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Method of Washing Bulbs

Used by Philips Co.

March 16, 1939.

1. The bulbs are washed in a hot solution of caustic soda (NaCO) - proportions 2 kg to 100 liters of water. Solution is held at 80° C. Solution is changed twice a week for a production of 400 tubes per week. No special precautions seem to be necessary in handling this solution. They use a steel tank for washing and the washing time per tube is approximately 5 minutes.

2. The caustic soda solution is washed from the bulb with softened tap water.

3. Bulbs are dipped in a wooden tank containing a 10% hydrofluoric acid solution and re-rinsed in softened tap water. The hydrofluoric acid solution is made in concentration of 10% by volume and is made by diluting normal 30% acid solution.

4. The bulbs are washed with distilled water.

5. Bulbs are placed in a tray and allowed to dry. Care is taken to prevent the formation of water drops on the screen.

6. Bulbs are dried in air for 12 to 18 hours.

7. The bulbs are rinsed with Acetone, the Acetone being used over again for approximately 5 bulbs. It is then placed in containers and is repurified.

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LER:HT

Date: 20-12-38.

SAFETY MEASURES WHEN OPERATING WITH HYDROFLUORIC ACID, FROSTING LIQUID, ETC.

Operations with hydrofluoric acid and materials that have been prepared with it (as e.g. frosting-liquid etc.) are to be considered as VERY DANGEROUS.

First of all this acid is very injurious when it gets on the skin. The wounds are very painfull and inconvenient and only heal very slowly.

However, any detriments of this acid need be of no consideration if only the undermentioned safety measures are STRICTLY OBSERVED.

The operators in question become conversant with the acid very soon and it is precisely this side of the matter that is dangerous.

Operators handling directly acid and frosting-acid must be duly protected. The operator who is in charge with pouring acid from bottles, weighing acid, preparing frosting-acid, etc., must wear a Degea gas-mask (make: Deutsche Gasglühlicht Auer Ges., Berlin) provided with an absorption-cartridge (filling-box B). He must further wear long rubber gloves, wooden shoes and rubber leggings (these should be fixed in such a way that any spilt acid cannot run into the wooden shoes) or rubber boots. Besides, he must wear a coat and trousers that are more acid-proof than normal working-clothes. It is recommendable to use a small fustian apron for the purpose of preventing the acid-proof clothing from wearing away. However, due care should be taken that the apron extremity does not hang in the acid (e.g. when carrying a bucket of acid) as this might wound the operator. A further precaution is to rub the unprotected parts of the face with ointment consisting of equal parts of vaseline and lanoline.

The operator seeing to the frosting must likewise wear acid-proof clothing and a fustian apron, while it is recommendable that beginners wear goggles (Focus spectacles, type Ir. Gorter). When cleaning machines, e.g. scraping off paint and frosting-acid, the operator must properly protect himself, especially the eyes.

In case an operator, in spite of all these precautions has come into touch with the acid, he must at once wash the parts of the body that have been splashed, in a strong soda solution. Should there be painful or itching spots on the skin, rub them with a paste consisting of:

50 g of Sesam oil and 43 g of magnesium oxide

Wrap a bandage round the spot in question. Repeat this a few times, if necessary. Prepare new paste in case it has become dry or harder.

Should acid spatters get into the eyes, never wash them with soda water or the like, but exclusively with clean water.

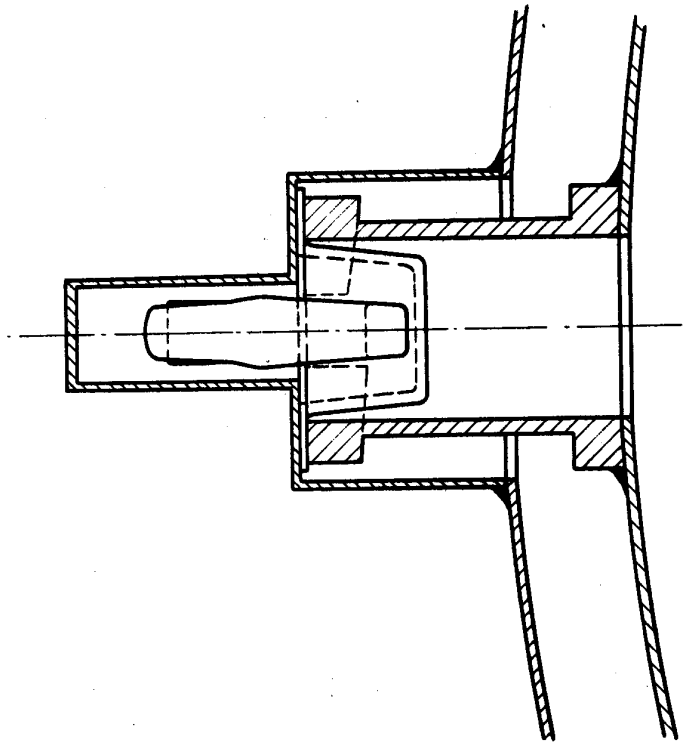
In case the nature of the wounds does not appear to be innocent, or if wounds that looked innocent at first, are getting worse, the operator should take the advice of a doctor right away.

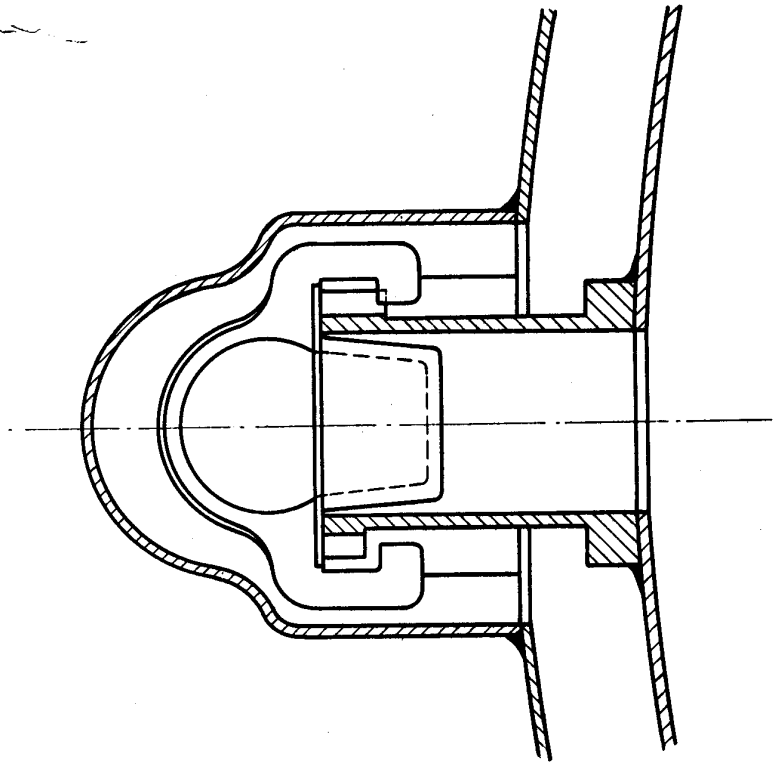
Bottles containing HF must be kept in a cool place, so not in the neighbourhood of heating-radiators or in sunny places. This is because strong HF has a low boiling-point. In case the bottles of HF should get warm in spite of these preventive measures, they should not be opened before they have cooled completely.

Removing stoppers from HF bottles is a dangerous job, especially in case they are fitting tight. The operator in charge of this should protect himself as described above (gas-mask,etc.) and use an implement designed for the purpose (cf. page 3). This implement is a protective hood at the same time. It is placed over the stopper, whereupon the operator strikes with a hammer against the projecting part until the stopper gets loose and the acid vapours can escape through the space round the loosened stopper. When the vapours have disappeared, the tension has gone, the operator (who is still protected by the gas-mask, etc.) may remove the hood and a few minutes later the stopper.

Close the bottles with a stopper immediately after use. Empty bottles are also at once closed with a stopper, while they may never be rinsed with water.

Page 4 represents a device permitting of a convenient and non-perilous way of emptying bottles of HF.





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R 1-5-5
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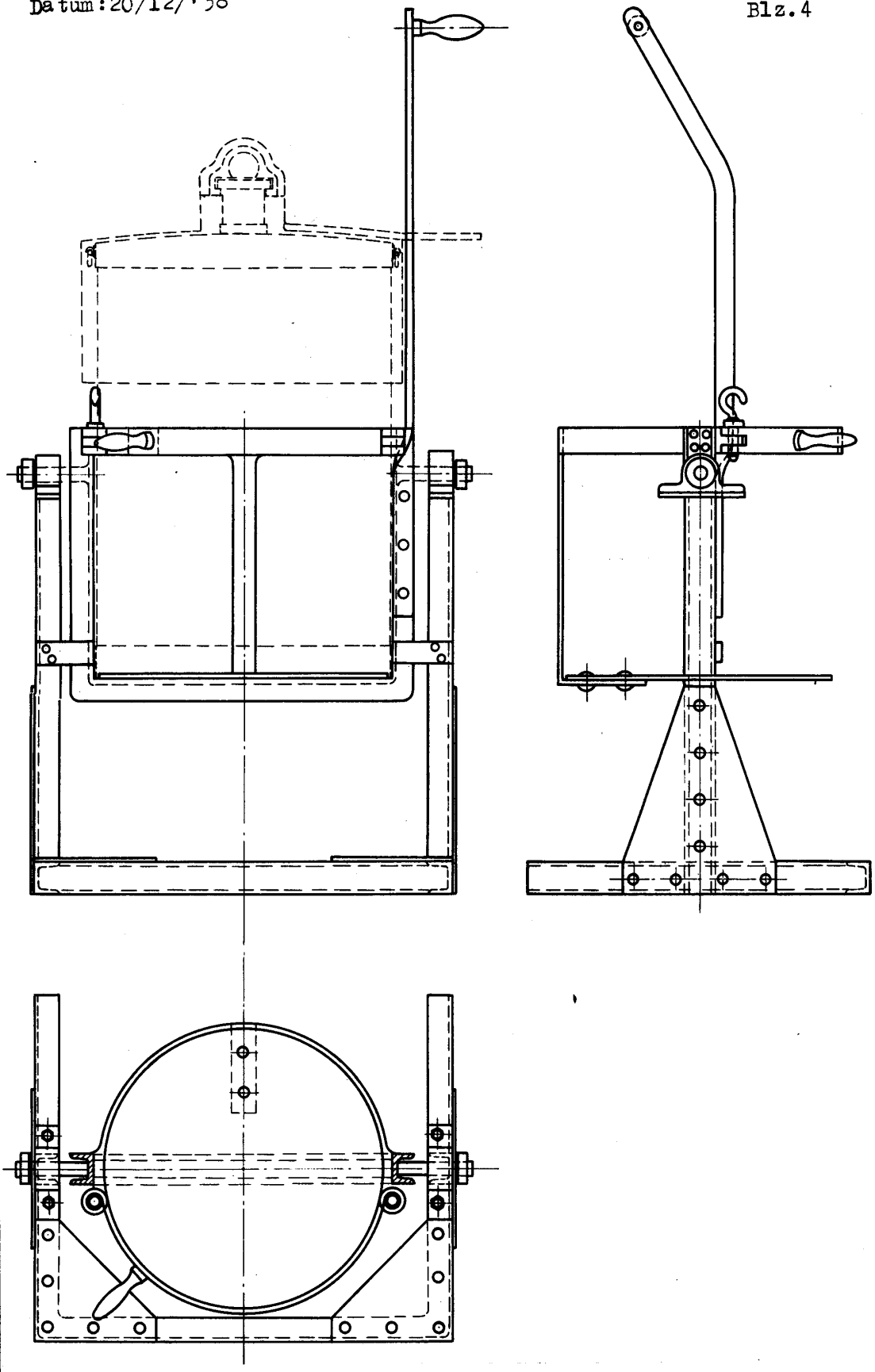


MANOMETER FOR LOW GAS PRESSURES.

OBJECT:

Measuring gas pressures between 10^{-5} and 10^{-3} mm. (100 micron / micron)

APPARATUS.

The apparatus is obtained from Messrs.E.Leybold's Nachfolger A.G. at Cologne-Bayertal, and known under the name of "Philips Vakuummesser".

The installation is represented in the diagram on page 4. We distinguish the following parts:

1. Glow discharge tube.
2. Permanent magnet (field between the pole shoes).
3. Resistance of 1 megohm.
4. Neon tube, type 4662.
5. Single-pole switch.

The glow discharge tube (1) is given a high tension amounting to 2000 volts at a load of 1 mA (without load 2200 volts). The + of the arc voltage is applied to the two plates of the tube across a switch (5) and a lamp (4), the plus across a resistance (3) to the clip mounted between the two plates. So the two plates act as cathode and the clip as anode.

A permanent magnet (2) is mounted round tube (1) in such a way that the field is perpendicular to the two plates (cathode) of tube (1).
An electron leaving one of the plates, is prevented from reaching the anode by the magnetic field; it will move to the other plate along a helical path. Then, however, it will be thrown back by the retarding electric field and thus will it repeatedly go to and fro between the plates thereby being ionized and losing in energy until it is eventually received by the anode. The magnetic field may be said to increase the gas pressure in the discharge tube; at a pressure of 10^{-5} mm with a magnetic field of 300 Oerstedt the same voltage is required for the purpose of obtaining a discharge as in the case of a pressure of 0,06 mm without magnetic field.

The manometer is based on this principle; it has been calibrated for pressures between 10^{-5} and 10^{-3}.

The length of the discharge in the neon lamp (4) is a measure for the pressure in the discharge tube (1). Since the latter tube in connected to the space the pressure of which is to be measured, this length is also a measure for the pressure to be registered. The graphs on page 5 represent the pressure as a function of the length of the discharge in the neon lamp (4).

At a given value of the current the height of the pressure is largely dependent upon the kind of gas the pressure of which is to be measured. Therefore the graphs on page 5 represent the average value for H_2, CO, air and argon. These kinds of gas agree, except for a factor 2. E.g. the gas pressure of neon is much higher at the same current intensity and that of Xe much lower.

In case more accurate measurements are required, a uA-meter with shunts should be used instead of the neon lamp. On page 5 the pressure is at the same time represented as a function of the current in uA. It is advisable then to earth the - of the high-tension and to connect the - of the uA-meter direct to earth seeing that otherwise the meter may be spoiled.

The gas discharge in tube (1) possesses the peculiarity that the current intensity of the discharge sometimes changes with leaps and bounds and sometimes even increases, when the pressure is constantly decreasing. It has appeared, however, that in the case of air no greater deviations than a factor 2 occur. Owing to this the present design of the apparatus is not yet suitable for precision measurements.

For accurate measurements the manometer must be calibrated for the kind of gas to be used. Then the voltage for the tube must remain accurately the same as throughout the measurements. Besides, it should be borne in mind that the discharge absorbs gas (with air 1 litre of a pressure of 0,02 mm is absorbed per 1 coulomb). For accurate measurements the voltage must be switched on as short as possible, e.g. with a button switch, while the connecting tube between the glow discharge tube and the apparatus to be tested, must be short and wide.

PRACTICAL USE:

Since this manometer also indicates the pressure of condensable vapours, it must always be separated from the mercury-holding parts of the exhaust.bench by means of a mercury-trap.

This manometer offers the following advantages over a Mc.Leod manometer. It indicates momentarily and continuously and its reading is very well visible, which allows of bringing the manometer as closely as possible to the object to be exhausted.

When the discharge tube (1) has been in contact with moist air, it is necessary to degas it after exhausting it, which may be done, e,g, by simply switching on the manometer for some time.

By virtue of its direct indication this manometer is particularly suitable for measuring the pressure when doing odd jobs, such as turning cocks, admitting gases at low pressures, tipping off valves, degassing metal parts, etc.

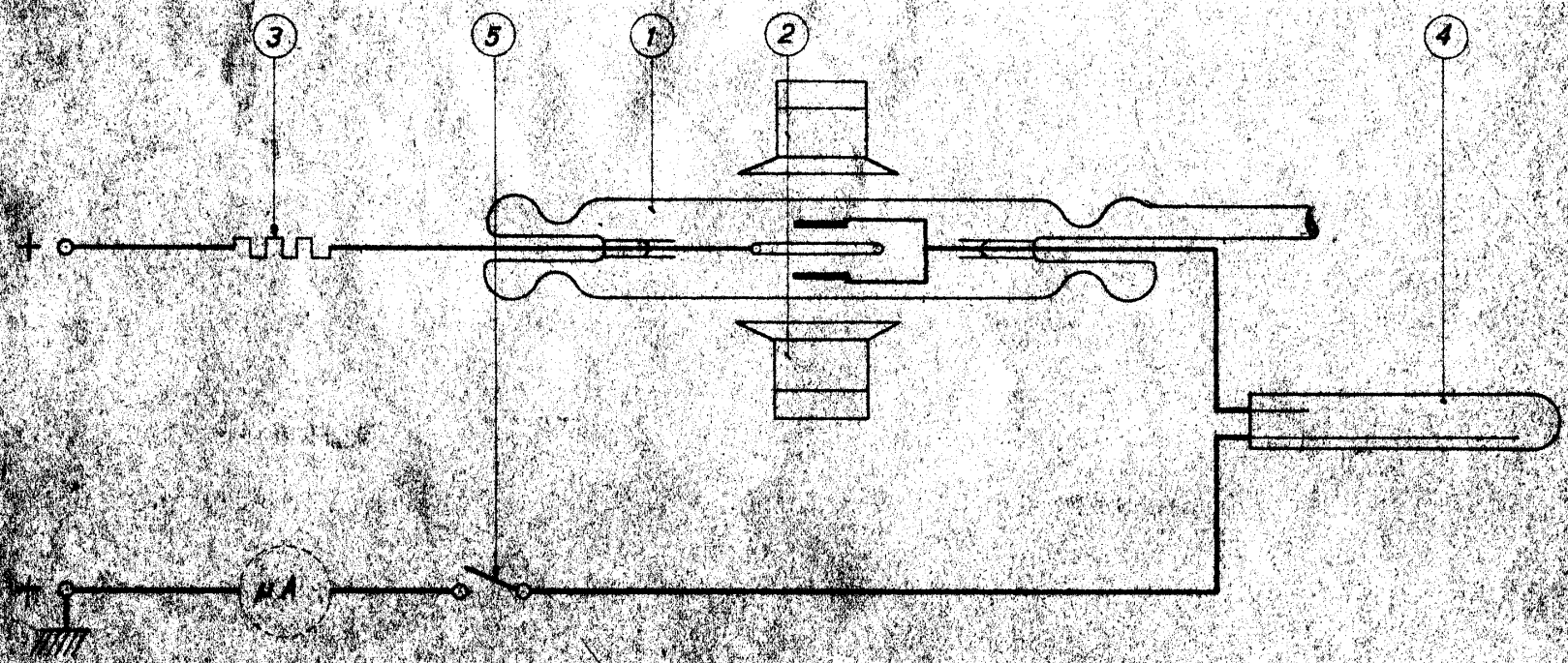
Besides, it is possible to follow the degasing-process of filaments, which is already done in practice in the manufacture of expensive transmitting-valves.

Then it is seen at a glance whether too much gas is liberated from the filament.

This manometer also indicates the pressure of condensable vapours and so it is possible to ascertain whether the vacuum is spoiled by mercury vapour, grease vapour, water vapour, etc.

In addition this manometer is very suitable for the indication of pressure in the event of oil vacuum pumps because impurification of the oil with mercury vapour as with Mc.Leod manometers, is avoided.

Eventually it may be said that it can also be used to advantage for testing the pressure in a tipped-off valve or in a vacuum apparatus.



DATUM: 9-2-'37.

