EUROPEON CATHODE RAY SURVEY
CHAPTER II

August 7, 1957

I. Visit to Sieman's Ediswan - Cosmo Works (London)

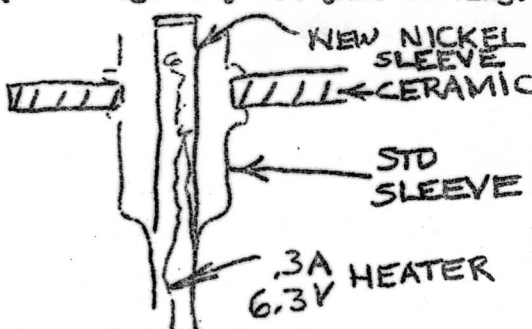
People Contacted: A.E. Cole
P.A. Deegan
K. Yates

Messrs. Deegan & Yates work for Mr. Hirchner who succeeded to Mr. Price's job of development engineering head. Mr. Hirchner was on vacation. Mr. Cole is in what we would term Process Engineering. He will be visiting Syracuse about September 19, 1957.

General: This company spends most of its time in monochrome tube production. They run a few magnetic type radar tubes similar to our 5F & 7B lines. A few one gun oscillograph tubes are made. The only special sort of work has been along the line of projection tubes. Their problems in the latter case consist of the familiar voltage breakdown and phosphor burning problems. After reading Feldmans work they had a go at evaporating P19 and Willemite (P1). No success. (They tried to do the work on an ordinary aluminizing head inside a pyrex bulb.) They have a good deal of trouble getting good P7, P14 screens and don't like P19. I suggested that when Mr. Cole visits Syracuse, he look at our P25.

Ediswan has a low wattage heater of simple design they are just testing.

The old sleeve is said to act as a heat shield. The whole thing operates at a little more than 800°C.



We discussed standard processing (mostly monochrome) step by step, the discussion follows:

Bulb Wash: 5% Hydroflouride + 20% caustic soda followed by tap and deionized water rinse. There has been a general trend toward using more and more volume although the exact amount is not known.

Screening: They use a barium acetate calcium metaborite process, with potassium silicate. The schedule takes about 20 minutes to settle, 5 minutes to pour off. No heat is used. Shrinkage runs about 20% at ultra-violet check. Three phosphors are used.

ZnCd Sulfide:	Cu
Zn Sulfide :	Ag (Weight use 6 grams for 17" tube)
ZnCd Sulfide:	Cu (a yellow)

These are blended by Levy & West to give x=.275, y=.304 tristimulas valves. A Donaldson type colorimeter is used and is standard in England. This resulting color is known as "Mullard Blue". They use a standard demineralizing plant and a water limit of 20,000Ω. They do no debugging.

Bake: Screens are air dryed - no bake.

Filming: Spray - Merthaculate - will report more after next visit

Aluminize: Pumps use Silicone Oil. Engineering doesn't approve. No gas ballast is used and water vapor is thought to be a problem. A typical machine has 16 heads (rotary) rated capacity 100/hour. A stranded upright filament is used. 500-800Å aluminum thickness is shot for. They calibrate by observing color orders coming up on an unscreened bulb. As oscillator similar to ours is then calibrated and used for production checking. Actual flash time is stopped by operator at proper thickness.

Gun Seal: Use nitrogen flush to prevent G1 & cathode oxidation. Both hand & 12 position rotary gear is used. They find that G1 gets to 400°C and more during normal drop seal. This is thought to be bad.

Exhaust: (Data per Mr. Jones Foreman)

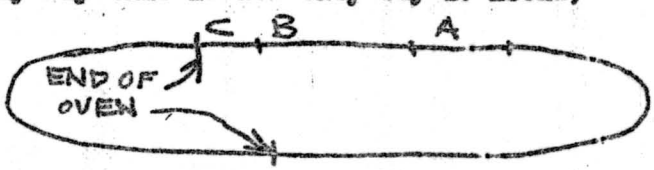
1. Bakeout

Type Oven: Lehr-necks up 
Speed: Unknown (I'll ask again later)
Method of taking curve: Cemented Thermocouple
Peak Temperature: (1CF): 425°C
Time over 400 (1CF): 20
Time over 390 (1CF): 34 min.
Rate shot for: 10-11°/min. hot, 4°/min. cool
Exit Temperature: 150°C
(More data to follow)

2. Exhaust

Type Machine: In Line - circulated air oven - gas fired
Index: 1 min. on 21", 8 min. on 17"
No Oven Positions: 145 (They also have smaller machines w/125 & 99 bugg
No. Buggies: 159
Type Pumps: Dow Oil 1405 - Back Pump
Silicone Oil - Diffusion Pump
Type Pump - Will check
Peak Temperature: (1CF) 405° (21") 420° (17")
Time over 400°C (1CF) 45 min. (21") 28 min. (17")

(This latter information shook me up - so we started to shield the set up. I can only say this is how they say it looks)



Activation:					
	"A" area	10 min.	G1	If	R.F.
			0	.35	61 750°C Max.
	"B" area	4 min.	+5	.35	0
	"C" area	60 sec.	0	.4	0

All this with the 12.3 volt heater (3 watt) sort of double If durrents for our equivalent.

