SCHEDULES (Cont'd)

SCHEDULE #9M

Note - This schedule is with gun perpendicular to spray bar.

Initially used with following type:

50B5

Spray Material	33-C-138
Gun Pressure (psi)	25-30
Tank Pressure (psi)	8-9
Nozzle Setting (on dial)	0-10
Distance Gun to Assly (in.)	8-8 1/2
Rate of Passes	45 sec. for 4 rev.
No. of Passes or Times Around Machine	12 passes (3 rev.)
Gun opened to obtain discharge of	12-15cc per gun per 3 rev.
Major Axis of Spray Pattern	Horizontal

Refer to Notes under Sched. #1M

STANDARDIZING SECTION
ENGINEERING DEPT.

9. MACHINE SPRAYING SCHEDULES (Cont'd)

SCHEDULE #10M

Note - This schedule is with gun perpendicular to spray bar.

Initially used for Type 6J6

Spray Material	33-C-138
Gun Pressure (psi)	50
Tank Pressure (psi)	6-1/2
Nozzle Setting (on dial)	15-20
Distance Gun to Assly (in.)	9
Rate of Passes	45 sec. for 4 rev.
No. of Passes or Times Around Machine	8 passes (2 rev.)
Gun opened to obtain discharge of	11 cc per gun per 2 rev.
Major Axis of Spray Pattern	Horizontal

Refer to Notes under Sched. #1M

STANDARDIZING SECTION
ENGINEERING DEPT.

9. MACHINE SPRAYING SCHEDULES (Cont'd)

SCHEDULE #20

Note - This schedule is with gun perpendicular to spray bar.

Initially used with following type:

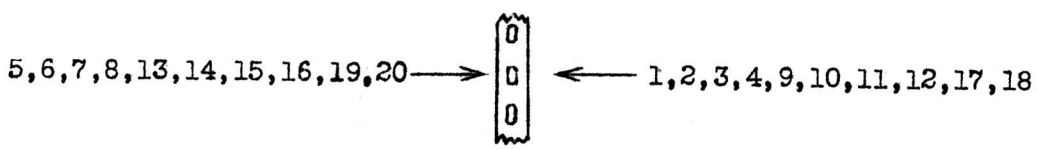
50B5

Spray Material	As specified on Assembly
Gun Pressure (psi)	40-50
Gun Opening (turns)	1-1/4 - 1-3/4
Nozzle Setting (on dial)	18-20
Distance Gun to Assly (in.)	5-6
Rate of Passes	1-1 1/2 sec/pass
No. of Passes	20
Major Axis of Spray Pattern	Vertical
Drying - Dry for 3 min. at 100°C after spray application.	
Appearance	Medium-Rough

Refer to Notes under Sched. #1M

SPRAY DIAGRAM

Top View of Holder



End View of Holder