R 1-9-3[illegible]
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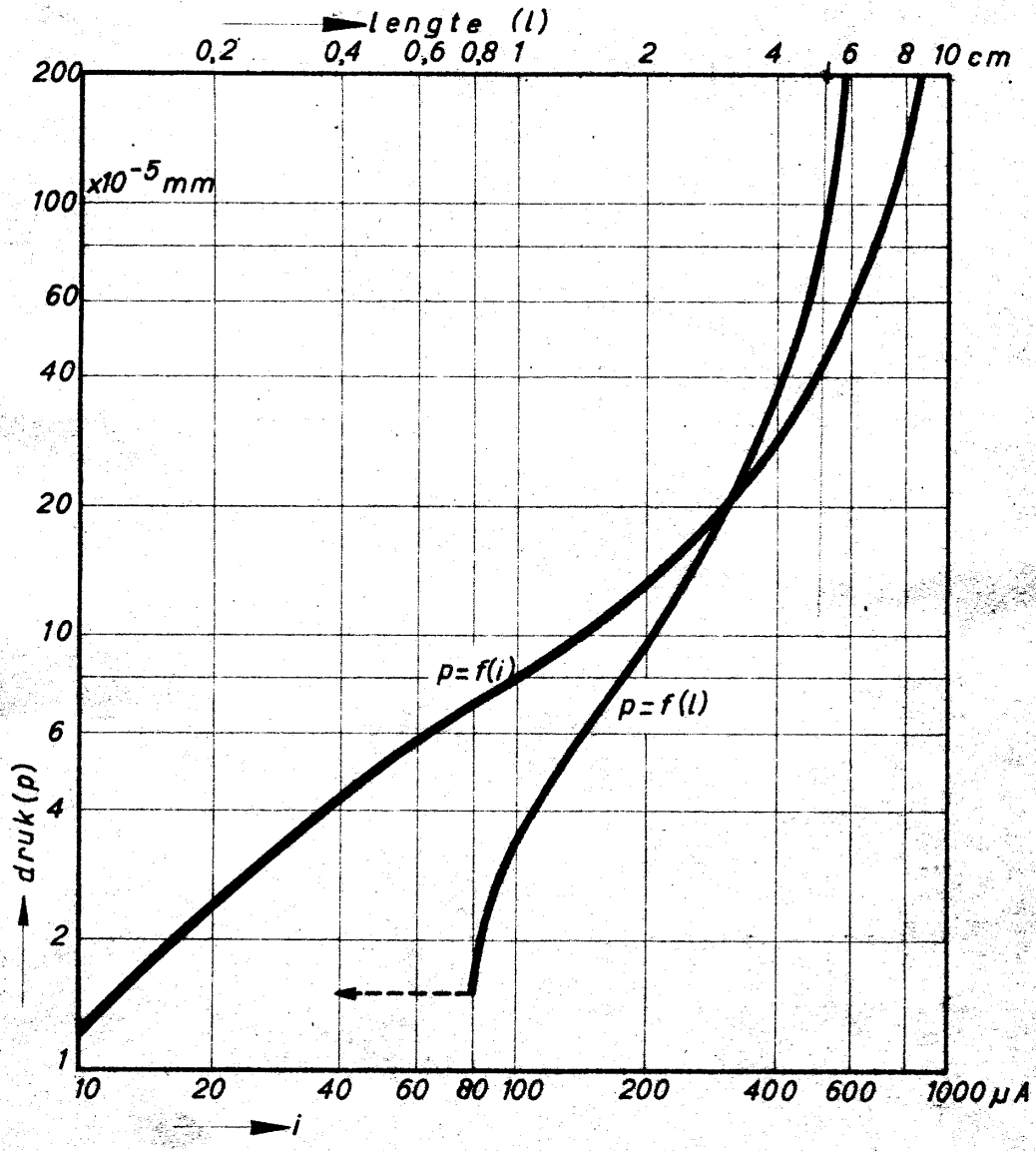


Het is verboden, dit blad uit dit boekje of aan derden te staan aan derden.

It is not permitted to lend out or to surrender this leaf to third parties.

Il est défendu de prêter de céder cette feuille aux tiers.

Date : 2/5/'39
Date superseded sheet: 31/1/'39

R 2-1-5
Page 1

THE PREPARATION OF BINDER.

COMPOSITION:

Binder No.2 :	57	g	of nitrocellulose E950
	0,95	litre	of amylacetate
Binder No.3 :	0,45	kg	of nitrocellulose E950
	10	litres	of amylacetate
* Binder No.4 :	0,25	kg	of nitrocellulose E1160
	8	litres	of methylic glycol acetate
	2	litres	of butanol
Binder No.5 :	1	litre	of binder No.3
	1	litre	of amylacetate
Binder No.7 :	60	g	of nitrocellulose E1160
	1,95	litre	of amylacetate
	0,85	"	of diaethyl-oxalate
Binder No.7A:	60	g	of nitrocellulose E1160
	1,95	litre	of diaethyl-carbonate (diatol)
	0,85	litre	of diaethyl-oxalate
Binder No.8 :	0,45	kg	of nitrocellulose E950
	10	litres	of methylic glycol acetate
Binder No.9 :	0,25	kg	of nitrocellulose E1160
	10	litres	of diaethyl-carbonate
Binder No.10:	0,45	kg	of nitrocellulose E950
	10	litres	of diaethyl-carbonate
Binder No.15:	1	litre	of binder No.3
	2	litre	of amylacetate

PREPARATION OF THE BINDERS No. 2-3-4-7-7A-8-9 and 10:

1. Put the ingredients together and shake them until the nitrocellulose has dissolved completely.
2. Determine the viscosity with the aid of the Ford cup. The exigencies are:
binder No.2: 2,5 min.; binder No.3: 50 sec.; binder No.4: 45 sec.; binder No.7 and 7A: 38 sec.; binder No.8: 56 sec.; binder No.9: 33 sec.; binder No.10: 45 sec.

* PREPARATION OF BINDER No.5 and No.15.

Join the ingredients and shake them until the mass has become homogeneous.

ANALYSIS:

	The	solid	part	of	binder	Nr.2		amounts	to	abt. 4,5%
	"	"	"	"	"	"	3	"	"	" 3,5%
	"	"	"	"	"	"	4	"	"	" 1,9%
	"	"	"	"	"	"	5	"	"	" 1,5%
	"	"	"	"	"	"	7-7A	"	"	" 2,5%
	"	"	"	"	"	"	8	"	"	" 3 %
	"	"	"	"	"	"	9	"	"	" 1,8%
	"	"	"	"	"	"	10	"	"	" 3,1%
*	"	"	"	"	"	"	15	"	"	" 1 %

USE:

Binder is used a.o. for the preparation of the spraying-liquids for cathodes and heaters.

CODENUMBERS AND INSTRUCTIONS:

Nitrocellulose E950	02 771 09	as per R 16-4-4
Nitrocellulose E1160	02 771 13	as per R 16-4-4
Amylacetate	02 752 95	as per R 16-4-1
Methylic glycol acetate	02 870 35	as per R 16-4-3
Diaethyl-oxalate	02 870 12	as per R 16-10-11
Diaethyl-carbonate(diatol)	02 780 10	as per R 16-4-6
Binder Nr.2	02 761 06	
" " 3	02 761 07	
" " 4	02 761 15	
" " 5	02 761 08	
" " 7	02 763 10	
" " 7A	02 763 09	
" " 8	02 763 11	
" " 9	02 763 12	
" " 10	02 763 13	
* " " 15	02 763 18	

Date: 21/2/38 R 2-1-30

PURIFYING OF ACETONE.

REQUIRED MATERIALS:

10 l of acetone
25 g of permanganate of potash (crystals)
50 cc of distilled water
20 g of sodium hydroxide
abt.1 kg of calcium chloride

The above quantities yield abt. 7 litres of purified acetone.

PROCEDURE:

1. The permanganate of potash is put in the acetone after which it must stand over 24 hours. After this the acetone is discoloured.
2. Filter off-
3. Add the distilled water and the sodium hydroxide, and allow it again to stand over 24 hours.
4. Add the calcium chloride and allow to stand for 16 hours.
5. Filter off the whole quantity.
6. Distil the acetone off over calcium chloride. (the first running is abt. 1 litre; the remainder in the flask is abt. 1 litre).

USE:

Purified acetone is used a.o. when applying fluorescent sulphide screens in cathode-ray tubes. (see R 3-14-6).

STORAGE:

Purified acetone must be kept in a well-closed stoppered bottle.

Remark:

The distillation must be done by means of an electric oven, and not with the aid of a gas burner, to prevent a fire.

CODE NUMBERS AND NOTICES:

Acetone	02 752 85	R 16-10-8
Permanganate of potash	02 901 10	R 16-10-66
Distilled water	02 970 25	
Sodium hydroxide	02 380 60	S 501
Calcium chloride	02 770 56	R 16-10-47
Acetone purified	02 752 86	

Date: 11-5-'37. R 2-1-31

THE PREPARATION OF WATER-FREE LIQUID PARAFFIN.

REQUIRED MATERIALS:

1 litre of liquid paraffin
10 g of sodium chips

PREPARATION:

1. Shake the above quantities for 12 hours.
2. Allow to settle and drain.

USE:

Pieces of BaNi-tube are kept in water-free liquid paraffin.

INSTRUCTIONS AND CODE NUMBERS:

Liquid paraffin	as per R 16-10-15	02 002 60
Sodium		02 880 68
Water-free liquid paraffin		02 002 62

Date: 2/2/38 R 2-1-33

THE PREPARATION OF ACID FOR TREATING CATHODES:

REQUIRED MATERIALS:

1,165 litres of distilled water
0,385 kg. of nickel sulphate $NiSO_4$ 6 aq.
0,55 kg. of sulphuric acid (strong) technical.

The above quantities yield 1,5 litres of acid for treating cathodes.

PREPARATION:

1. Dissolve the nickel sulphate in distilled water; heat, if necessary.
2. After cooling, prudently add the sulphuric acid, stirring all the while.

USE:

This liquid is used in acid-treating cathodes.

STORAGE:

Keep it in stoppered bottles.

CODE NUMBERS AND INSTRUCTIONS:

Distilled water	02 970 25	
Nickel sulphate	02 880 55	R 16-9-1
Sulphuric acid (strong) technical	02 990 03	R 16-10-18
Acid for treating cathodes	02 031 08	

Date: 11/1/38 R 2-2-1.

BALL-MILLS.

TYPES:

The following types of ball-mills, which may be filled with porcelain balls or with flints, are in use:

I. Porcelain ball-mills.
II. Steatite ball-mills.

APPARATUS:

The table below states the different dimensions of the ball-mills, the quantity and the diameter of the balls or flints that are put in the normal types, and the number of revolutions.

Capacity of porcelain or steatite ball-mill	Quantity of balls or flints	Diameter of the balls or flints	Number of rev./min.
0,5 litre	0,3 Kg	abt. 20 mm.	85
1 "	0,5 "	" 20 "	75
1,5 "	1 "	" 20 "	75
3 "	2 "	" 20 "	65
5 "	3 "	" 30 "	65
15 "	6 "	" 30 "	50
25 "	10 "	" 40 "	50
40 "	16 "	" 40 "	45

PROCEDURE:

The materials to be mixed + the required number of balls or flints must fill abt. two thirds of the mill.

WASHING SULPHIDE Z64

OBJECT:

Removing the admixtures.

APPARATUS:

Stirring device (any given type will do).
Beaker.
Gas burner.
"Büchner" funnel + suction flask.
Drying oven.
Sieve B 50.
Brown stoppered bottle.
Test tube.

REQUIRED MATERIALS:

*	Double distilled water	02 970 26	
	Acetone	02 752 85	R 16-10-8
	Silver nitrate ($AgNO_3$)	02 991 55	R 16-11-13
	Nitric acid (HNO_3)	02 930 13	S 600

PROCEDURE:

* 1. Put 200 g of the powder to be cleaned in a beaker and pour 1 litre of double distilled water on it.
2. Fit the stirring-device, start it and heat it on a gas burner.
3. Boil it for 2 hours.
The powder may not settle as otherwise the beaker will crack. So constant and quick stirring is necessary.
* 4. Allow the powder to settle and pour off the double distilled water.
* 5. Add again 1 litre of double distilled water and boil it once more for 2 hours.
6. Repeat this 7x.
7. As certain the presence of chlorine, if any, in the wash water with silver-nitrate solution and nitric acid.
This should be done as follows:
Put abt. 10 cc of the wash water in a test tube and add abt. 3 cc of nitric acid 2 N (see the remarks).
Heat to abt. 80°C.
Add abt. 2 cc of silver-nitrate solution 1/10 N (see the remarks).
If the solution remains clear, no chlorine is present.
If the solution becomes bluish white, the wash water still contains chlorine; in this case continue washing as specified under point 5 until testing proves the absence of chlorine.

8. Suck the powder dry on a "Büchner" filter and wash it 4 times with acetone.
9. Heat the powder at 100°C in a drying-oven for 2 hours.
10. Then sieve the powder through a sieve B50 (50 meshes per running cm) and put it in a brown stoppered bottle.

Remarks:

1. Prepare nitrate of silver 1/10 N in the following way:
   Dissolve 17 g of nitrate of silver in ½ litre of double-distilled water.
   Replenish with distilled water to 1 litre.
2. Prepare the nitric acid 2 N as follows:
   Replenish 140 cc of nitric acid with double-distilled water to 1 litre.

Date: 18/4/'39 R 2-5-6

PREPERATION OF RED SEALING WAX.

REQUIRED MATERIALS:

A.	25	kg	of resin
	5	kg	of manilla copol
	30	litres	of acetone
B.	50	kg	of solution A
	12.5	kg	of beeswax
	40	kg	of barium sulphate
	0,35	kg	of sudan red (BB)

PREPERATION:

Mix the quantities mentioned under A in a churn for about 12 hours then sieve it through sieve B10 (10 meshes per running cm). Then mix the quantities mentioned under B in a vacuum-mixing mill which is heated by steam; then damp it dry on a temperature of 90°C.

USE:

Red sealing wax is used for closing the ends of the BaNi-tube.

CODE NUMBERS AND SPECIFICATIONS:

Resin	02 851 29	S75
Manilla copol	02 871 21	S73
Acetone	02 752 85	R 16-10-8
Beeswax (yellow)	02 100 21	
Barium sulphate	02 760 00	R 16-10-79
Sudan red (BB)	02 930 96	
Red sealing wax	02 020 41	

Date: 17-8-'37. R 2-6-1
Date superseded sheet: 18-1-'36. * Page 1.

KINDS OF GAUZE.

See instruction R 16-1-2 for testing specifications of Ni-gauze and R 16-1-42 for Mo-gauze.

Code number	Number of meshes	Material	Wire diam. in mm	Ribbon width in mm	Weight in g p.1000 mm^2
04 258 45	18x18 p.cm^2	Ni	0,150	35	0,593
50	21x21 "	Ni	0,150	16	0,690
51	20x20 "	Ni	0,150	29	0,659
54	21x21 "	Ni	0,150	22	0,690
55	30x28 "	Ni	0,150	15	0,942
59	30x28 "	Ni	0,150	26	0,942
60	22x40 "	Ni	0,080	7	0,286
62	22x40 "	Ni	0,080	16	0,286
66	22x40 "	Ni	0,080	26	0,286
75	30x28 "	Ni	0,150	34	0,942
80	56x56 "	Ni	0,045	16	0,137
85	56x56 "	Ni	0,045	46	0,137
90	20x20 "	Ni	0,200	56	1,178
91	20x20 "	Ni	0,200	36	1,178
92	20x20 "	Ni	0,200	45	1,178
04 259 20	20x20 "	Ni	0,200		1,178
04 318 10	500 "	Mo	0,060	60	
12	7x7 "	Mo	0,110	35	
20	20x22 "	Mo	0,060	85	

The number of meshes per cm^2 ($inch^2$) is stated in this table by two figures axb, of which

a = number of meshes per cm (inch) lengthwise the gauze-tape.

b = number of meshes per cm (inch) breadthwise the gauze-tape.

The various executions are indicated by a cypher behind the code number.

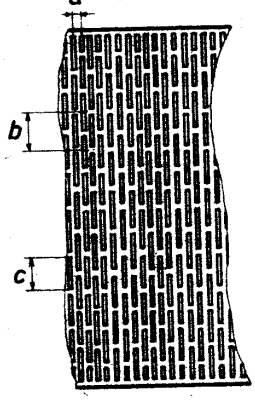
.0 = blank.
.3 = blackened on 1 side.
.4 = blackened on both sides.

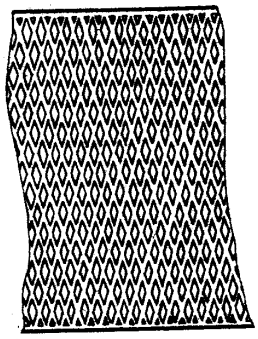
e.g. 04 258 50.0
.3
.4

Date: 30/11/'37
Date superseded sheet: 22/9/'36

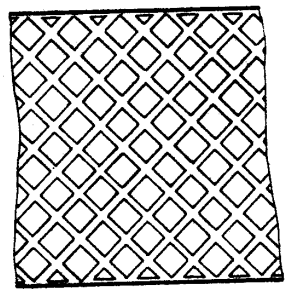
EXPANDED METAL STRIP.

The expanded metal leaving the machine as per R 2-6-6 has the following dimensions:





EXPANDED ONCE



EXPANDED TWICE

STARTING MATERIAL				RIBBON AFTER EXPANSION					
Dimensions of the ribbon	Dimensions of the indentations (see the sketch)			thickness	width	number of meshes/cm² ⌜	weight in g/cm²	Code-number	
	a	b	c						
Ni/0,15x43	0,2	1,2	1,0	0,18-0,20	40-41	13x9 ⌜		0426099	after exp. once
				0,24-0,26	37-38	11-10 ⌜	0,0534	0426150	after exp. twice

⌜ Measured in the direction of the length and the width repectively.

From the expanded metal as per the above table, the following widths are cut.

Code number of the ribbon	Width of the ribbon expanded once	Width of the ribbon expanded twice	To be cut from ribbon code number
04 260 56	6		04 260 99
04 260 61	7		04 260 99
04 260 62	8		04 260 99
04 260 73	13		04 260 99
04 260 64	9		04 260 99
04 260 71		11	04 261 50
04 260 80		20	04 261 50
04 260 82		22	04 261 50
04 260 86		26	04 261 50
04 260 88		28	04 261 50
04 260 94		34	04 261 50

THE MANUFACTURE OF Ba-Ni-tubes.

APPARATUS:

Apparatus for sucking barium into Ni-tubes R 2-9-20

ADDITIONAL APPARATUS:

Degassing apparatus (see photo on page 8)
X-ray apparatus "Madro 100" type No.1117
Apparatus for testing Ba-Ni-wire R 2-9-21
Clamping piece
Vacuum vessel (exsiccator)
Grinding machine for grinding Ba-Ni-tubes R 2-9-22
Cutting machine for cutting Ba-Ni-tubes R 2-9-23

REQUIRED MATERIALS:

Nitube		R 16-1-3
Barium (American blocks)	02 760 03	R 16-8-4
Red lacquer	02 020 41	R 2-5-6
Liquid paraffin (water free)	02 002 62	R 2-1-31
Petrol (gasolene)	02 810 90	S 80
Trichloric ethylene	02 940 65	
Argon (Ar+12% N_2)	40 100 49	R 16-10-54

VARIOUS SIZES OF Ba-Ni-TUBE:

The dimensions of the tube, before and after the filling with barium, are given on page 2.

DIMENSIONS OF THE ORIGINAL MATERIAL			DIMENSIONS AND CODE NUMBERS OF THE DaM1 TUBE READY FOR DELIVERY				REMARKS
OUTER DIAM. IN mm	WALL THICKNESS IN mm	LENGTH IN mm	OUTER DIAM. IN mm	WALL THICKNESS IN mm	LENGTH IN mm	CODE NUMBERS	
8,0	1,5	600	2,0	0,4-0,55		33 032 69 /*	The tube is drawn after it has been filled with barium
8,5	1,25	750	2,0	0,25-0,35		33 032 68 /*	The tube is drawn after it has been filled with barium
2,0	0,1	500	2,0	0,1		33 032 70	
2,0	0,5	500	2,0	0,5		33 032 71	
1,14	0,1	500	1,14	0,1		33 032 61 /*	
0,8	0,1	500	0,8	0,1		33 032 40 /*	
0,8	0,075	500	0,8	0,075		33 032 30 /*	
1x3 /-	0,1	500	1x3	0,1	5 /-	62 880 97	This tube is squashed from round tube of 2,0 diam.
1x3 /-	0,1	500	1x3	0,1	7 /=	61 882 69 /*	This tube is squashed from round tube of 1,14 diam.
0,65x1,5	0,1	500	0,65x1,5	0,1	5 /-	62 881 51 /*	

/- A length of 40 mm of thetube remains unsquashed. This part serves for connection with the clamping piece.

/= Is delivered under liquid paraffin.

/== Is delivered in vacuum tubes.

/* Degassed barium.

PROCEDURE:

1. Clean the Ni tubes in trichloric ethylene (tri) and then clean them out with pressure air.
   Dry them well as otherwise a black film will form either on or in the tube.
   The dimensions of the blank tubes are given in the table of page 2.

2. Anneal the Ni tubes in H_2 or mixed gas.
   Tubes of 0,8 diameter to be stoved for 3 min. on 850°C.
   The tubes of 2,0 diameter (also the squashed ones) should be stoved for 5 min. on 900°C. Stove the tubes of 8 and 8,5 diam. for 2 hours on 1200°C.
   The stoving is not done continuously i.e. the Ni-tubes (in the boats) are placed directly in the middle of the oven and are brought into the cooler after the prescribed time has elapsed.