Tip-Off: Bulb Temperature 100°C

Type - Radiant Electric, 11 amp. 10 volt
(They complain of short life of radiant heaters)

Aging:	Stem	Time	EG1	EG2	If
	1	1 min.	0	0	20 volt
	2	30 min.	+5	450	17 volt

Cathode:

Cap Material & Thickness:

"Wiggins Nidal" (Active) Deep tube .004" top

EM Mix Type: Triple Carbonate

Thickness [redacted]: .0025 (8-10 milligram/cm^2)
Density: Unknown
Texture: Plough - no peel

Getter: Type: V Channel & pellet
Vendor: English Kenet
Direction of Flash: Crossfire (Mag.) Upfire E.S.
Total Material wt. 24 mg. (That's what they say)

Life Test - (Later)

Cathode Temperature:

820°C Brightness (Optical)
870° Thermocouple

This information was gleaned at a round table discussion. I will visit the Cosmo plant on my next visit.

II. VISIT TO 20th CENTURY ELECTRONICS:

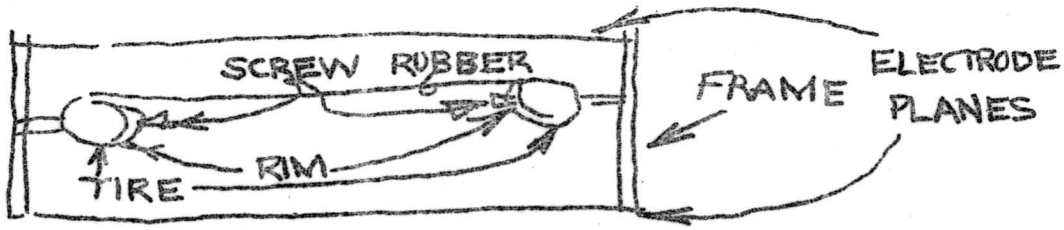
People Contacted: Mr. Tomes
Mr. N.B. Balaam
Mr. T. Jennings

This is a small and very alert company about 10 years old. Tomes founded it to make Geiger counter tubes. This is still a major port of the production. The factory is clean, light and every piece of gear is hand made. Mr. Tomes is most dynamic with a personality exactly like Norman Mears of Buckbee-Mears. He expects to be in the States soon and may contact IGE for a contact. The company makes:

1. Scope tubes 1, 2, 4, 8 gun
2. Photomultiplier tubes (Jap copies of EMI)
3. Geiger counter tubes
4. Distill Boron 10 to Boron 11

Interesting Processes:

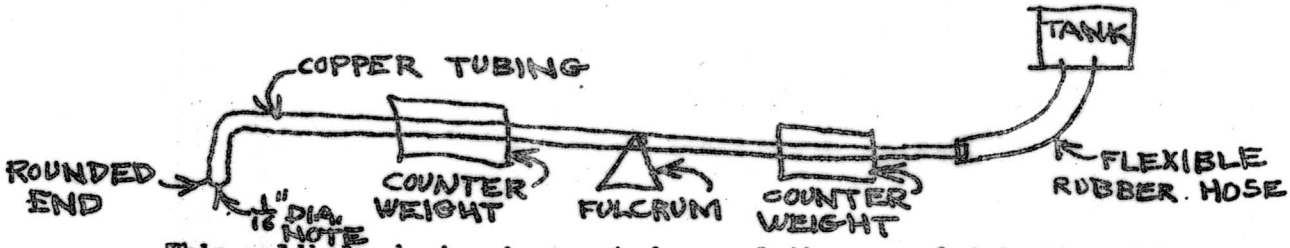
A rubber membrane model is used to study photomultiplier anodes. An ordinary bicycle wheel is used to support the membrane. The spokes are removed and the dire deflated. The rubber membrane is loosely held over the tire and is screwed to the rim through the former spoke holes. Self tapping screws + washers are used as fasteners. The tire is then inflated. Presto! the membrane is stretched.