3. The Ni tubes of 8 and 8,5 diameter should be heated to about 650°C in the preheater.
   8 to 10 litres of (green) mixed gas should be supplied into the lower part of the oven.
   About 10 tubes can be preheated simultaneously.

4. Bring the Ba-oven on a temperature of 950°-1000°C.
   This is done while 8 or 10 litres of mixed gas are supplied per minute.

5. Fill the crucible of the oven with barium.
   For this purpose shut the mixed gas off and supply argon (3 litres per min.).
   It is absolutely necessary to supply argon before the tubes are filled with barium and also during the following operations argon should be supplied.
   The crucible is filled in the following way:
   1. Open a tin of barium.
      Each tin contains about 1,5 kg. of barium.
      The barium may only be exposed to the open air as short as possible.
   2. When necessary degas the barium (see photo on page 8).
      This degassing is done for most Ba→Ni tubes (though not for all kinds). The table on page 2 shows what Ba-Ni tubes have to be degassed.
      Pre-degassed barium is of better quality.
      This degassing is done in the following way:
      a. Fill five basins with barium.
         These five basins together can hold about 1 kg of barium. The 0,5 kg. of barium which is left in the tin, is kept under petrol (gasolene).

The material of the basin is: iron, thick 0,150mm
High : abt. 40 mm
Diameter : abt. 68,5 mm
2 holes have been made in the bottom of the basin, diam. = 2 mm (distance between centerlines is 57mm). These holes are made to thread the basins over an iron wire, bent in U-shape. The easiest way of working is to thread the basins first on the iron wire and to fill them afterwards.

b. Put the basins in an oblong glass bulb to which a chrome iron flange with bajonet joint is fixed.
Material of the tube: X-ray glass
Height : about 700 mm
Diameter : about 83 mm outer and 72 mm inner

c. Connect this bulb to an exhaust bench and pump it vacuum for approximately ½ hour.
Also a chrome-iron flange, with bajonet joint has been melted to the pump. The bulb is connected to the pump with a bajonet joint while a rubber ring is used for air tightness.

d. Heat the barium by means of an oven (220 V, 11 Amps. 700°C).
When this is done all basins with barium should be in the oven.
The oven is put over the bulb when the latter is still cold and then the oven is switched on.
After 45 minutes the oven should have reached a temperature of about 400°C, while the temperature should be about 475°C after 60 minutes.
Now the temperature is raised until the barium just starts evaporating. This evaporation begins when a black film is formed in the bulb above the basins. This takes place at about 500°C.

e. At this moment adjust the temperature of the oven 25° lower than it was when the evaporation began.

f. Leave the oven on this temperature until the vacuum is less than 50 units, measured with a Mc.Leod, after the exhaust cock has been shut for 3 minutes.
Duration about 1 1/4 hour.

g. Cooling.
Immediately after the oven is switched off, it is removed and the bulb remains there for about 1,5 hour, so it can be cooled down by the surrounding air.
Thereafter pressure air is blown against the outside of the bulb for about 1 hour.

h. Take the basins with barium out of the tube and put them in an exsiccator (vacuum vessel).

3. Fill the filling tube with barium.
The filling tube is a tube of sheet iron long 455 mm outer diam. 31,5 mm, inner diam. 27 mm. A piece of barium which can just pass the tube is put on a nail fastened to a piece of iron wire of about 750 mm length. Let this piece of barium down in the tube as far as the bottom end of the tube.
Then fill the tube with one basin of barium. Lower the tube into the oven. In the oven the lump of barium melts on the pin, this causing the remainder of the barium to fall into the crucible and to melt. Then take the tube out of the oven again.

6. Clamp the tube in the clamping piece to which a glass tube long 330 mm diam. 7 mm outer diam. 10 mm has been melted by means of a chrome iron flange.

7. Preheat the tubes to be filled one by one in a Ba-oven. The thinner tubes, which are not brought in the preheater oven, are preheated for 20 to 40 seconds on 1000°C.
The tubes with diameter of 8 mm are preheated during 10 to 12 minutes on 1000°C.
The tubes of 8,5 mm diameter are preheated during 5 minutes on 1000°C.
During the preheating process the lower end of the tube is about 40 mm above the surface of the barium.

8. Fill the tube with barium.
The vacuum hose is connected to the glass tube. Then lower the Ni-tube in the molten barium nearly as far as the bottom and open the vacuum cock.
The tube should be such hot that it gets just sufficiently filled.
If the height of the barium in the tube is too low, the tube is too cold. If the barium rises as high as the clamping piece the tube is too warm. To prevent the barium from getting into the tube through the clamping piece, which would make it crack, a piece of gauze is put in the clamping piece.
When the tube is filled in the proper way the gauze plate should always be clean.
Remark: The duration of the entire sucking-in process may not take more than 2 hours, as otherwise too much dirt will come into the crucible.

9. Close the vacuum cock, pull the Ni tube slowly up, such that the red hot part of the tube cools down so much that the tube does not glow any more.
Before pulling up the tube the conduct pipe of the mixed gas is connected to the glass connecting piece above the opening of the oven.

10. Take the tube out of the clamping piece, cut off the empty parts of the thin tubes and the 10 mm length of the bottom end, which has been in the crucible, and throw the cut-off ends away.
    About 30 mm length of the empty ends of the thick tube can be used for connection when drawing.

11. As far as the thick tubes is connected the tube should be ground and painted with lacquer paint. The thin tubes are ground and cleaned throughly on the grinding machine after the black end, which has been in the barium, has been ground.
    The thick tubes are entirely ground by hand. Ordinary sandpaper is used for this work.

12. Draw the thick tubes to the diameter as given in the table on page 2.
    Before drawing, the lacquer on the tubes is removed.

13. See whether the tube is properly filled.
    The thin tubes are screened with an X-ray apparatus. So-called "bubbles" can easily be discovered as they show up as light spots. These parts are cut out and are not used.
    The thick tube is checked for "bubbles" on a special apparatus after drawing.

14. Close the ends of the approved tubes with lacquer paint or cut the tube in small pieces.
    These pieces are either 5 mm or 7 mm long and are put into a bottle with liquid paraffin (free of water) or are sealed into a vacuum tube.

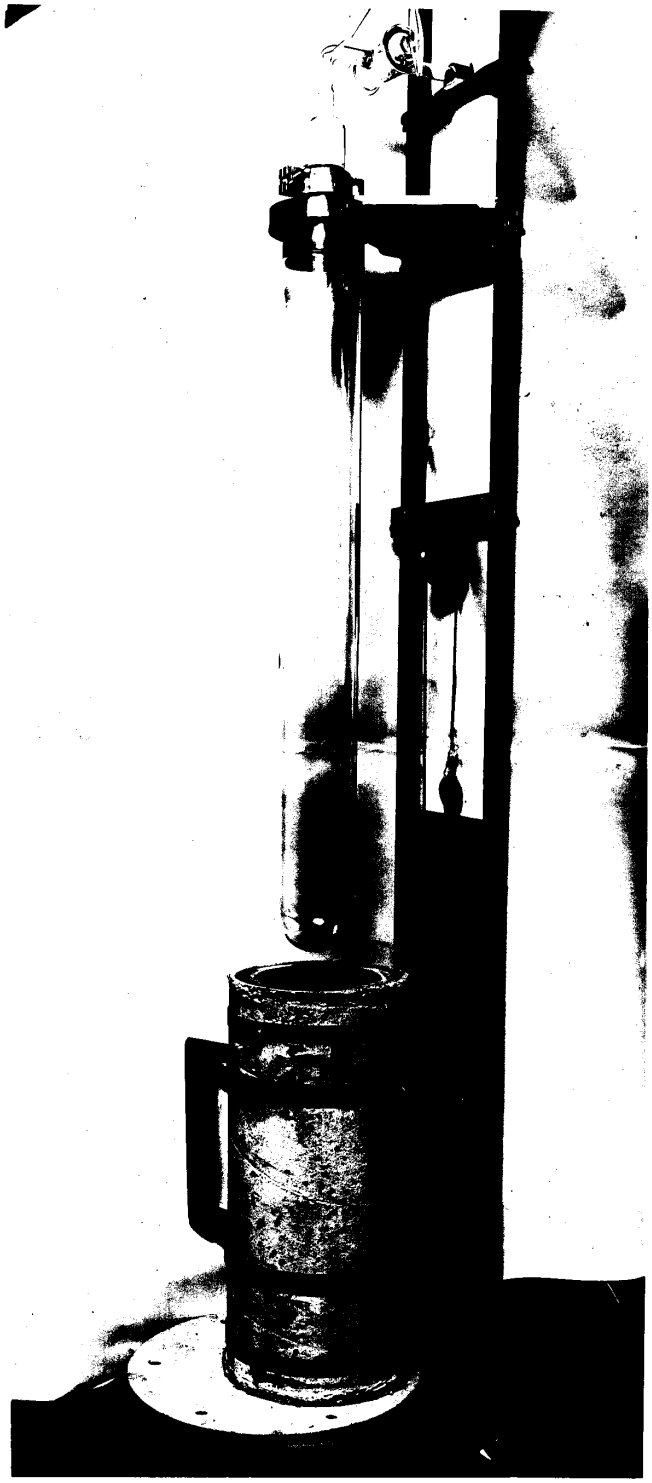
The drawn tube is wound to a diameter of 100 mm on either a winding machine or a lathe. Then the coils are put in petrol (gasolene) for 2 or 3 hours, to remove the grease. After pouring off the petrol close the ends with lacquer paint and keep (store) the coils in closed tins.

REMARKS:

When making Ba-Ni tubes for X-ray tubes the above mentioned procedure is deviated from on the following points:
1. Use only "the first filling of the crucible".
2. The ends of the filled tubes are not closed with lacquer paint, but after screening, the tubes are pumped vacuum in tubes of X-ray glass (4,5-5,0 diameter, wall thickness 0,5-0,6 mm and long 450 mm) on a temperature of 300°C for 30 minutes.
   (Put 1 Ba-Ni tube in each glass tube).

SAFETY MEASURES:

1. Never touch barium with tri or tetra, as this would cause an explosion.
2. Care should be taken that the tube provided with screw cap, in which the petrol is put, is proper dry, as otherwise hydrogen would be developed (with the Ba).
   In the works it is prohibited to use glass bottles for the petrol (gasolene).
3. Be extremely careful with the petrol to prevent a fire and explosion.
4. Keep the stock of the Ba under petrol in a well ventilated room, where no open light is present.
5. Remove the barium from the petrol at a safe distance from the melting oven.
6. Do never throw waste or rejects of barium or filled tube in the dustbin. This could start a fire.
7. Always care should be taken to have sufficient sand present on the place where barium is handled. Sand is the best means to extinguish any possible fire. Also foam extinguishers should be present in case of a petrol fire. A fire blanket and a spray extinguisher, are also recommended.
8. Use safety goggles during all operations.
9. Always use a tin opener for opening the tin of barium and donot chop to prevent danger of fire.



Date: 19-7-38. R 2-9-1

SUPPLEMENT.

With some types of valves BaNi tubing is used, the barium of which is first degassed before putting it in the furnace. This is done on the following method.

1. Pick up the pieces of barium with a pair of pliers or tweezers from the petrol (gasoline) and transfer them to a cup.
   Material of the cup : iron sheet 0,150 mm
   Height : abt. 160 mm
   Diameter : must just fit in the tube referred to below.
   The pieces of barium must be piled as loosely as possible.
2. Bring the cup into a glass bulb to which a chrome-iron flange is fixed.
   Material of the bulb: RÖntgen glass
   Height : abt. 600 mm.
   Diameter : abt. 50 mm.
3. Fix the bulb to an exhaust-bench and exhaust for about ½ hour so as to remove the gasoline.
   A chrome-iron flange has also been sealed to the exhaust-bench. The bulb is fixed to this flange by the aid of a few clamps, a rubber ring being used as a washer.
4. Heat the barium by the aid of the furnace.
   The whole cup must be in the furnace.
   After about 45 minutes the furnace temperature must have risen to 400° C, and after abt. 60 min. to abt. 500° C.
   Now the temperature is still raised until the barium just begins to evaporate. This may be gathered from the fact that a black deposit forms in the bulb over the cup.
5. Now decrease the temperature that reigns at the beginning of the evaporation, by about 25° C.
6. Maintain this temperature until the vacuum, measures by the Mc.Leod manometer, is less than 50 units when the exhaust-cock is closed for 3 minutes.
   Time: about 1½ hours.
7. Allow to cool, remove the cup from the bulb and use the barium as soon as possible in the manufacture.

REMARK:

In case degased barium is to be forwarded, use a bulb that is not fixed to the exhaust-bench by the aid of a flange, but one that is sealed direct to the bench. To this end a capillary is drawn to the bulb after having introduced the cup.
When the barium has been degased the bulb is tipped off and forwarded.

Date: 18/4/'39

R 2-9-20
Page 1

APPARATUS FOR SUCKING Ba INTO Ni-TUBES.

TYPE:

There is only one type of this apparatus.

Oven and electricalequipment:

This is the latest type. On page 2 and following a description is given.

Application:

The preheating of the Ni-tubes and the melting of the barium.

REQUIRED MATERIAL:

Green mixed gas R 16-10-65

APPARATUS:

The drawing on page 4 shows a section of the oven, while the photo on page 5 shows the entire apparatus. The following parts are to be distinguished:

1. Two ovens (1 for melting Ba and 1 for preheating) 1050°C, 220 V, 18 A, inner diam. 100 mm, length 500 mm.
2. Tube (silimanit) 50x60x220.
3. Crucible 84 335 60.2, material: mild steel, wall thickness about 5 mm.
4. Connecting piece for hose.
5. Tube (porcelain) 80x70x720.
6. Cooling piece.
7. Gasmeter for argon and green mixed gas.
   The photo shows a ball instead of a meter. This has been altered lately.

10. Glasstube for cooling the tube filled with barium.
A1. Drum switch.
M1. Meter 0-60 Amps. A.C.
M2. Pyrometer 0-1200°C.
T1. Transformer 7 kVA primary 380 V, secundary 220 V. This transformer is built in the switch casing.

This equipment consists of an electrically heated oven (1). Tube (2) is mounted in this oven, while the crucible (3) is placed on top of the tube (2). Lumps of barium are put into the curcible and are melted by the heat of the oven.

While heating and cooling the oven green mixed gas should flow through the oven and fresh water should run through the cooler. The mixed gas as well as the water is connected before the oven is switched on. The cooling water should be kept on for about 5 hours after the oven is switched out. The mixed gas flows for 3 hours at a rate of 3 Litres/min. and is then stopped.

The cooling piece (6), through which streams the cooling water serves for keeping the top end of the porcelain tube (5) cool. The cooling piece should be made of red copper. If the lower lid is soldered on, the soldering material would loosen when the water is not connected or if for some reason or other the cooling water does not stream properly. If in that case the cooling water would start streaming again, the water could come into the oven through the leaking spots and would very likely cause an explosion. The red copper pieces are stuck to the porcelain tube (5) at the top as well as at the bottom and should dry for about 24 hours in the air near the central heating.

Silver solder should be used for the soldering of the top cover.

A hood and a ventilator have been applied above the equipment because a white smoke (BaO) comes out of the oven during the filling and also frequently during the use of the equipment. This smoke affects the membranes.

The electric current for the oven is derived from a transformer (T1), which supplies the following secundary voltages by means of the drum switch (A1).
The transformer and the drum switch have been built together in one casing.

Position of Al	Secundary voltages of (T1)	Position of Al	Secundary voltages of (T1)
1	0 V	6	170 V
2	45 V	7	180 V
3	85 V	8	190 V
4	120 V	9	210 V
5	140 V	10	220 V

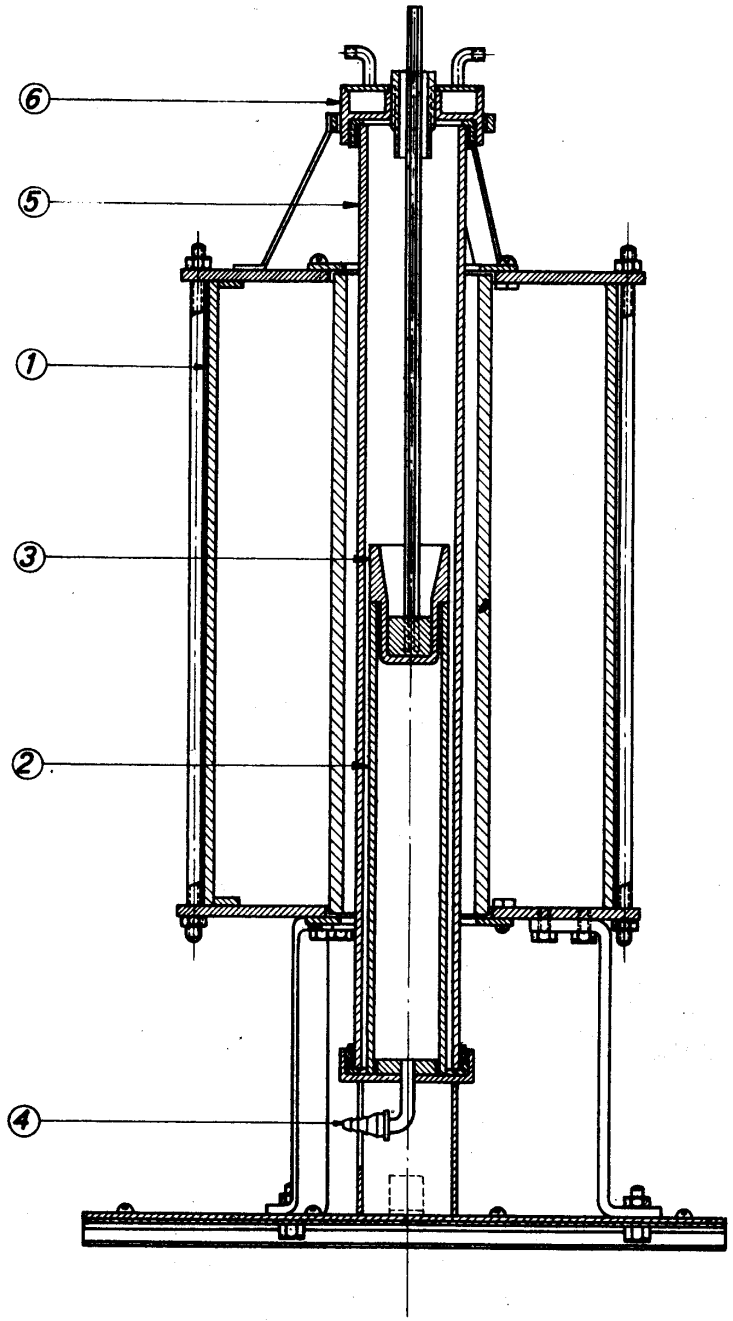
When switching the oven on, the drum switch is immediately put in position 5 or 6. The switch remains in this position for about 10 min. and is then brought into position 10 until the pyrometer indicates 1000°C.

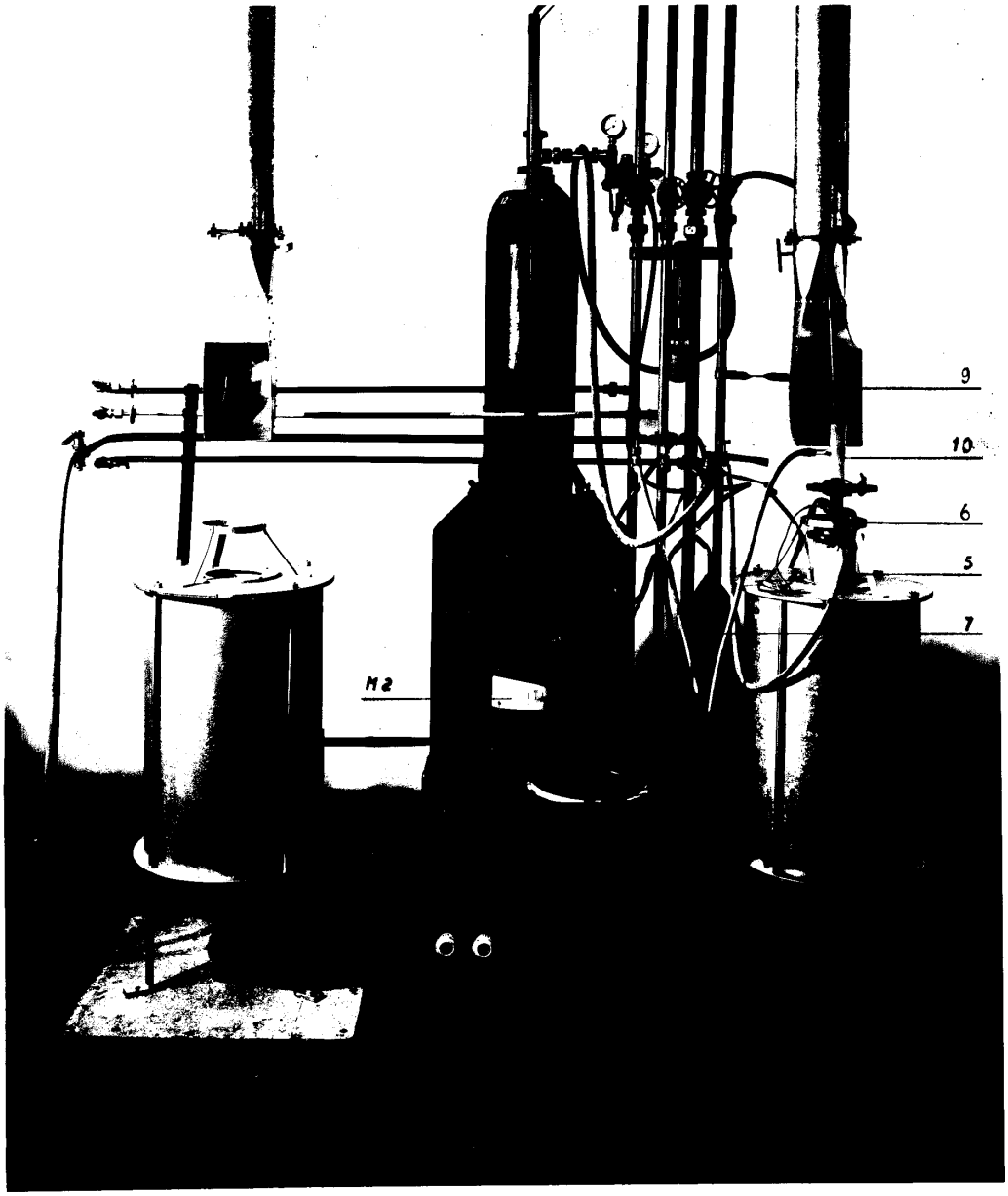
UPKEEP:

Every day, before starting work, the crucible which has been used the day before, is taken out of the oven and is replaced by a clean one. The dirty crucible is placed in fresh water for about one day and is then cleaned with sandpaper.

FLOOR SPACE AND WEIGHT:

The floor space sufficient for 2 ovens is 1,6x1,1 m^2.
The weight is 370 kg.





Date: 3-7-39.
Date superseded sheet: 6-2-39.

R 2-10-5

PREPARATION OF GRAPHITE SUSPENSION NR. VII.

REQUIRED MATERIALS:

45 g of cut agar-agar
1 litre of distilled water
0,425 kg of dixon graphite Nr. 1365
10 cc of ammonia 6 N.

* The above quantities yield about 1,35 litres of graphite suspension.

PREPARATION:

* 1. Cut the agar-agar to pieces as small as possible.
* 2. Dissolve 45 g in one litre of distilled water.
This is done in an Erlenmeyer flask which is placed as low as possible in boiling water during 5,5 to 6 hours. (Continuously replenish the water).
A small funnel is placed in the opening of the flask in order to prevent evaporation as much as possible.
* 3. During dissolving 0,425 kg of dixon graphite and 10 cc of ammonia 6 N are put in the jar of a ball-mill (contents 5 litres and containing porcelain balls as per R 2-2-1).
* 4. The dissolved agar-agar is poured into this jar through a sieve B 40 (40 meshes per running cm). The agar-agar solution should be as warm as possible. Accelerate this process by means of a small brush.
* 5. Immediately thereafter shut the jar and start the ball-mill.
* 6. Grind continuously during 96 hours (four days).

USE:

* This graphite suspension is used a.o. for the inside blackening of bulbs. However to this end it still has to be diluted (see R 3-14-15).

STORAGE:

* Graphite suspension is kept in well-closed stoppered bottles.

CODE NUMBERS AND NOTICES:

Agar-agar	02 753 05	R 16-10-69
Distilled water	02 970 25	
Dixon graphite Nr.1365	02 810 42	R 16-10-5
Ammonia 6 N	02 750 80	AN-8271
Graphite suspension Nr.VII	02 752 26	

te: 13-7-'40. R 2-11-10.
Date superseded sheet: 10-1-39. * Page 1.

THE PREPARATION OF TRIPLE-CARBONATE.

REQUIRED MATERIALS:

Triple carbonate T1:

a.	12,42	kg	of barium nitrate $Ba(NO_3)_2$ (waterfree)
	7,14	kg	of strontium ~~carbonate~~ $Sr(NO_3)_2$ (waterfree)
	4,9	kg	of calcium nitrate $Ca(NO_3)_2$ (1½ % of water)
	160	litres	of distilled water
b.	17,6	kg	of ammonium-bicarbonate
	32	litres	of distilled water of 45° C
c.	1		tablespoonful of norit (colloidal activated charcoal)
d.	7,6	litres	of ammonia
e.	15	litres	of alcohol

(5.437 kg $Ca(NO_3)_2 \cdot H_2O$ 679.62)

Triple carbonate T2:

a.	9	kg	of barium nitrate $Ba(NO_3)_2$ (waterfree)
	17,76	kg	of strontium nitrate $Sr(NO_3)_2$ (waterfree)
	1,32	kg	of calcium nitrate $Ca(NO_3)_2$ (1½ % of water)
	140	litres	of distilled water
	1		tablespoonful of norit
b.	20,94	kg	of dried soda
	75	litres	of distilledwater of abt. 85° C.
c.	1		tablespoonful of norit
d.	15	litres	of alcohol

PREPARATION:

Triple carbonates T1 and T2:

1. Entirely dissolve the quantities mentioned under a in a V2A-steel or nickel tank, stirring all the while.
2. Add one tablespoonful of norit to the solution and keep it at a temperature of abt. 85° C.
3. Entirely dissolve the quentities mentioned under b in a V2A-steel or enamelled tank, stirring all the while.
   With T1 the temperature may not exceed 45° C.
   With T2 the temperature may not exceed 85° C.

21a

4. Add d to b (only for triple-carbonate T1).
5. Filter the hot solution a and pour the liquid drawn in an aluminum tank. Let it before pass through a metal sieve Nr. 325 (325 meshes per running inch).
   In this tank the solution is kept at a temperature of 85° C.
6. Add solution b, stirring all the while.
   To this end the solution b is poured through a funnel with filter Nr. 117½. The outlet opening of the funnel has been perforated in such a way that solution b is added in abt. half an hour.
   After the addition of b, not all the barium -strontium will have precipitated as carbonate; after the addition of a little soda-solution the clear liquid should becoms a little cloudy.
7. After the precipitation the liquid is drawn in a tank destined for the purpose, stirring all the while.
8. Decant after the liquid has settled.
9. Prepare a second portion in the samw way.
10. Thereafter transfer the precipitate on two stone-ware suction filters.
11. After tamping down the precipitate, wash it with 20x5 litres of hot distilled water.
12. Thereafter wash it with 15 litres of alcohol.
13. Then suck it air-dry and transfer it on flat dishes; dry in a vacuum drying-case for 24 hours.
14. Pulverize the large pieces and finally dry it for about 3 hours.

REQUIREMENTS:

Triple-carbonate T1.

barium carbonate	abt. 50%
strontium carbonate	abt. 30%
calcium carbonate	abt. 16%
N_2O_5	abt. 1%
H_2O_5	abt. 1%
Na_2O	abt. 0,1%

The abovementioned double portion yields about 33 kg of triple-carbonates. For a practical test from this quantity a sample is drawn.

Triple carbonate T2.

$BaCO_3$	abt. 34%
$SrCO_3$	abt. 61%
$CaCO_3$	abt. 4%
H_2O	0,5%
N_2O_5	0,5%
Na_2O	0,1%

22a

USE:

Triple-carbonate is used in the preparation of triple-carbonate coating as per R 2-11-11.

CODE NUMBERS AND INSTRUCTIONS.

Barium nitrate	02 760 20	R 16-3-1
Strontium nitrate	02 930 01	R 16-3-2
Calcium nitrate	02 770 81	R 16-3-3
Distilled water	02 970 25	
Ammonium-bicarbonate	02 751 10	R 16-10-2
Ammonia	02 750 80	Norm S271
Norit	02 880 91	R 16-3-6
Alcohol	02 752 75	R 16-10-17
Soda	02 931 45	R 16-10-19
Triple carbonate T1	02 770 79	
Triple carbonate T2	02 770 73	

23A

Date: 10-1-39. R 2-11-11
Date superseded sheet: 4-10-38. Page 1.

THE PREPARATION OF TRIPLE-CARBONATE COATING.

REQUIRED MATERIALS:

Triple-carbonate coating T1:

a. 3 kg of triple-carbonate T1
0,5 litre of binder Nr. 3
1,28 litre of amyl acetate
1,8 litre of methylic alcohol

The triple-carbonate must be quite dry. It should always first be dried in a drying-case at abt. 110° C.

b. 1,170 litre of binder Nr. 3

c. 0,3 litre of diaethyl oxalate

Triple-carbonate coating T2:

a. 3 kg of triple-carbonate T2
0,5 litre of binder Nr. 3
1,28 litre of amyl acetate
1,8 litre of methylic alcohol

The triple-carbonate must be quite dry. Is should always first be dried in a drying-case at abt. 110° C.

PREPARATION:

1. Ball-mill the quantities mentioned under a during 48 hours in a porcelain ball-mill (contents 5 litres), containing abt. 3 kg of flint stones (diam. 25 to 30 mm) andmaking abt. 65 rev./min.
2. Add b.
3. Then pour it into a dried stoppered bottles through a siete Nr. B50 (silk gauze of 50 meshes per running cm) or Nr.130 (phosphorus bronze gauze).

REMARK:

If the spraying should be too dry, c may be added to the coating.

STORAGE:

Store the coating in dried stoppered bottles.

24a

USE:

This coating is used in spraying some cathodes. See the relevant construction-data.
Before use, shake the coating until a homogeneous mixture has been obtained.

NOTICES AND CODE NUMBERS:

Triple-carbonate T1	02 770 79	R 2-11-10
Triple-carbonate T2	02 770 73	R 2-11-10
Binder Nr. 3	02 761 07	R 2-1-5
Amyl acetate	02 752 95	R 16-4-1
Methylic alcohol	02 870 40	R 16-10-3
Diaethyl oxalate	02 780 12	R 16-10-11
Triple-carbonate coating T1	02 770 78	
Triple-carbonate coating T2	02 770 74	

T1 is cath. ray tube coating.

25a

THE PREPARATION OF THE SPRAYING LIQUID FOR HEATERS.

REQUIRED MATERIALS FOR COATING NO.A1

1,6 kg of alundum (purified)
2 litres of binder no.7

REQUIRED MATERIALS FOR COATING NO.A3

12 kg of alundum (900 mesh)
9,6 litres of binder No.7

REQUIRED MATERIALS FOR COATING NO.A4

8 kg of alundum (900 mesh)
12,8 litres of binder No.7

REQUIRED MATERIALS FOR COATING NO.A8

3 parts of coating no.A4
1 part of butanol

THE PREPARATION OF COATING Nos.A1, A3 and A4.

1. Dry the alundum in a vacuum drier at a temperature of 90° C for two hours.
2. Sieve through a sieve No.130 (phosphor bronze gauze of 139 meshes per running inch)
3. Mix the required materials:
   A1 for 3 hours in a porcelain ball mill (contents 5 litres) containing 1,5 kg of flint stones having a diameter of 30 to 35 mm and making abt. 65 rev./min.
   A3 and A4 for 18 hours in a steatite ball mill (contents 40 litres) containing 16 kg of flint stones having a diameter of 30 to 35 mm and making abt. 45 rev./min.
4. Sieve the mixture through a sieve No.130 (see above) (alone for Nos.A3 and A4).

THE PREPARATION OF COATING No.A8

Shake the above mentioned quantities in a bottle until a homogeneous mass has been obtained.

USE:

Coating No.A1 is used in spraying some filaments by hand. See the relevant coildata as per R 3-1-..
Coating No.A3 is used in spraying filaments on the belt as per R 3-1-29
Coating No.A4 is used in spraying filaments by hand as per R 3-1-27

Coating Nr. A8 is used in spraying some filaments; cf. the relevant filament specifications R 3-1-...

These coating must be kept inblosed stoppered bottles and should be shaken one hour before use, until a homogeneous mass has been obtained again.

INSTRUCTIONS AND CODE NUMBERS:A

Alundum (purified)	as per R 2-12-3	02 750 48
Alundum (900 mesh)	as per R 16-7-6	02 750 52
Binder Nr. 7	as per R 2-1-5	02 763 10
Butanol	as per R 16-5-8	02 761 70
Alundum coating Nr.A1		02 750 57
Alundum coating Nr.A3		02 750 39
Alundum coating Nr.A4		02 750 33
Alundum coating Nr.A8		02 750 21

Date: 3-5-38. R 2-12-17
Date superseded sheet: 6-7-37.

THE PREPARATION OF ALUNDUM COATING FOR REINFORCING FILAMENT EXTREMITIES AND FOR REPAIRING COILS.

REQUIRED MATERIALS FOR COATING Nr. A6:

2.2 kg of purified alundum
0,8 litre of binder nr. 4

REQUIRED MATERIALS FOR COATING Nr. A7:

1,7 kg of alundum (900 mesh)
0,3 litre of binder nr. 4
0,4 litre of binder Nr. 9

PREPARATION OF COATINGS Nr. A6 AND A7:

1. Dry the alundum at a temperature of 90° C in a vacuum drier for 2 hours.
2. Sieve through a sieve Nr. 130 (phosphorus bronze gauze of 130 meshes per running inch).
3. Mix the sieved alundum with the binder for 14 hours in a dried steatite ball-mill (capacity: 5 litres) containing 1,5 kg of flint stones (diam. 30-35 mm) and making abt. 65 rev./min.
4. Sieve the mixture through sieve Nr. 130 (see above) Only after use, to remove impurities.

USE:

The alundum coating A6 is used in reinforcing filament extremities and in repairing all coils with the exception of 55-volts coils.
The alundum coating Nr. A7 is used in reinforcing the coil extremities and in repairing 55-volts coils.

The coating should be kept in dried stoppered bottles and be shaken into a homogeneous mass before use.

CODE NUMBERS AND NOTICES:

Alundum (purified)	02 750 48	R 2-12-3
Alundum (900 mesh)	02 750 52	R 16-7-6
Binder Nr. 4	02 761 15	R 2-1-5
Binder Nr. 9	02 763 12	R 2-1-5
Alundum coating Nr. A6	02 750 42	
Alundum coating Nr. A7	02 750 20	

THE PREPARATION OF CLEAR LACQUER 7-3026.

*REQUIRED MATERIALS:

a. 187 litres of toluol
34,5 litres of trioresylphosphate
12 litres of butanol
40 litres of benzol
4,25 kg of ricinus oil

b. 77 kg of nitrocellulose E 510

c. 100 litres of ethylacetate
60 litres of amyl acetate
32,5 kg of cellodammar resin

PREPARATION:

1. Bring the quantities mentioned under a in a lead-clad tank with mechanical stirrer and then put the machine in operation.
2. Add b and thereafter stir for abt. 10 min.
3. Add c and stir during abt. 2 hours.
4. Sieve the lacquer through a phosphorus bronze screen having 130 meshes per running inch.
5. Ascertain the viscosity with the aid of the Ford cup. It should amount to at least 3,5 min.
6. Store in closed iron tanks and in a fire-free room.

USE:

Clear lacquer is used in the preparation of diluted clear lacquer as per R 2-13-8

INSTRUCTIONS AND CODE NUMBERS:

*	Nitrocellulose E 510	02 771 86	R 16-4-4
	Trioresylphosphate	02 940 70	R 16-5-6
	Cellodammar resin	02 773 08	R 16-5-7
	Ricinus oil	02 000 90	Norm.Sheet S 620
	Ethylacetate	02 752 ~~35~~ 34	R 16-10-21
	Amylacetate	02 752 95	R 16-4-1
	Butanol	02 761 70	R 16-5-8
	Totuol	02 940 85	R 16-5-9
	Benzol	02 761 45	R 16-10-7
	Clear lacquer 7-3026	02 01024	

Date: 6-7-'37.
Date superseded 9-3-'37.

* R 2-13-3

THE PREPARATION OF DILUENT (WITHOUT ALCOHOL).

REQUIRED MATERIALS:

Diluent M31.

20 litres of amylacetate
40 litres of toluol
10 litres of butanol
20 litres of aethylic acetate
10 litres of aethyllactate (solactol)

Diluent B:

3,5 litres of benzol
3 litres of aethylic acetate

PREPARATION OF THE DILUENTS ~~Z-2031~~ AND B:

Mix the above materials and shake them.

USE:

Diluent M31 may be used in the preparation of diluted clear lacquer as per R 2-13-8; it is also used as a cleaner (see R 3-1-27 and R 3-1-30).
Diluent B is used in the preparation of diluted clear lacquer as per R 2-13-8.

INSTRUCTIONS AND CODE NUMBERS:

Amylacetate	as per R 16 -4-1	02 752 95
Toluol	as per R 16-5-9	02 940 85
Butanol	as per R 16-5-8	02 761 70
Aethylic acetate (solvent V)	as per R 16-10-21	02 752 35
Aethyllactate (solactol)	as per R 16-5-10	02 931 75
Benzol	as per R 16-10-7	02 761 45
Diluent ~~Z-2031~~		02 021 18
Diluent B		02 021 12

Date: 21/8/'34 R 2-14-4

LEAD GLYCERATE CEMENT

Composition:

500 g of lead oxyde (yellow, powder), see notice R 16-6-1.
100 cc of a mixture of 7 parts of glycerine (specific gravity 1.26) (see notice R 16-6-2) and 2 parts of water.

Preparation:

Mix the constituents in a mortar immediately before use.

Use:

This cement is used in basing transmitting-valves.

Code numbers:

Lead oxyde	0286031
Glycerine	0281101

Date: 5-12-38. R 2-14-11.
Date superseded sheet: 1-8-38.

THE PREPARATION OF GLUTEN FOR FLUORESCENT SCREENS OF CATHODE-RAY TUBES.

REQUIRED MATERIALS:

I. 3 g of cetyl alcohol (puriss.)
50 cc of alcohol

II. 10 cc of phosphoric acid
1000 cc of acetone(purified)
3 cc of solution I

The quantities stated under II yield abt. 1013 cc of gluten.

PREPARATION:

1. 3 g of cetyl alcohol are dissolved in 50 cc of alcohol by shaking.
2. 3 cc of this solution are added to the quantities of phosphoric acid and acetone (purified) stated under II and shaken into a homogeneous mixture.

USE:

This gluten is used in applying sulphide screens in cathode-ray tubes.

CODE NUMBERS AND NOTICES:

Phosphoric acid	02 900 28	R 16-10-67
Acetone (purified)	02 752 86	R 2-1-30
Alcohol (denaturated)	02 752 75	R 16-10-17
Cetyl alcohol (puriss.)	02 752 79	R 16-10-72
Gluten	02 110 16	

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Date: 9/1'34

R 2-16-2

THE PREPARATION OF SOLDERING-FAT N AND D.

Constitution:

A 4,5 kg of vaseline
1,5 kg of lanoline

B 750 g of $ZnCl_2$(powder)
75 g NH_4Cl
750 g of water.

Preparation:

1. Separately melt the vaseline and the lanoline on a steam-bath and then put them in an iron churn.
2. Dissolve $ZnCl_2$ and NH_4Cl in water.
3. Add B to the melted substance A and make the mixture rotate until it has entirely cooled(about 6 hours).

In case a softer soldering-fat is wanted(e.g. in winter when a low temperature prevails) replace part of the vaseline by liquid paraffin according to requirements.
The material is termed "Soldering-fat D" if the vaseline has been entirely replaced by liquid paraffin.

Code-numbers:

Soldering-fat N 3396900
" " D 3396901.

THE MANUAL SPRAYING OF HEATERS.

OBJECT:

Applying an insulating coating to heaters.

REQUIRED MATERIALS AND INSTRUCTIONS:

Alundum coating A1	as per R 2-12-8	02 750 57
Alundum coating A6	as per R 2-12-17	02 750 42
Alundum coating A7	as per R 2-12-17	02 750 20
Diluent N31 (cleaner)	as per R 2-13-3	02 021 18
Gun	as per R 3-1-71	
Reducing	as per R 36-2	

INSTALLATION:

The spraying is done in a spraying-case, in which a horizontal disc has been applied which can be moved by means of a motor.