This device seems to work fine. Four upright posts support the wheel and two datum planes from which electrodes poke up or down. Since in multiplier tubes, they always assume negligible initial velocity, no ramp is employed. A 1/8" ball is brought to rest through a piece of tubing and is released by raising the end of the tubing. No recording apparatus is used to trace the path.

Spiral Anode:

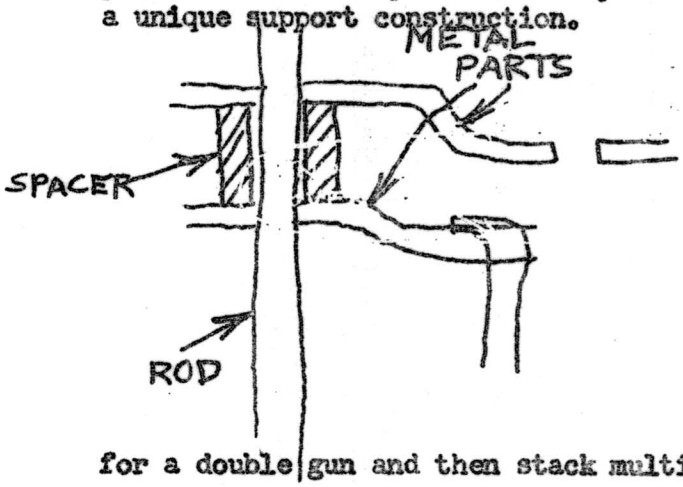
They make spiral anodes easily with the simplest device.



This unlikely device is mounted on a lathe crossfed in the position shown. The counterweight is adjusted so that a reasonable pressure is in the nozzle. The lathe is started (no feed) The tak is raised until a clean line appears. The feed is started. It works! The ink is Acheson Colloid Dag diluted with potassium silicate. The amount of dilution is pure art. A spiral anode of resistance about 300 megohms is the goal. They simply use a bare piece of glass and a dummy nozzle, then dilute the tank until the nozzle writes without spreading.

Gun Assembly:

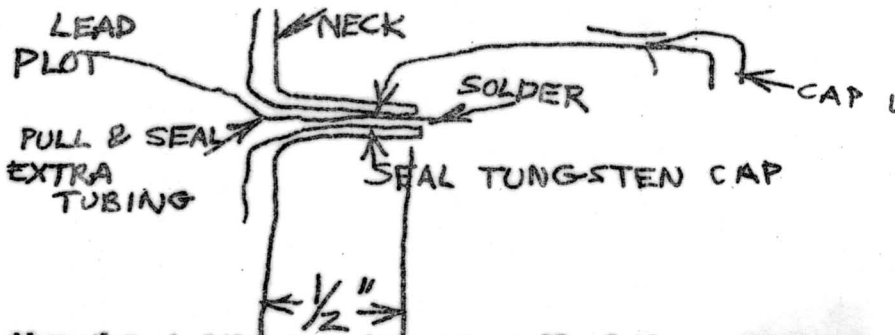
20th Century do an amazing job of fabricating gunparts. Simple dies they make. Progressive dies they have made. In either case, they stamp out the parts on the most primitive of presses. The parts look very good. They use a unique support construction.



All guns except one are using this construction.
The parts to make a complete gun are gathered in a fishing tackle type plastic box. (They call it the "mechano set" approach). The parts are simply dropped over the support rods and retainers are crimped at the assembly ends. Deflection plates have flanges which are also pierced to take the rods. Some rods have hollow centers and are used to bring out leads. They have a basic assembly for a double gun and then stack multiples of this to make 2, 4, 6 or 8 gun tubes.

They have an excellent glass shop. All bulbs are pyrex, mostly flat faced. Faceplates are affixed with no R.F. A few rectangular pressed faces were about. They show the same mechanical weakness as ours. Some screening is

done by simply spraying 20% (vol.) solution of Phosphoric acid on face through an air brush. Half drying, then dusting and slapping off excess dry powder. (Good way to get calluses.)