A suction-hood is connected to this case which sucks the coating that falls beside the heaters.

For the spraying a spraying-gun as per R 3-1-71, but without stirrer, is used which is connected to a reduction-valve fixed to the compressed-air conduct. The opening of the gun is 1 or 1,5 mm, whereas the pressure (read on the reduction-valve) amounts to 1,5 to 3 atm. This pressure depends upon the type of heater which has to be sprayed.

PROCEDURE:

* 1. If necessary, reduce the heaters as per R 3-6-2.
   a) to remove the elasticity from the heaters.
   b) to remove any finger-grease (which makes the coating difficult).

2. Place the heaters (with alundum rods or tubes, if any) in an eternite block with 30 holes, so thath the ends of the heaters protrude from the block.
   The depth of the holes is equal to the sprayed length of the heaters + the sprayed length of the ends).

3. Take the heaters from the block with a rubber-clad clamp.
   One clamp takes all the coils at a time.

4. Place six clamps with heaters in a wooden block.
   Into this block 6 holes are drilled beside each other.
   The distance between the holes is 50 mm.

5. Place the block with clamps on the disc in the spraying-chamber after which a turning movement is given to the disc.

6. Pre-spraying (gun in hand).
   Care should be taken that all the heaters are sprayed as equally as possible.
   The air-pressure for the gun is regulated as follows:

Type of heater to be sprayed	Pressure in kg/cm^2
Single bifilar heater without or with short alundum rod or tube	abt. 1,5
Single bifilar heater with thick long alundum rod	2-3
Double bifilar with thin alundum rod	abt. 1,5

7. Final spraying (gun in han d).
   After the disc has been stopped, take the block out, take the clamps one by one out of the blosk and spfay the heaters equally to both sides, until the required thickness has been obtained (see the relevant filament specifications (R 3-1-...).
8. Check the thickness (tests at random).
   This thickness is checked with 2 micrometers.
   These micrometers are adjusted such that a heater sprayed to measure falls through the first micrometer and is stopped by the other.
9. Dry the heaters.
   Place the block with 6 clamps in a drying-furnace; temperature 110°, time abt. 10 min.
10. Strenghten the ends, if necessary.
    This is done with the aid of a small brush.
11. Take the heaters from the clamps and check them as to damages, if any.
* If possible the damged heaters should be repaired with alundum coating Nr. A6 or A7 as per R 2-12-17.
12. Put the heaters in the appertaining Mg or alundum tubes, which the exception of those which are not baked in a tube; see the relevant filament specifications (R 3-1-....).
13. Reduce as per R 3-6-2.
14. Apply flattened ends to the heaters, if any.
15. Finally check as to:
    a. damage of the spraying.
    b. regularity of the spraying.
    c. thickness of the spraying (random test).
    d. length of the coil
    e. brittleness (by moving the ends to and fro).
    f. the cold resistance (random test).
* The specific resistance of tungsten wire at 15° C amounts to 0,057.
    g. the sprayed length of the ends.
    h. the length of the alundum rod protruding from the heater. If not stated otherwise in the filament specifications, this should be between 0,5 and 1 mm).
    i. The flattening of the flattened ends.

UPKEEP:

After the termination of the work the coating of the tank is poured into a bottle with the remaining coating and is kept homogeneous in a shaker. The tank is cleaned with diluent N°1(R2-15-1).

Required floor space: 1,8x0,9 m^2. Weight: 300 kg (estimated).

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6/12'32.

THE SPRAYING-GUN .

The sprayıng-gun is the principal part of every sprayingmachine, as the quantity and the nature of the spraying depends on it, while the slightest defect of the gun entails irregular spraying.

The gun consists of the following parts (cf.drawing on page 2):

(1) Outside nozzle
(2) Inside nozzle
(3) Check-nut
(4) Packing
(5) Six-angled head-piece
(6) Needle
(7) Packing
(8) Packing-bush for packing(7)
(9) Driver
(10) Packing-bush for packing (11)
(11) Packing
(12) Air-valve
(13) Puller-shaft
(14) Adjusting-nuts
(15) Screw for puller-shaft
(16) Valve-spring
(17) Needle-spring
(18) Valve-screw
(19) Locking-bush
(20) Puller
(21) Handle-nut
(22) Socket for fixing the hose
(23) Driver-fork

The gun operates as follows:

The liquid of the reservoir passes through a channel in the gun to the inside nozzle (2).

For the purpose of atomizing the liquid, compressed air is used which is led to the mouth of the gun through a second channel which runs round about the firstmentioned channel. The air enters through a tube in the handle of the gun and then follows the way indicated in the drawing by means of arrows; it finally arrives at the space which is formed by the inside nozzle and the conical bush which locks the former and which is termed outside nozzle(1). The air then leaves the gun through the ring-shaped opening which is formed in this way.

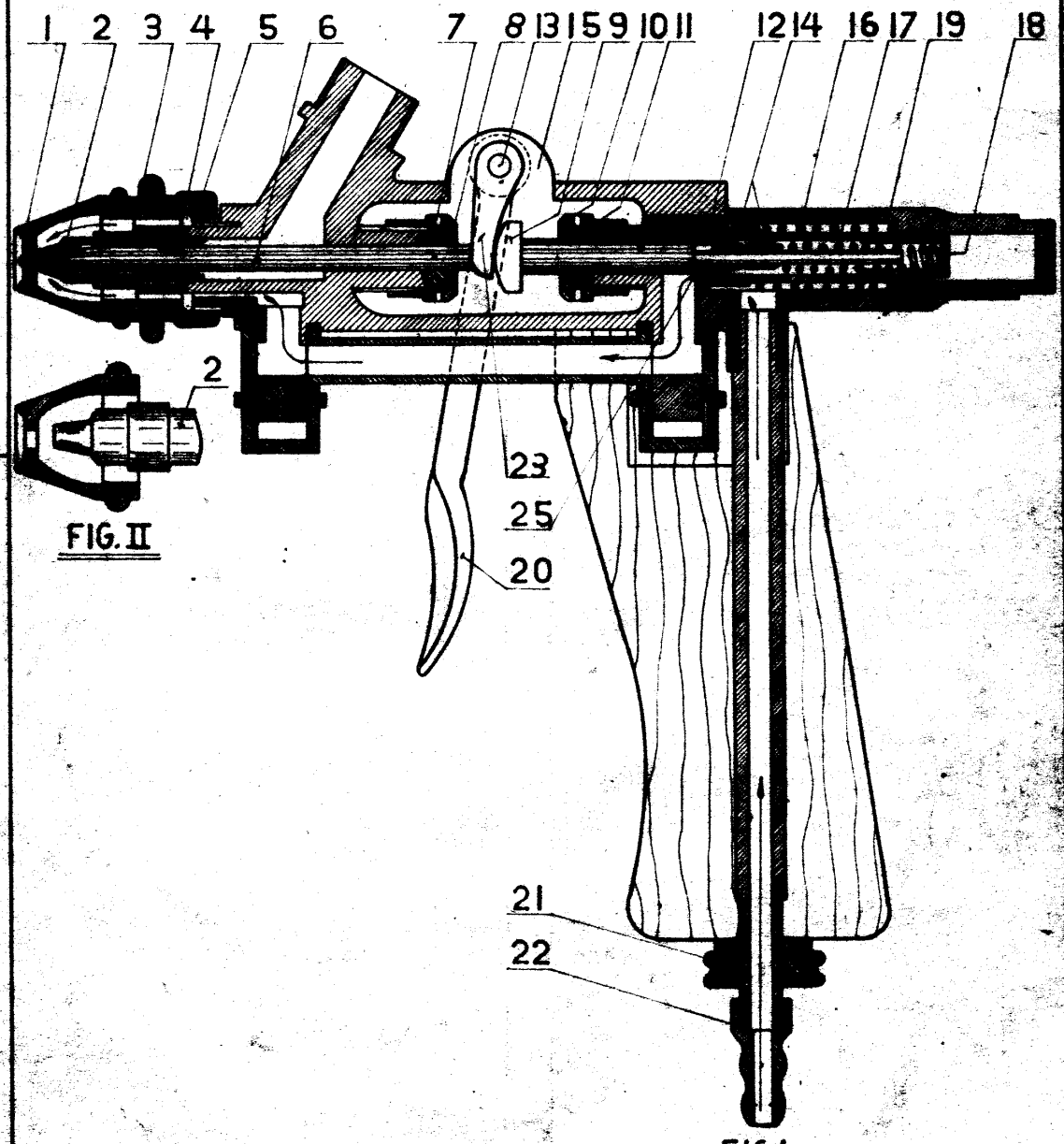
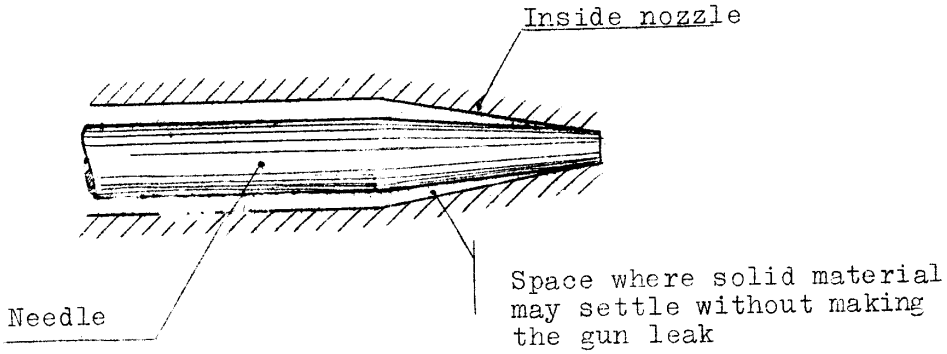


FIG. II

FIG. I

In general the jet of the gun is good when the opening of the outside nozzle (1) lies in the same plane as that of the inside nozzle.The jet becomes thinner, when the outside nozzle is turned forward, so that it occupies the position shown in fig.2. In case the outside nozzle is turned forward too much, the air will finally be driven into the liquid-reservoir which makes that the jet is interrupted every now and then (the gun is beginning to bump).When the outside nozzle is turned backward the jet becomes thicker and thicker, until at last the air-supply is choked and only a jet of liquid leaves the mouth of the gun.

The liquid-outlet can be closed with a rust-proof steel needle (6).This needle has been turned off conical in such a way that only the point obturates while there is still some space between the inner wall of the inside nozzle and the remaining part of the tapered point.This is essential,because when the needle exactly fitted in the conical inside nozzle, solid material might get between the needle and the inside nozzle which would cause leaking of the gun.



Leakage,if any, of the liquid-opening may consequently generally be prevented by turning off the needle less tapered.

At the other end the needle has been provided with screw-thread and with 2 small adjusting-nuts (14).These nuts must be adjusted in such a way that the needle just closes the liquid-outlet.

The air-supply is opened by moving the puller (20) back.The latter takes along the driver (9) and therewith the air-valve (12) is taken back, on account of which the compressed air can flow through the opening (25). When the puller is released again the air-valve is driven forward by the spiral spring (16) and the opening (25) is closed again. The adjusting-nuts (14) must be fixed in such a way that when the gun begins to operate on account of the movement of the puller, the air-valve is first removed ½ to 1 mm before the needle is taken along.Consequently the air must get out before the liquid leaves the opening.When the adjusting-nuts are placed too far back, then the air-valve is taken along too far, before the needle is taken along. The needle then only covers a small distance, on account of which the mouth is not sufficiently opened.The jet is too thin then.

In case the adjusting-nuts are placed too far in front, the point of the needle does not reach far enough to close the mouth.The gun then leaks, while each time when the gun begins to operate, first some drops leave the opening before a good jet is obtained.

The position of the adjusting-nuts must be experimentally determined. The needle-spring sees that the needle is always vigourously pressed into the opening of the inside nozzle, so that the latter is well closed. Owing to the frequent use the inside of the inside nozzle wears away. In this case the needle projects somewhat from the opening of the inside nozzle, which is as a rule an indication that the inside nozzle must be renewed, as same wears away more rapidly than the needle.

Of the packing-rings packing (4), which separates the liquid channel from the air-channel, is the most important, as in the case of a leak in this packing the air enters the liquid-channel and the gun begins to bump.Therefore careful attention must always be paid to the fact whether the six-angled head-piece (5) is screwed on well, as this compresses packing (4).A continuously interrupted jet is in most cases caused by a leaking packing (4) or by the absence of this packing.

The good obturation of packing (7) is also of importance. Same closes the liquid-channel.The leaking of this packing can be gathered from the fact that the interior of the gun becomes wet. The packing-bush (8) must then be screwed on or the packing (7) must be entirely renewed. Packing (7) is very much subject to wear and tear in contrast with packing (11). Through this packing the air-valve moves to and fro,

On the top of the spraying-gun is the spraying-liquid reservoir with or without stirrer.
The stirrer is driven by compressed air and used for mixing the spraying-liquid.

The reservoirs with stirrer are provided with a float for the purpose of checking the height of the liquid level. The float consists of an air-tight brass cylinder which carries a brass rod that leaves the reservoir through a hole in the lid.

As for the type of reservoir to be used, the cleaning of the gun after working-time, the size of the spraying-opening in the inside nozzle and pressure of the compressed air, we refer to the relative spraying-notices.

* In order to spread the spray-jet the gun can be fitted with a spreading-piece (fig.1 page 6). The outside nozzle (1) has then to be altered as indicated in figure 2.
By means of air which flows through the drilled holes the spray-jet is spreaded in such a way that it gets the section of an ellipse.
This spreading-piece is now fixed in such a way that the longitudinal axis of the ellipse points in the direction of the movement of the objects to be sprayed.

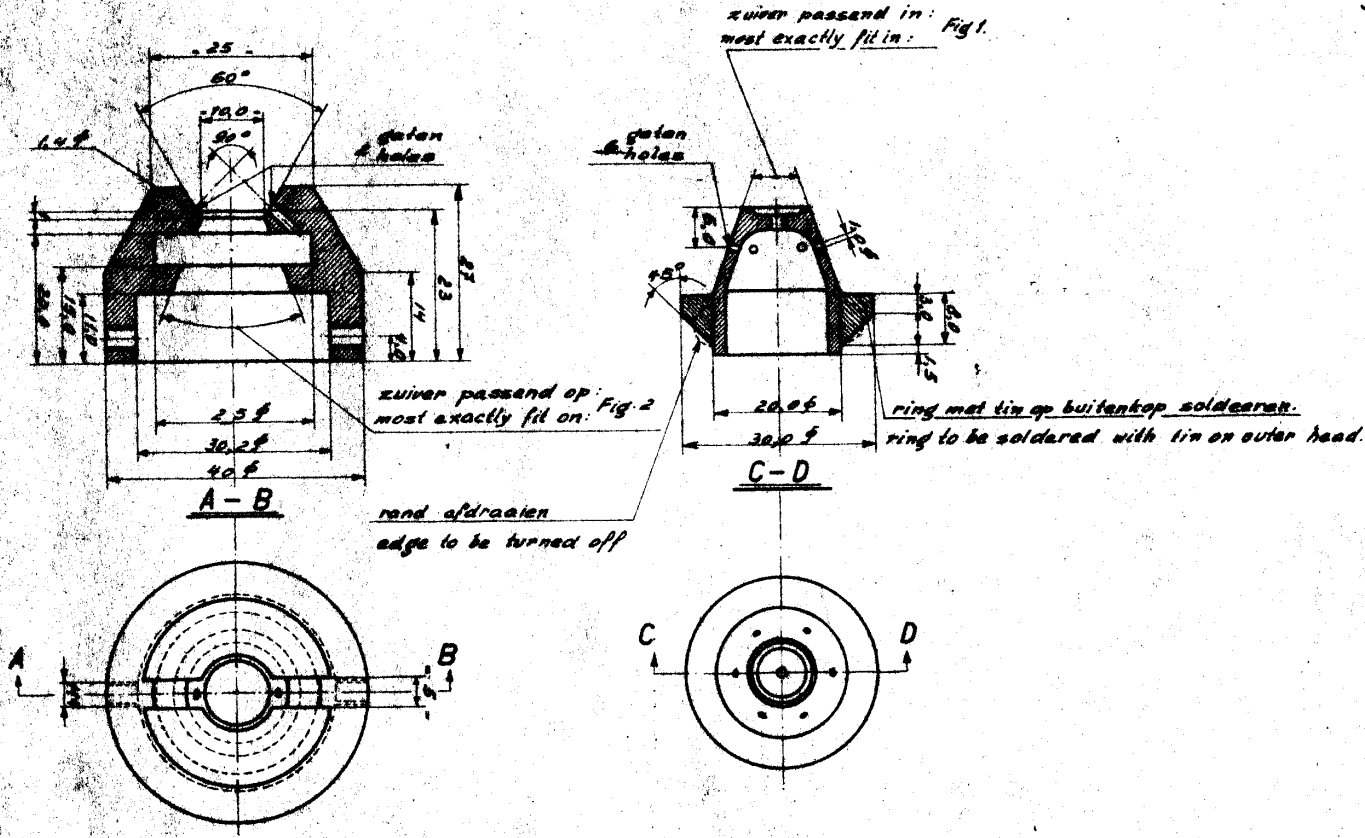


Fig. 1
schaal 1:1
scale

Fig. 2
schaal 1:1
scale

Date: 18/1/'38 * R 3-2-8
Date superseded sheet: 13/10/'36 Page 1

ACID-TREATING CATHODES.

OBJECT:

Cleaning the cathode surface.

REQUIRED INSTRUCTIONS:

Acid	02 031 08	as per R 2-1-33
Methylic alcohol	02 870 40	as per R 16-10-3

INSTALLATION:

This installation is represented in the diagram on page 3. We distinguish the following parts:

1. The cathode to be acid-treated.
2. Cup containing acid.
3. Leaden cylinder.
4. Meter 0-10 Amps.=
5. Resistance 35 Ohms/9 Amps.
6. Single-polar switch.
7. Bipolar switch.
8. Meter 0-150 Volts =.

Before being sprayed the cathode (1) is acid-treated by dipping it into the acid in the cup (2).
This cup also contains a leaden cylinder (3), which is connected to the - of the direct voltage via an ammeter (4) and a series-resistance (5). The cathode to be treated is connected to the + of the direct voltage.

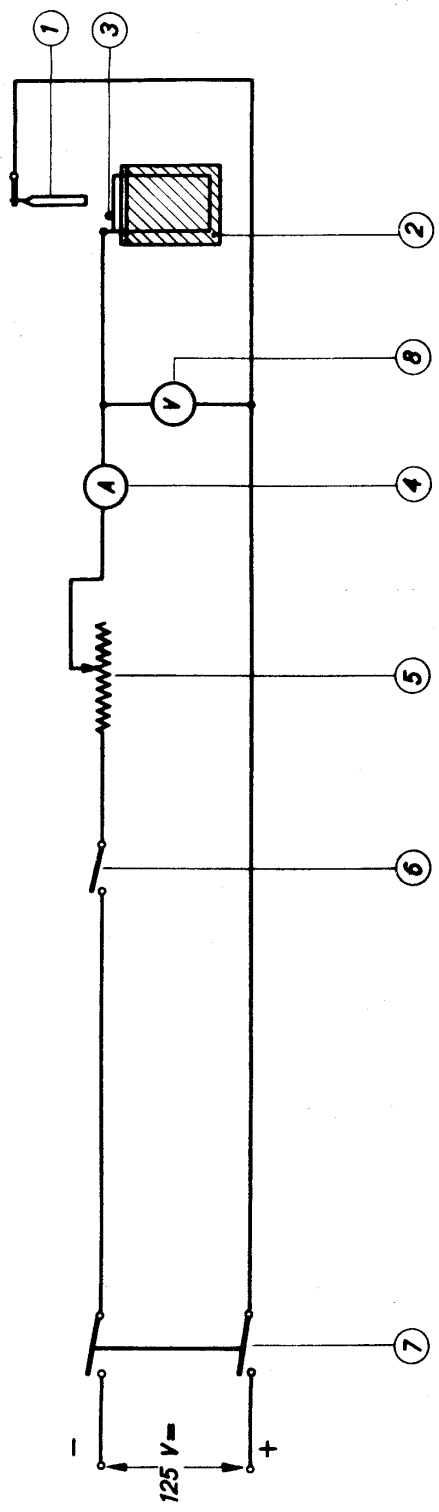
PROCEDURE:

1. Fix the cathode to be treated in a tie-clamp and dip it into the acid.
2. Switch on switch (6) and regulate at the required current-intensity with the aid of the resistance (5).
   This current-intensity has been indicated on the relevant cathode ~~it is~~ drawing.
3. Take the cathode out of the liquid after the prescribed time.
   This time has also been indicated on the relevant cathode drawing.
4. Clean the cathodes carefully in running water for ½ hour after the acid-treating.
5. Rinse the cathodes in methylic alcohol.
6. Thereafter shake them and dry them during 10 min. at 50-60°C.

Observations:

1. The installation described above allows of the treatment of one cathode at a time only.
2. The temperature of the bath during the acid-treating may not surpass 35°C. The temperature is dependent upon the dimensions of the bath and upon the current-intensity used.
3. If the cathodes to be treated do not get clean, this may be caused by:
   a. a too small current intensity.
   b. a too small time of acid treating.
4. Safety-spectacles equipped with mica glasses must be used by the operatur during the operations.

Datum: 18/1/'38
Datum vervallen blz.
7/10/'35



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D. REDUCTION OF COILS, CATHODES AND OF PARTS OF SAME.

Nr.	Material	Non-continuous: Temp. in °C.	Non-continuous: Time in min.	Gas
	a. Coils (general) except those mentioned under b.			
1	Single coils or filaments (V- or other shape) sprayed with or dipped in alundum	1700	3	H2 moist
2	Single bifilar coils spr ayed with or dipped in alundum (except those mentioned under 3); reduce in alundum tubes.	1550-1600	5	Brmg moist
3	Single bifilar coils without or with short alundum tube or rod (quick heater) sprayed with or dipped in alundum; reduce in alundum tube	1700	5	H_2 moist
4	Coils as mentioned under 3, but which are not reduced in alundum tube	1700	3	H_2 moist
5	Double bifilar coils sprayed with alundum (reduce in MgO tube)	1550-1600	8	Brmg moist
6	Lots of V-shaped Ni-strips(flattened ends for heaters)	1200	15	H_2 dry
8	Bare coils which must be rembved from finger-grease	1600	5	Brmg moist
7	Bare coils the elasticity of which must be removed	1600	5	Brmg moist
9	Repair coils.	1000	3-5	Brmg moist
	a. with nickel flats	as normal coils		
	b. without nickel flats			
10	Bare bifilar coils, V- or other shape filaments which are to be cataphoretically coated as per R 3-1-34 (reduce in alundum tube)	1500-1600	5	Brmg moist

Nr.		Temp. in °C.	Heating-time in sec.	Annealing time at the accompanying temp. in sec.	
11	Bifilar coils, V- or other shape filaments which are to be cataphoretically coated and annealed as per R 3-1-34.	abt. 1700	The coating may not crack. Time lies between 15-35 sec. Must be ascertained for each type experimentally	10	Brmg dry

Nr.	Material	Non-continuous		Gas
		Temp. in°C.	Time in min.	
1	All the cathode tubes with spike, collar and/or tails (welded, flattened or rolled) except those mentioned under 4 and 5 (ready for spraying, but reduce before checking)	875-925	5	Dry Brmg
2	Cathode tubes with welded tail + MgO tube which is fixed with Ni-oxide (reduce before checking)	1100-1150	5	Dry Brmg
3	MgO-tubes covered with Ni-oxide (reduce before checking)	1100-1150	5	Moist Brmg
4	Cathodes ext.diam. 4 mm, wall-thickness 0,050 mm	not		
5	Cathodes ext.diam. 4 mm, wall-thickness 0,100 mm	675-725	5	Dry Brmg
6	Cathodes which are to be cataphoretically coated (The reduction should take place immediately before the cataphoretization)	975-1025	5	Dry Brmg

for remarks see page 6.

.- Reducing parts of transmitting-valves. AND cathode-ray tubes.

Nr.	Material	Non-continuously		Gas
		Temp. in °C.	Time in minutes	
A1	Bare grids without zirconium	1000	10	Dry H2
B1	Mo anodes, except those mentioned under B2 andB3	800	15	Dry Brmg
B2	Anode QB 3/500 with clamping ribbon	800	20	Dry Brmg
B3	Bare anode with clamping-ribbon QB 2/75	800	20	Dry Brmg
B4	Parts of Ni-sheet and -gauze	900	10	Dry Brmg
B5	Parts of carbonized Ni-sheet	700	10	Dry Brmg
B6	Parts of CuNi-sheet	800	20	Dry Brmg
C1	Grid strips TA18/100 and TA 20/250	900	15	Dry H2
C2	Copper screen-ring for TA18/100 and TA 20/250	600	10	Dry Brmg
C3	Copper screen-ring with chrome-iro n ring	600	10	Dry H2
C4	Iron cylinder	800	5	Dry H2
C5	Steel rings	1000	10	Dry H2
C6	Compression springs for filament s	1450	60	Dry H2
C7	Filament supports	1000	10	Dry H2
C8	Iron screws and nuts	800	10	Dry H2
C9	Tungsten filament with core (QB3/500, QB 2/75)	1250	9	Dry H2
C10	Mo-sheet 5 mm	1350	20	Dry Brmg

Observations: Parts with zirconium may not be reduced.

For further remarks see page 6.

Observations:

1. When the annealing is done continuously, the boats are put in the pre-cooler of the furnace and after the expiry of the time prescribed they are each time pushed on one boat-length by placing an additional boat in the pre-cooler.

2. When the annealing is done non-continuously the boats are at once placed in the middle of the heating-zone and, after the expiry of the time prescribed, they are placed in the cooler at the end of the furnace.

3. N_2 = nitrogen
   Brmg = combustible forming-gas (75% N_2 + 25% H_2)
   H_2 = hydrogen
   N^2Brmg = incombustible forming-gas (90% N_2 + 10% H_2)

4. Reducing: with H_2 or N_2 in furnace as per R 3-6-4 or in furnace as per R 3-6-1, which allows of changing over to H_2.
   with Brmg in furnace as per R 3-6-1
   for affiliated factories in furnace as per R 3-6-5

5. All parts which are reduced (except heaters) may not be exposed to the air for longer than a week. This being the time between the parts leaving the furnace and their being sealed-in in the bulb.
   The waiting-time being longer than a week, the parts must be reduced again.

Date: 23-2-'37. R 3-11-9

TESTING PHILAST TUBES.

Philast tubes should satisfy the following requirements:

1. The shorting voltage of a tube having an outside diameter of 2 mm and an inside diameter of 1 mm should be > 6000 V $\sim$
2. The tangent $\delta = < 350 \times 10^{-4}$ at a wave-length of 200 m
   δ = the angle of loss (the complement of the phase sh ifting φ).
3. The tubes may not burn or carbonise in the bulb.
4. The tubes must be rather flexible.

THE APPLICATION OF A FLUORESCENT SCREEN IN CATHODE-RAY TUBES.

APPARATUS:

PROCEDURE A:

Shaking apparatus.

Graduated glass.

Mirror.

Connection to air-line using a dust filter.

PROCEDURE B:

Tray for drying bulbs.

Ventered funnel. (as per sketch II, page 7).

Apparatus with 4-Volts lamp as per sketch III, page 7.

Centered powder spray-gun (as per sketch I, page 7).

Nitrogen cylinder with reduction valve.

Black cloths.

Biosol apparatus.

REQUIRED MATERIALS:

Procedure A:

Alcohol	02 752 75	R 16-10-17.

PROCEDURE B:

Acetone	02 752 85	R 16-10-8

See further the bulb drawing and/or parts list.

REQUIRED NOTICES:

Washing sulphides Z64	R 2-3-12
Cleaning bulbs	R 3-14-16

PROCEDURE:

A: For emulsion screens.

B: For powder screens.

A. 1. Shake the emulsion in question well before use. It is recommendable to use a small shaking-apparatus in which the bottle can be placed, and that can be put into operation in time beforehand.
2. The bottom of the bulb must be clean and thoroughly dry. The cleaning may be done by shaking with alcohol. If the bulb has already been covered with an aquadag layer, the latter may not have been annealed, seeing that otherwise it will loosen and be damaged.
3. Pour into a small graduated glass the quantity of emulsion specified in the parts list or bulb drawing.
4. Pour this quantity prudently into the bulb in such a manner that it all gets on the bottom.
5. Immediately thereafter turn the bulb in a circle for a few moments, holding it in vertical position so that the emulsion is uniformly divided all over the bottom.
6. Hold the bulb in an approximately horizontal position just for a moment until the emulsion which is slowly flowing down, has reached the edge. Immediately thereafter quickly turn the bulb 180° round its axis, allowing the emulsion to cover the bottom once more. With calcium tungstate (blue) it suffices to repeat this twice, this emulsion being thicker than the willemite emulsion (green). With the latter emulsion the bulb must be turned round its axis 4 times.
   If the bulb has already been given an aquadag coat, a mirror is placed obliquely behind the bulb so that the course of the emulsion can be clearly followed in the mirror.
7. Immediately thereafter put a rubber tube that is connected to the air-line, down into the bulb in such a manner that the air is blown obliquely against the side wall; at the same time quickly turn the bulb round its longitudinal axis.
   A bulb filled with glass wool or cotton wool is fitted into the air-line so as to catch any dirt.
8. Keep turning the bulb in such a manner for abt. ½ min. until the screen is so dry that the maximum risk of running is excluded.
9. Allow the bulb to dry in a tray, the opening down, lest dirt gets into the bulb.
10. See the bulb drawing of the cathode-ray tube in question as for the subsequent treatments.

B.

REMARK: The sulphide to be used must be cleaned beforehand as indicated in R 2-3-12.

a. APPLYING A GLUTEN:

I. With unfrosted bulbs:

1. Scour the bottom of the bulb (by shaking with coarse, dry sand).
2. Remove the sand as much as possible by tapping at the bulb.
3. Rinse the bulb with acetone until the bulb is wholly clean.
4. Allow the bulb to dry on a tray (the bulb should be in an oblique position, its opening turned downwards).
5. Pour the gluten (see the relevant partslist) on the bulb bottom through a long centered glass funnel (see sketch II on page 7). To this end first enter the copper tube (which fits in the neck of the bulb) into the bulb, and thereafter lower the funnel.
6. Remove the funnel. (First raise the funnel wholly, thereafter take the copper tube out of the bulb neck).
7. Move the bulb in such a manner that the black coating and the bottom of the bulb are uniformly covered with the gluten.
8. Pour off the superfluous gluten and allow the bulb to dry on a tray under an angle of 45° with its opening turned downwards.
9. Keep the bulb so until the black coating is wholly dry.
10. Remove the drop at the opening of the bulb, if any, by means of a cloth.
11. Thereafter apply the screen (see bI or bII).

II. With frosted bulbs:

The same as for unfrosted bulbs; only, they are not scoured with coarse, dry sand. So one should start with rinsing in acetone (point Ba, I3).

b. APPLYING THE SCREEN:

I. Bulbs $\leq$ 16 cm (by hand):

1. Put the quantity of powder indicated in the parts list in the bulb by means of a dry spoon. Turn the bulb so long by hand, until the powder has "rolled" a few times over the bottom of the bulb and the latter is uniformly covered with a layer of powder.

2. Turn the bulb upside down on a clean sheet of paper and remove the superfluous powder by striking the bulb by hand.
   After being washed for 4 minutes as per R 2-3-12 and sieved (sieve of phosphorus bronze gauze Nr. 270: having 270 meshes per running inch) this powder can be used again.
   If the powder layer appears to be too thin, a little powder can still be added, after which the bulb is turned once more as indicated above. The superfluous powder is again removed by striking.

II. Bulbs > 16 cm (with centered powder gun).

1. Place the bulbs into the holder of the centered powder gun (sketch I, page 7), after having filled the latter with powder.
2. Loosen the supply-tube of the dry nitrogen conduct.
3. Slowly drop the gun into the bulb until it is abt. 2 cm over the bottom (with very large bulbs this distance should be determined empirically). Fix the holder at this height.
4. Open the valve to an overpressure of 0,1 atm.
5. Connect the supply-tube of the nitrogen-cylinder to the valve and keep it so during abt. 12 sec. Thereafter shut the valve, raise the powder gun again and remove the bulb from the holder.
6. Turn the bulb in such a way that the powder "rolls" a few times over the bottom of the bulb.
7. Turn the bulb upside down on a clean sheet of paper and remove the superfluous powder by striking the bulb by hand. (After being treated as indicated above, this powder can be used again.)

e. INSPECTION:

1. The fluorescent layer must be very uniform and may not show thinner or thicker spots.
2. The screen may not exhibit black spots (spots of the black coating).
3. There may not be injurious holes in the screen,
4. Impurities against the glass wall or in the screen may be verified by means of a biosol apparatus, whereas impurities at the inside of the screen may be seen by the aid of a 4-volts lamp (screened by a tissue paper) (see the sketch III, page 7).

d. APPLYING A NEW SCREEN:

If a screen does not satisfy the abovementioned requirements, one should proceed as follows:
If the screen itself contains impurities the screen can be removed by rinsing the bulb twice with acetone. Thereafter allow to dry in an oblique position and once more apply gluten and screen.
If impurities are found against the glass wall, the whole bulb should be washed as indicated below:
1. Scour the bulb with coarse sand, diluted with hydrofluoric acid (2,5%) and a few pieces of paper, until it is wholly clean.
2. Rinse in running tap water.
3. Rinse in warm soda water (60 to 70° C).
4. Rinse in running tap water.
5. Rinse in diluted hydrofluoric acid (2,5%).
6. Rinse in running tap water.
7. Rinse in distilled water.
8. Drying.

Hereafter the bulb is treated in the normal way.

e. CLEANING:

1. After application of the screen the bulb neck and the exhaust-tube must be made free of powder with the aid of a small brush or cotton wool. Also tap at the bulb by hand.
2. If the fluorescent screen and the black coating do not touch each other (e.g. with type DN 9-3), first the bare part is cleaned as per R 3-14-16.

f. ANNEALING:

1. After cleaning the screens are baked as per R 3-14-23 (Procedure II).
2. When the bulb has cooled down, tap at the bottom and side-wall by hand, until all the superfluous powder has been removed.

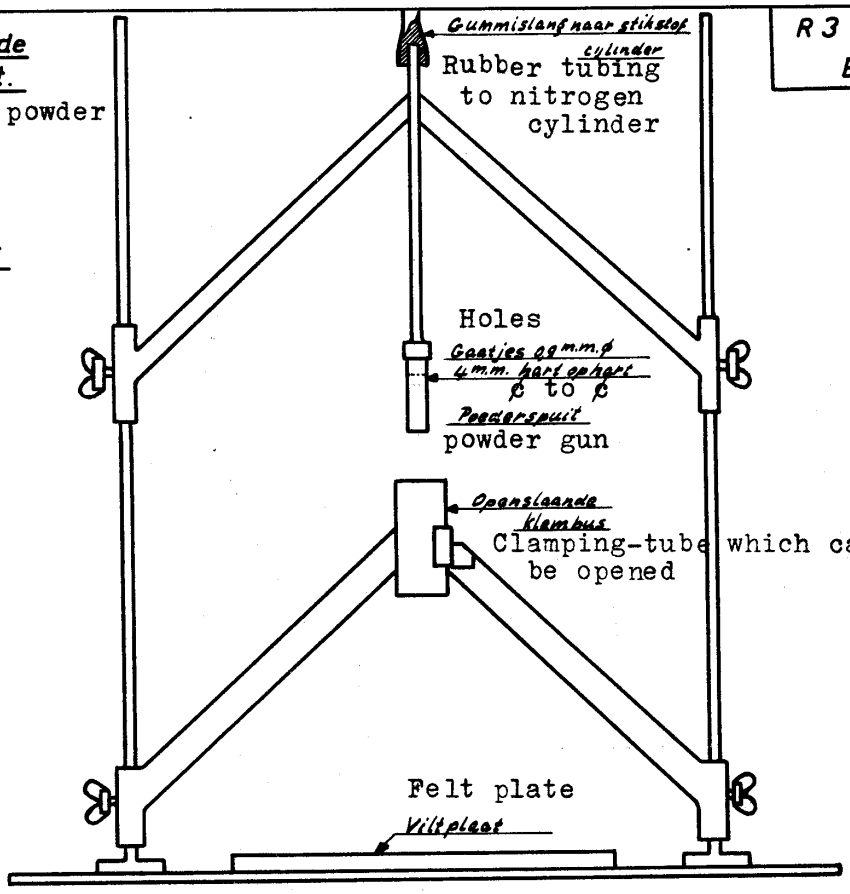
REMARKS:

1. The different operations as application of the screen, cleaning, baking, sealing and exhausting must take place as quickly as possible, the one after the other. If this is not feasible for some reason or other, the bulb must, if possible, be kept warm in an atmosphere of nitrogen, or be closed with a cork (first fill the bulb with nitrogen). This renders the absorption of moisture practically impossible.
   Besides it is highly recommendable to cover the screens immediately after baking with a black cloth or paper so as to prevent the action of light.

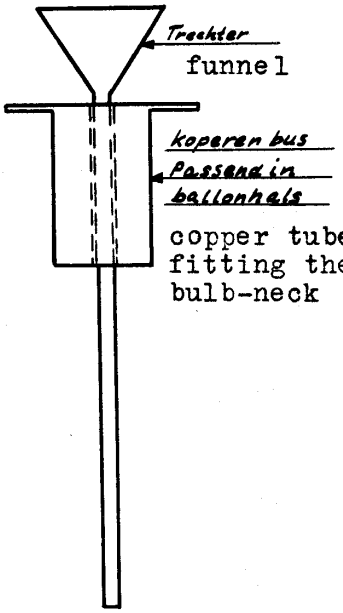
2. With bulbs having a neck diameter which does not fit in the clamping tube of the centered powder gun, first open the clamping-tube, whereafter the bulb can be inserted. Then the powder gun is cautiously lowered.

Gecentreerde Poederspuit.
Centered powder gun

Schets I

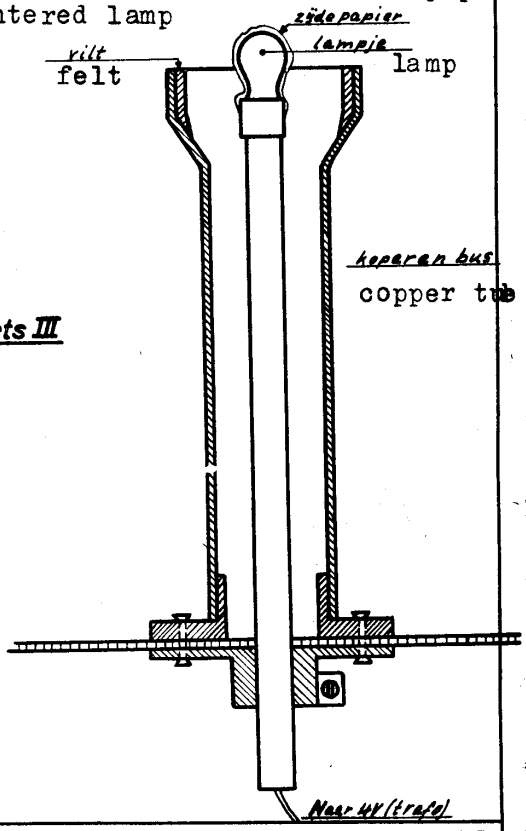


Gecentreerde trechter
Centered funnel



Schets II

Gecentreerd lampje
Centered lamp



Schets III

BLACKENING BULBS WITH AQUADAG.

OBJECT:

A. **For receiving-tubes:**

Preventing S effect.

B. **For gasfilled rectifying-tubes:**

To adapt them to the use as valves with grid control.

C. **For cathode-ray-tubes:**

For intercepting the electrons which come from the fluorescent screen.

MATERIALS TO BE USED:

Aquadag		see bulb drawing
Distilled water	02 97⁰ 25	
Hydrofluoric acid (for the valve-types mentioned under B and C)	02 800 05	R 16-10-40

METHOD A (Receiving tubes):

Apparatus:

The photograph on page 2 represents the installation.