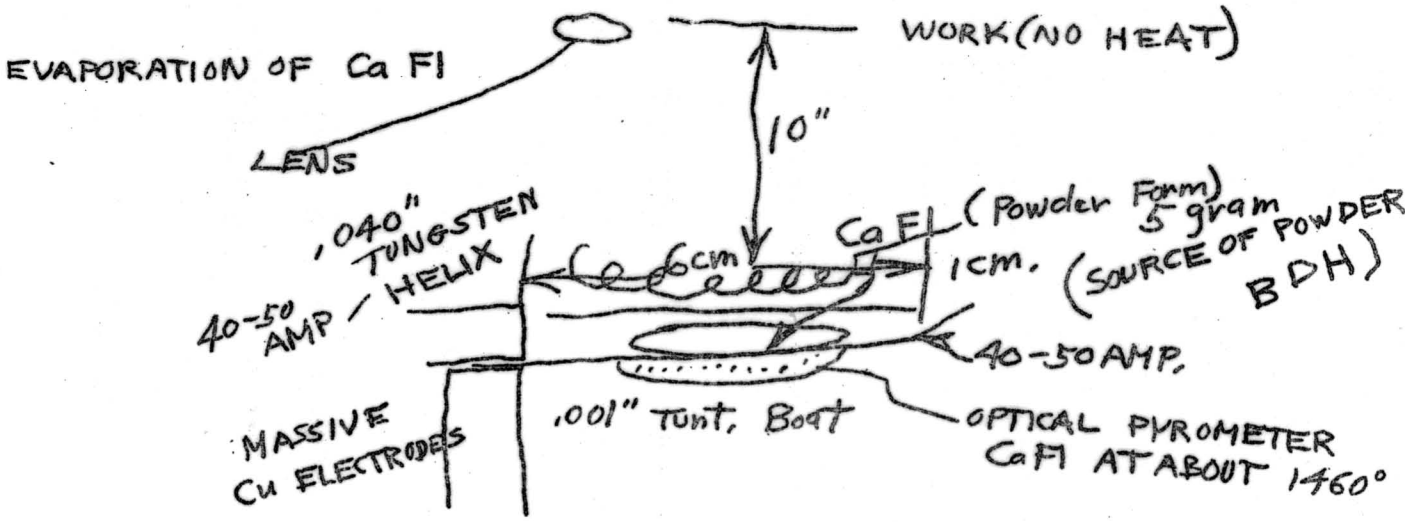


Leads are brought through neck like so. As many as 32 of these stick out a single neck. The leads are button hooked out before the tungsten cap is sealed on with a sort of housekeeper deal. All hand torch work!

The structure will stand little heat and long exhaust (10-12-18 hours) is the substitute. I have some typical T.I. sheets to show about what they sell. No other processes are worth reporting here although we can talk later.

MORE EMI

I have now spent three days with these people and intent to return Friday. They have been most helpful. We set up and evaporated CaFl yesterday. They have arranged to have me bring back a workable ECR-350 (double ender) with me. I have watched them assemble and handle meshes. Some of this is much to lengthy to report, but I'll hit the highlights.



The set up is as I have illustrated in the genuine sketch I drew all by myself (God). A little double convex lens of any sort is mounted adjacent to and with its plane aligned with the plane of the work. The work is very slowly brought up to temperature (about 45 min.). The little lens is only used to watch

for interference patterns. The number of color orders are counted as they nicely appear on the little lens. About 8 orders gives the magical 1 micron. After each evaporation the little lens is simply cleaned and replaced. Thickness of between .5 and 1 micron are used. (Total time = about 2 hours)

No cleaning is necessary on their mesh. (This won't be true of ours). They use a 1000/inch mesh of 70% transparency - material silver. The silver is a peculiarity of the mesh forming process.

Mesh Making:

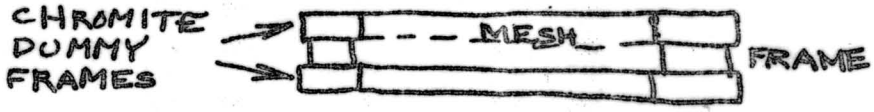
The desired mesh is first ruled on a resist covered copper plate, just cutting the resist with a sapphire stylus. The plate is then etched through the cut resist. A reverse master is now made (ala phonograph master technique) From the reverse master a sub master is made. (All copper plating techniques.) A heavy layer of silver is now plated on the sub master.

This is then shamvared down

Then the copper is etched: and the silver is removed.

All very easy for people who make phonograph masters. This mesh is most painstakingly examined uner a microscope and sections that cannot be used (filled holes etc.) are rejected.

The frames are milled steel, silver plated. The mesh (speaking briefly is layed across the frame. Weighted down with another dummy frame and fired as follows:



Airfire: 3 min @ 600°C
Forming Gas: 8 min @ 850°C

The choice of material for the ring and mesh, and the heating cooling cycle are all critical to give a properly tightened mesh. This technique is used in the 3" camera tubes and vidicon as well. Some changes will have to be made for a 5" target, using nickel mesh.

Our further planes call now for a session on setting up the ECR 350 preparatory to bringing it with me as well as general discussions on image tubes.

NEXT CHAPTER EDISWAN & EMI

Frederick Mayer
August 7, 1957