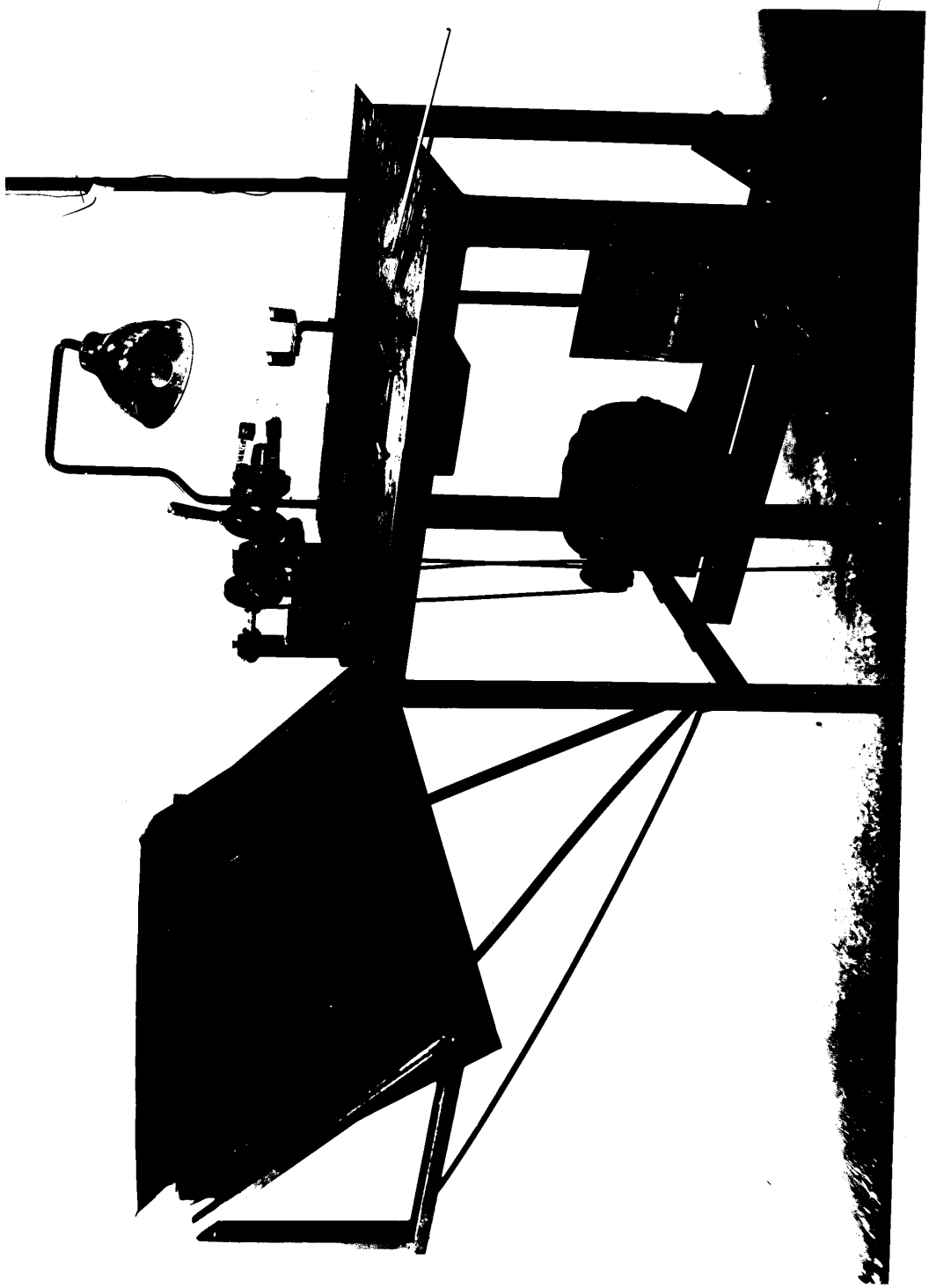
Procedure:

1. Dilute the aquadag with distilled water until the required thickness is obtained (ascertain empirically).
2. Switch on the motor (1).
3. Put the clamping-device (2) out of action with the aid of a pedel (3), which operates a friction-coupling, and put the bulb that has been normally cleaned and may be tubulated, in the clamping-device.
   This clamping-device can be opened and closed by means of the handle (4).
4. Blacken the bulb at the right spot with aquadag using a small brush (5).
   The layer to be applied must be as thin as possible while besides there may not be stripes in it.
   When the layer is too thich, it will patch off.

5. If it appears that the layer has not been applied at the right spot, it must be polished to measure with a brush (6), consisting of a holder to which a piece of rubber plate (thickness 8 mm.) has been fixed.
6. Remove the bulb from the clamping-device and allow it to dry in the air for 2x24 hours.
   The neck-opening of the bulb should be up.
7. a) Heat the blackened bulbs without exhaust-tube in an oven as to R 3-14-51.
   Temperature of the oven 450-500°C, depending on the wallthickness of the bulbs.
   Output 1800/hour; in this way each bulb is heated for about 2 min.
   Place the bulb-holders of the oven in such a way that the upper side of the bulb runs free 2 to 3 cm. of the oven.
   b) Anneal the blackened bulbs with exhaust-tube see notice R 3-14-22.

Output:

The output is ca. 275-400 bulbs/hour.



METHOD B (Gasfilled rectifying-tubes and cathode-ray tubes):

Apparatus II (drawing nr. M627276).

The installation is represented in the photograph on page 5.
This installation is composed of: A - the filling apparatus and
B - the shaking-apparatus

A. The filling-apparatus:

This apparatus consists of a tank (1) fitted with the compressed-air line (2) and a drain cock (3). To prevent the aquadag from settling, there is a stirrer (4) in the tank.
The tank is filled through the hole(2) in the lid. The hole can be easily opened by means of winged nuts.
There are two cocks (6 and 7) in the air line (2). Cock (7) can be used to disconnect the tubes (8).
The supply-pipe (9) and the cock (10) are fitted below the tank.
The holders (11) with the cocks (12) can be screwed on to the supply tube. These holders are composed of a brass tube with two rubber stoppers.

B. The shaking-apparatus:

This apparatus consists of a motor (13) driving the drum (14) via wheels.
The number of shocks is abt. 24/min.
The drum can be fixed with the aid of the clip (15).

PROCEDURE:

1. Wash the bulbs, in case they are dirty, in diluted hydrofluoric acid (2,5%), and rinse them in running tap water.
2. Mark the level for the aquadag on the bulb, e.g. with the aid of a glass pencil.
* 3. Dilute the aquadag with distilled water (0,65 litre of distilled water for every kg of aquadag). First mill this mixture during 24 hours in a bal l-mill (3 kg of balls; contents of the mill 5 litres).
4. Shake this mixture in the drum (14) on the shaking-apparatus for abt. 10 minutes.
   The drum may not be filled for more than two thirds.
5. Pour the aquadag into the tank (1) and close the opening (a) well.
6. Bring the holder (11) into the bulb so that it closes the latter satisfactorily; then screw the assembly on the tube (9). The cocks (12) are still closed.
   Any idle positions on the tube (9) must also be fitted with such holders with closed cock (12).

7. The cocks (6 and 7) are in position I (see below).
8. Stir the aquadag (with 4) open cock (6) (see position 2) and open the cocks (12).
   The aquadag level can be accurately regulated with the aid of the latter cocks; then these cocks are closed.
   See to it that the bulbs are exactly vertical.
9. Remove the aquadag (see position 3 for the cocks 6 and 7). Thereafter open the cocks (12).
10. Dry the aquadag layer somewhat by hanging a rubber tube, which is fixed to the tube(8) in the top of the bulb.
    The tubber tube may not touch the aquadag.
    See position 4 for the cocks (6 and 7).

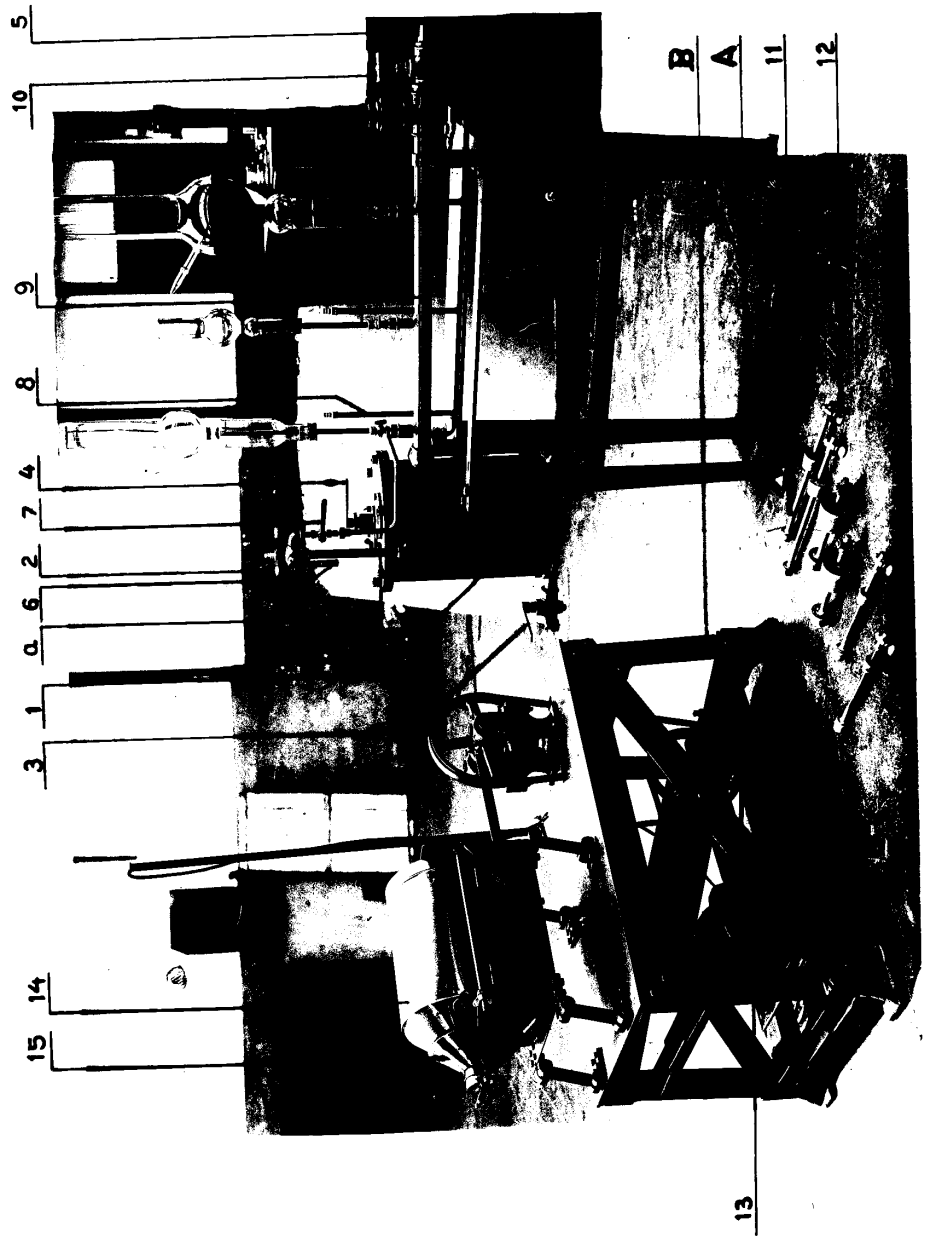
Position	Position of the cocks.	
	cock 6	cock 7
1	handle up in vertical direction	handle to the right in horizontal position
2	handle to the right in horizontal pos.	as in position 1
3	handle down in vertical position	handle down in vertical position
4	handle up in vertical position	as in position 3

Remarks:

1. If all the aquadag has not been used up, theremainder must be transferred to the drum (14). This can be done through cock (3).
2. For the various types of tubes different holders are used.
3. Due care should be had that the aquadag is sufficiently in contact with the chrome-iron ring.
4. The aquadag applied can be easily removed by means of a brush and tapwater.

Cleaning the filling-apparatus:

Fix the holders (11) on the tube(9) and shut the cocks (12). Connect the tube (9) to the water pipe at (5). Fill the tank (see position 3 for the cocks 6 and 7).
Move (4) substantially, open cock (3) againagain thoroughly rinse the tube.
Always keep the drum (14) clean.



METHOD C (Gasfilled rectifying-valves and cathode-ray tubes):

Apparatus:

Stand
Stoppered bottle
Rubber stoppers
Woulff bottle (capacity abt. 6 litres).
Holders provided with stoppers with two perforations; one glass tube gets abt. 5 mm above the stopper; the other glass tube ends abt. 10 mm below the top part of the bulb bottom.

Procedure:

1. If the bulbs are dirty clean them in diluted hydrofluoric acid (2,5%) and rinse them in running tap water.

2. Mark the aquadag level on the bulb.

3. Press the holder into the bulb.
   If the bulb has side tubes, close the latter well beforehand from the inside with rubber stoppers.

4. Fix the bulb in the stand in exactly vertical position.

* 5. Dilute the aquadag with distilled water (0,65 litre of distilled water for every kg of aquadag; first mill the mixture during 24 hours in a ball-mill of 5 litres contaning 3 kg of balls). Then pour this mixture into the Woulff bottle.

6. Connect this bottle with a rubber tube to the smallest glass tub in the holder and then place it on an elevation in such a manner that the bottom of the bottle is at a higher level than the aquadag layer to be applied.

7. As the aquadag flows pretty slowly into the bulb, this may be accelerated by exercising some air-pressure on the aquadag in the Woulff bottle.

8. If the aquadag has risen sufficiently, lower the Woulff bottle again so that the aquadag will flow back into the bottle.
   Speed up this procedure by connecting the long tube in the bulb with the compressed-air line.

9. As soon as all the aquadag has flown back, disconnect the aquadag supply and allow the bulb to dry.

10. Disconnect the air supply and remove the stopper.

Date: 17-1-'36.

R 3-14-16
Page 1.

THE CLEANING OF BULBS FOR CATHODE-RAY TUBES AFTER THE APPLICATION OF THE FLUORESCENT SCREEN.

Object:

The removal of any redundant fluorescence material.

Apparatus:

The bulb cleaner M 634810 (see the photo on page 3).
This apparatus consists of three tubes (1) fitting on the supports along which they can slide. They are connected by the two rings (3), between the clamping piece (4) has been applied. The assembly can be raised and lowered by means of the wheel (5), which is connected with the toothed wheel (6), which engages in the teeth of the rod (7).
The brake spring (8) maintains the position so that the assembly cannot descend of its own accord.
On top different fitting plates (9) can be fixed by means of the nuts (10) in order to be able to match the different bulbs. In the tube (11) there is a massive rod (12), which is connected with a motor (13).
The dusters (14) for the different bulbs can be fixed to this rod. The extremities of this rod consist of a plate round which a piece of cloth is wound.
The speed of the rod can be regulated with the resistance (15).
The tension is applied by means of the switch (16).

Procedure:

1. Turn the required duster (14) on the rod (12).
2. Make the arms of the duster appraoch one another and slip the bulb to be cleaned on them. The position of the apparatus must be such that the arms do not get as far as the fluorescence screen.
3. When thebulb rests on plate (9), clamp the piece (4) round the bulb.
4. Put the knob of the resistance in such a position that the whole resistance is switched on.
5. Apply the tension by means of (16) and regulate the speed of the duster by means of the resistance.
6. Owing to the turning movement of the cloth-clad arms, these will touch the inner wall of the bulb and clean it.
7. See the assembly drawings of the valve and of the bulb for the height of the part to be cleaned.
8. The bulb can be raised or lowered with regard to the dusters by turning the wheel (5).
9. In this way a screen with definite outlines is left in the bulb.
10. When the bulb has been cleaned as much as poss ible, the tension is switched off and the resistance is slid back again. The piece (4) is opened and the bulb is removed from the apparatus.

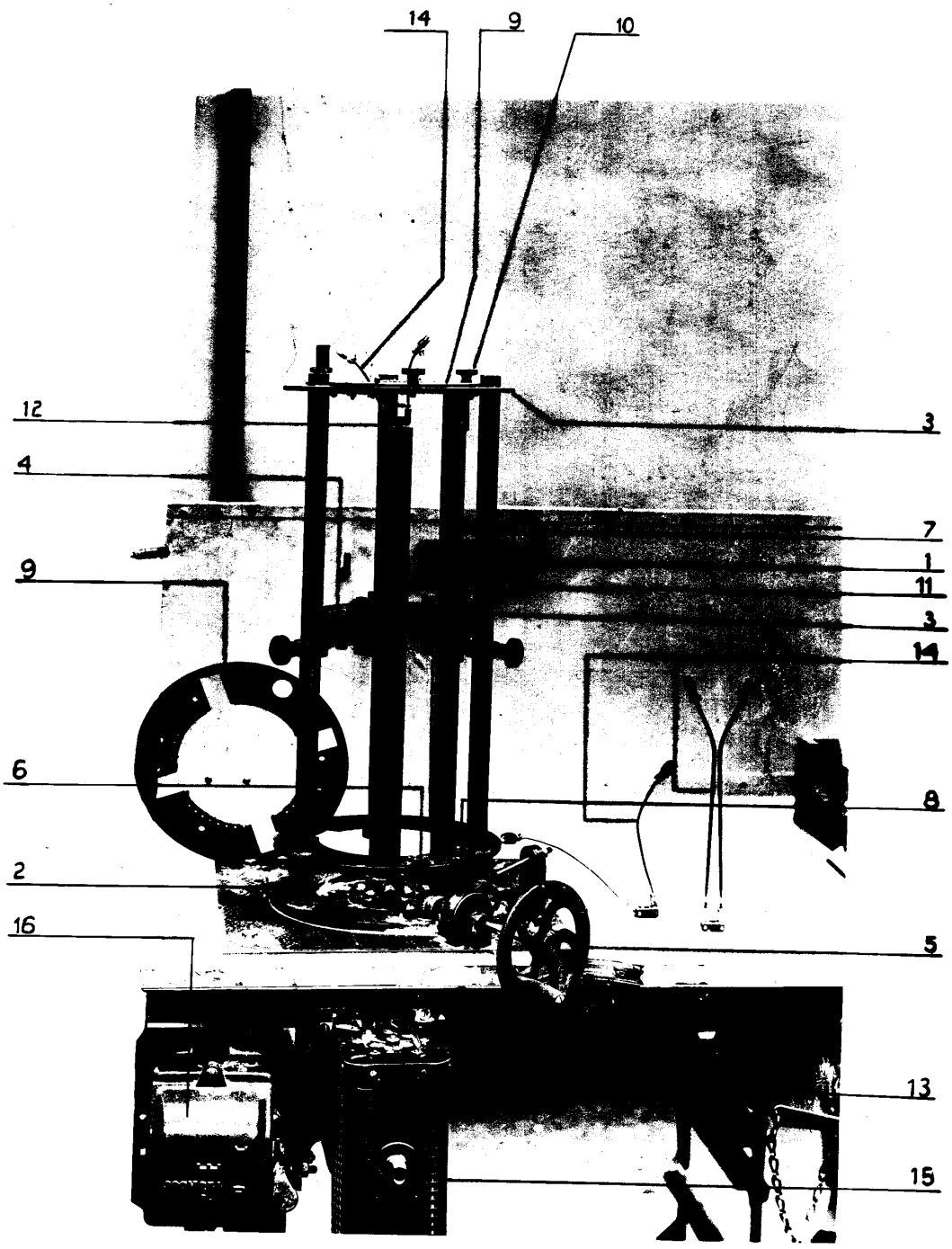
11. Continue by cleaning the bulb with a clean cloth until there is no dirt left in it.

Observations:

1. The cloth-clad parts of the dusters (14) must be cleaned regularly.
2. If it appears that the superfluous screen can only be removed with difficulty (if it has become hard, e.g.), just drench the cloth-clad parts of the dusters in alcohol.

Datum; 17/1/'36

R 3-14-16
Blad: 3



ANNEALING BULBS.

A. BULBS FOR RADIO TUBES.

APPARATUS.

Furnace R 3-14-51
Polariscope R 4-5-4

PROCEDURE:

1. The bulbs are heated as stated in the table below:

Bulb type	Temperature in °C.	Hourly Output	Time of heating
A. Clear, tubulated bulbs	450 - 500	1800	abt. 2 min.
B. Tubulated bulbs blackened as per R 3-14-13	400 - 450	1800	abt. 2 min.
C. Tubulated bulbs blackened as per R 3-14-15	450 - 500	1800	abt. 2 min.
* D. Indented bulbs as per R 3-14-28	450 - 500	1800	abt. 2 min.

The temperatures must be adjusted as high as possible. With the bulbs stated under A, C and D they depend on the thickness of the wall, while with the bulbs stated under B due care should be had that the carbon layer does not get detached.
If the graphite layer of the bulbs stated under C, appears to let loose, or to tear, we may assume that the bulbs have not been dried sufficiently long in the air after the blackening process.
The bulb-holders of the furnace must be adjusted such that the top of the bulb keeps 2 to 3 cm clear of the furnace.

2. Test the bulbs at random ascertaining whether they are free from tension.
This is done in a polariscope. See R 4-5-4.
If the bulbs are not free from tension, the temperature of the furnace must be raised inasmuch as the thickness of the bulb wall and the exhaust-tube allows of this.

(Voorloopig)

Het spanningsvrij maken van ballons .

In de hieronder volgende tabel worden de temperaturen en tijden opgegeven van de meest voorkomende glassoorten.

Glassoort	Holl.No.	Temp.in max °C	Tijd
K 1 A	01	460	1 uur
Kalkglas	03	520	1 uur
Kalkglas	34	520	1 uur
Geräthe	04	600	1 uur
Röntgen	06	550	1 uur
G 40	08	600	1 uur
Kali-natron	37	500	1 uur
Uviool	39	500	1 uur

opm. 1: De spanningsvrij te maken onderdelen worden in kouden toestand in de oven geplaatst, waarna deze gesloten wordt.
De temp. langzaam opvoeren tot de aangegeven hoogte. Is deze hoogte bereikt dan de gastoevoer zoodanig verminderen dat de temp.gedurende 1 uur constant blijft.
Daarna geheel af laten koelen, waarna de oven geopend wordt.

opm. 2: Wanneer ballons e.d.voorkomen,welke uit meer glassoorten bestaan, moeten deze spanningsvrij gemaakt worden op de hoogste aangegeven temperatuur.
Het glas, met de lagere temperatuur moet echter gesteund worden of recht omlaag hangen.

opm. 3: Deze temperaturen zijn vastgesteld voor de ovens van de Buizenfabriek. Het is zeer aan te bevelen om deze temperaturen voor de andere ovens proefondervindelijk vast te stellen.

ANNEALING THE COATED BULBS FOR CATHODE RAY TUBES.

OBJECT: Burning the binder.

APPARATUS:

I. Indirectly heated oven see R 3-14-53
II. Any electric oven.

ADDITIONAL APPARATUS:

Cylinder of nitrogen with reducing valve.

PROCEDURE:

I. Indirectly heated oven R 3-14-53.

This procedure stands for:

a. bulbs only provided with a layer of graphite suspension.
b. bulbs only provided with fluorescent screens of Willemite- or with Calcium Wolframate emulsion.
c. bulbs provided with a and b.

1. The bulbs are placed into the oven in asbestos clad iron racks with their screens upwards.
   If the bulbs are too large, they can also be placed horizontally but in this case they should be supported by asbestos in such a way that no sagging can take place.
* 2. For the bulbs mentioned under a a temperature of 460-470°C has been accepted. (For the 39 cm bulbs 450°C).
   When this temperature is reached decrease the gas supply in such a way that the temperature remains constant.
   Stop the supply of gas after ½ hour except for 25, 31 and 39 cm bulbs.
   For these bulbs the gassupply should be stopped after 2½ hours.
3. For the bulbs mentioned under b a temperature of ~~450°C~~
x ~~has been taken.~~ 450-470° has been taken.
   Stop the supply of gas after this temperature has been reached.
4. A temperature of 450-470°C stands for the bulbs mentioned under c. When this temperature is reached decrease the supply of gas in such a way that the temperature remains constant.
   Stop the supply of gas after ½ hour.
5. Let the oven cool down to 100°C.
6. Then open the oven and let the bulbs cool down.

REMARK: When not used in the manufacture within one week, all annealed bulbs have to be annealed again.
Especially the bulbs received in the factories abroad should be annealed before being used.

446

B. FROSTING BULBS FOR CATHODE-RAY TUBES.

OBJECT:

The fluorescent screen sticking better to thebulb.

APPARATUS:

Frosting installation R 3-14-60

REQUIRED MATERIALS:

1. See under preparation of the frosting liquid
2. As treating-liquid hydrofluoric acid (20%) is used.

ADDITIONAL APPARATUS:

Sieve B20 (20 meshes per running cm).
This sieve is made of silk gauze and is supported by a coarser sieve of brass gauze.

REQUIRED NOTICES:

Safety measures R 1-5-5

PREPARATION OF THE FROSTING-LIQUID:

This liquid may be obtained in the following way:

Theoretically the composition is as follows:

HF	11,7%
H_2O	30,7%
CaF_2	10,8%
NH_4FHF	42,3%
$Al_2(SO_4)_3$	3,5%
KF	1,0%

The CaF_2 is obtained out of HF + $CaCO_3$ according to the formula $2\ HF + CaCO_3 = CaF_2 + H_2O + CO_2$.

The composition of the acid becomes then:

HF	16,3%
H_2O	26,6%
$CaCO_3$	13,1%
NH_4FHF	39,9%
$Al_2(SO_4)_3$	3,3%
KF	0,8%

It is assumed that HF of 100% is used. However, this is practically impossible , so we fix the HF percentage at p %. Then the composition becomes:

HF	$\frac{100}{p}$ x 16,3%
$CaCO_3$	13,1%
NH_4FHF	39,9%
$Al_2(SO_4)_3$	3,3% } dissolved in q water
KF	0,8% }
H_2O	42,9 - $\frac{100}{p}$ x 16,3 - q %

The frosting-acid may be prepared in a brass tank with built-in hand-driven stirrer. The levigated chalk is put into it through a funnel placed in a hole in the lid.

This tank attaches the drawback that the chalk is blown out of the funnel by the strong CO_2 development. Therefore the preparation can be done more quickly in an open vessel with a stout, wooden stirrer. This method, however, is also attended with drawbacks in the shape of escaping acid vapours and spatters of acid. At any rate the operators in charge of the preparation of the frosting-acid must wear acid-proof clothes, rubber gloves (without any holes!!!) and a good gas-mask with goggles. See the safety measures in R 1-5-5.

A very good suction-device is likewise indispensable requisite. The escaping vapours must be removed in such a manner that they can do no harm. The preparation can also be done outdoors under a roof; this place must also be chosen with deliberation so that no materials can be affected; so not in the neighbourhood of stores, shops with machines, etc.

First pour into the mixing-tank or the vessel part of the required water; then add the HF of p %.

Then the $CaCO_3$ (levigated chalk) is slowly and prudently added to this diluted acid; the $CaCO_3$ is transformed into CaF_2 while CO_2 is developed.

The NH_4FHF is added when the reaction is over. The KF together with the $Al_2(SO_4)_3$ must first be dissolved in a certain quantity of water. Eventually the water is replenished in accordance with the above statement.

When the NH_4FHF has almost dissolved, the mixing (stirring) is continued for abt. a quarter of an hour. Besides, the mixture should be stirred substantially from time to time. The frosting-acid must only be used, if it has stood for a full night at least.

If only part of the frosting-acid prepared is taken the whole lot must be stirred first, so as to ensure a satisfactory homogeneity.

The acid must also be sieved, seeing that impurities, such as bits of packing-material, etc., may lead to rejected bulbs (see under Procedure).

Datum: 20/12/'38

R 3-14-27
Blz.4

In onderstaande tabel zyn voor verschillende percentage's HF de voorgenoemde formules uitgewerkt.
In the table below the different percentages of HF have been worked out in accordance with the foregoing formula.

BEREIDING VAN MATTEERPAP BY GEBRUIKMAKING VAN UITSLUITEND GRONDSTOFFEN.
PREPARATION OF THE FROSTING-ACID OUT OF RAW-MATERIALS ONLY.

% HF	60	61	62	63	64	65	66	67	68	69	70	71
HF	2,72	2,67	2,63	2,59	2,55	2,51	2,47	2,43	2,40	2,36	2,33	2,30
H_2O	1,57	1,62	1,66	1,70	1,74	1,78	1,82	1,86	1,89	1,93	1,96	2,00
$CaCO_3$	1,31	1,31	1,31	1,31	1,31	1,31	1,31	1,31	1,31	1,31	1,31	1,31
NH_4FHF	3,99	3,99	3,99	3,99	3,99	3,99	3,99	3,99	3,99	3,99	3,99	3,99
$Al_2(SO_4)_3$	0,33	0,33	0,33	0,33	0,33	0,33	0,33	0,33	0,33	0,33	0,33	0,33
KF	0,08	0,08	0,08	0,08	0,08	0,08	0,08	0,08	0,08	0,08	0,08	0,08

% HF	72	73	74	75	76	77	78	79	80
HF	2,26	2,23	2,20	2,17	2,14	2,12	2,09	2,06	2,04
H_2O	2,03	2,06	2,09	2,12	2,15	2,17	2,20	2,23	2,25
$CaCO_3$	1,31	1,31	1,31	1,31	1,31	1,31	1,31	1,31	1,31
NH_4FHF	3,99	3,99	3,99	3,99	3,99	3,99	3,99	3,99	3,99
$Al_2(SO_4)_3$	0,33	0,33	0,33	0,33	0,33	0,33	0,33	0,33	0,33
KF	0,08	0,08	0,08	0,08	0,08	0,08	0,08	0,08	0,08

22
46 2x
59 2x
63
67
137
Ir. Smelt

401 2x
402 3x
403
406
407
409

PROCEDURE:

1. Bring the frosting-acid and the treating-liquid into the tanks.
   The tanks must be filled to abt. 1 cm ~~over~~ the cover half-way down the tank.
   Before the frosting-acid is poured into the tank, it is sieved through a sieve B20 (see under additional apparatus). To this end the coating is heated to abt. 35° C. It cannot be sieved in the cold state, because all the NH_4PHF has not dissolved then.
   Hydrofluoric-acid (20%) is used as a treating-liquid. Every now and then the treating-liquid should be replenished with a little concentrated hydrofluoric acid, as it is continuously diluted by the water dripping out of the bulb. After adding concentrated HF, which does not mix immediately, first spray some rejected bulbs with the treating-liquid.
2. Light and regulate the burner under the thermosyphon.
   The temperature of the frosting-liquid should amount to 28-30° C. When using diluted HF as treating-liquid no thermosyphon (17) is required. Sufficient heat develops by the addition of concentrated HF.
3. Put the ring with the exact dimensions in the cover.
4. Place the bulb into the conical hole and adjust the presser at the required height.
   When the bulb is too long, hold it by hand. Then always wear goggles.
5. Spray frosting-acid into the bulb during a short time (± second) four times immediately after the other.
6. Allow the bulbs to drip out (abt. 10 sec.) and thereafter bring them over the rinsing-tank.
7. Rinse with water and then bring them over the treating-tank.
8. Treat them during abt. 10 sec.
   The treating-time depends upon the concentration of the acid. The bulb must be treated as long as the required colour has been obtained. To judge of the colour, there are standard bulbs, with which the frosted bulbs must be compared. These bulbs have been provided with a code nr. , e.g. code C. On the bulb drawing in question (R 3-14—....) has been indicated according to which code the bulbs have to be frosted.
9. Immediately after treating, bring the bulb over the rinsing-tank and rinse during abt. 15 sec. with water.
10. Place the bulbs on a tray and rinse them on the outside with water.
11. Allow the bulbs to dry in the air.
12. If necessary, inspect the colour of the bulbs. The frosting may show no spots.
    This inspection may be done by keeping the bulbs in the light of a glowlamp. If necessay, this light can be screened with e.g. a yellow or a green glass plate.

OCC[illegible]NG FAULTS:

Most frosting-defects (spots, stripes, etc.) are caused by too high or too low a temperature resp. concentration of the frosting-acid and the treating-liquid.

Also the pressure at which these liquids are squirted into the bulbs, may be too high or too low.

Besides, the rate of working may be too slow.

Clear spots in the frosted coating may present themselves in old, frosted bulbs (e.g. bulbs that have been stocked for too long a time, and have consequently been soiled by dust or affected by damp, etc.). Prior to being frosted such bulbs must be washed in the following way:

1. Rinse with 5% HF (temperature 35-40°)
   or 10% HF (room temperature)
2. Rinse with cold tap water.
3. Dry in the air.

The bulbs may not be frosted until they are perfectly dry.

The bulbs that allow of frosting a second time, must likewise be washed in the way as described above; however, with a stronger acid, viz. 10% at a temperature of 35-40° and 15% at room temperature.

Date: 21/2/38

R 3-14-53
Page 1.

INCIRECTLY HEATED FURNACE FOR BAKING COATED BULBS OF CATHODE-RAY TUBES.

TYPES:

There is only one type of this installation. A description is given on page 2, while a sketch is shown on page 3.

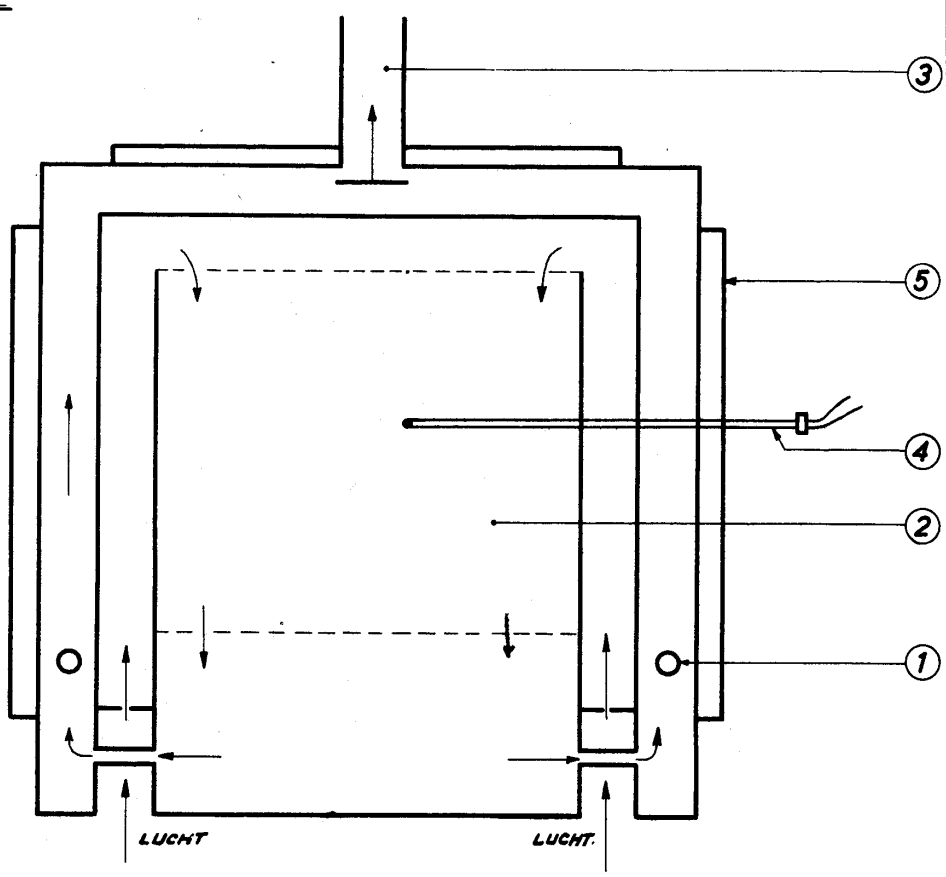
INSTALLATION:

See the drawing on page 3.
We distinguish in it:

1. Gas burner.
2. The space in which the bulbs are put on asbestos-clad iron trays.
   The bottom and the top of this space are equipped with air holes.
3. Chimney.
4. Pyrometer.
   The temperature is measured in about the middle of the furnace.
   When the furnace is cold the pyrometer must indicate the temperature of the surroundings, so it may not be at zero then.
5. Insulated wall.
   The arrows indicate the direction of circulation of the heated air.

Datum: 21/2/'38

Oven :



2262

Date: 20-12-38.

INSTALLATION FOR INSIDE FROSTING BULBS.

(One bulb at a time.)

TYPES:

There is only one type of this installation (808446D), a description of which is given on page 2 ff.

APPARATUS 808446D:

Of this installation a photo is given on page 6 and on page 7 a section drawing of one of the tanks.

This installation consists of three tanks viz. one for frosting (4), one for treating (7) and one for rinsing (10). There is only one jet-pipe (5) in each tank, so only one bulb can be treated at the time. Behind the tanks the shaft (2) has been mounted. Along this shaft two rollers (9) fastened to the lid (11) can be moved to and fro. In this way the lid can successively be brought above each of the 3 tanks. In this lid we find the detachable part (13), provided with conical hole. The end of the bulb-neck rests in this conical hole. Five of these loose pieces are supplied with the apparatus the smallest diameter of the conical hole in the pieces is: 30, 40, 50, 60 and 70 mm respectively.
The rod (12) is mounted on the lid (11). the press-jack on the rod (12) can be fastened in any position.

The frosting tank as well as the treating tank consist of two parts separated by a plate (19) in which the jet-pipe (5) has been mounted. This jet-pipe can be interchanged and can also be lengthened with the aid of a length of brass tubing. The frosting tank has a larger internal diameter than the treating tank. So these two cannot be interchanged.
In the plate (19) we find a valve box (20 and a spindle (23) provided with two drain-stoppers (25) and (26).
A ball (22) is placed in the valve-box. When compressed air is put on the installation the ball will close the hole in the valve, while when the air is shut off the ball will fall down and the liquid on top of the plate (19) can flow back to the lower part of the tank via the valve. The valve-box (20) and the spindle (23) with the drain stoppers are kept down by the tap-rivets (21) and (24).
The compressed air (reduced to 0.25 atm.) is led to the lower part of the tank via a so-called paste-collector (27). As the air-supply is effected in the top half of the paste-collector, no frosting paste (or treating liquid) can come into the air-pipes incase any liquid should be carried along by the air flowing back.
The air is led in via a three-way cock. When the cock is turned after the liquid has been injected into the bulb, the lower part of the tank is connected with a conduct leading to a drain-gutter.
The cocks allowing the compressed air to enter the frosting- and the treating-tank are provided with a safety-device that prevents the cocks from being opened by accident. To open them, first press the knob (6) down.

The frosting- and treating liquid in the tanks is heated by means of warm water. For this purpose two thermo-siphons (1) and (17) are used.

These thermo-siphons consist of a double-walled barrel provided with a tube running through its centre. The outside of the barrel is clad with a heat insulating material. Near the top as well as near the bottom the space between the two walls is connected to a conduct running through the liquid to be heated.

A ring-shaped burner is placed under the thermo-siphons. The water filling the whole thermo-siphon will rise when heated and after having been cooled down in the liquid it will return to the bottom side of the thermo-siphon. A few cocks have been mounted for removing the air from the tubing, otherwise the heated water will not rise. The tubing of the thermo-siphon running through the tanks with liquid, is not bent, but consists of short lengthes soldered together (by means of copper). The material proved to be strongly affected by the frosting-paste, as soon as a little stress was brought into the brass, as e.g. was the case here with bending.

(When diluted frosting-paste is being used as treating liquid fresh water should be added now and then to the treating-liquid to prevent the specific gravity from getting too high. In order to keep the liquid on the right temperature the water should have about the same temperature as the liquid. To obtain this in a simple way, the watertubing has been turned round the chimney (15) of the thermo-siphon. An adjustable screen (16) has been put round the spiral (14). The temperature of the water can be regulated ~~af~~ by moving the screen up- or downwards.

In order to check the concentration of the liquid, a little basin has been mounted on the outside of the treating-tank. This basin is divided into 2 parts by a partition. Both parts are connected with the large tank. A floater (18) is placed in both bassins to determine the specific gravity of the liquid. These floaters correspond with certain specific gravities of the liquid. When the specific gravity of the liquid should be between 1,14 and 1,155 the floater of 1,14 is placed in one of the basins and the floater of 1,155 is placed in the other one. When both sink, the specific gravity of the liquid is too low and the watersupply should be stopped for a moment. When both floaters float the specific gravity is too high and a larger supply of water is required.

The floaters are hollow ebonite cylinders, closed by screw-lids. Grain of shot is put in the inside as much as necessary to attain the required weight.

Dimensions:	diam. 25,0 mm	length	43,0 mm
Weight :	for S.G. 1,14	24,040	grams
	" " 1,155	24,370	"
	" " 1,17	24,670	"

These floaters are only applied when diluted frosting-paste is being used as treating-liquid.

The weights should be chequed e.g. every fortnight. If necessary add or take out grains of shot.

PREPARATION:

1. See R 3-4-27.
2. Place under suction-installation.

UPKEEP:

1. The centring-plates of the frosting- and treating tank are cleaned daily, like all other parts of the installation spattered with frosting-paste.
   As the frosting-tank remains filled, care should be taken that the paste is not diluted, while cleaning.
2. The paste-collectors should be emptied every evening. This is effected by draining. They may not be cleaned with fresh water for not running the risk of the water staying behind.
3. Once a week the frosting tank and the treating tank are cleaned while the jet-pipes for paste and treating liquid and the holes in the air are kept open by means of a drill. After taking out the double valve (23) the tank will be emptied. Then the top-plate is removed after which the plate, containing the jet-pipe, can be taken out. This plate is pressed down by the bolts in the top plate. When the tanks are empty they should be rinsed with water. Any dregs should be removed with the aid of a putty-knife.
4. The air-cocks should be dismounted onces week and after being cleaned with water containing soda they are mounted again.
   Care should be taken that not too much grease is put on the cocks, as this grease might get along with the air to the frosting-tank and almost surely would cause stains on the bulbs.

DISTURBANCE IN THE INSTALLATION:

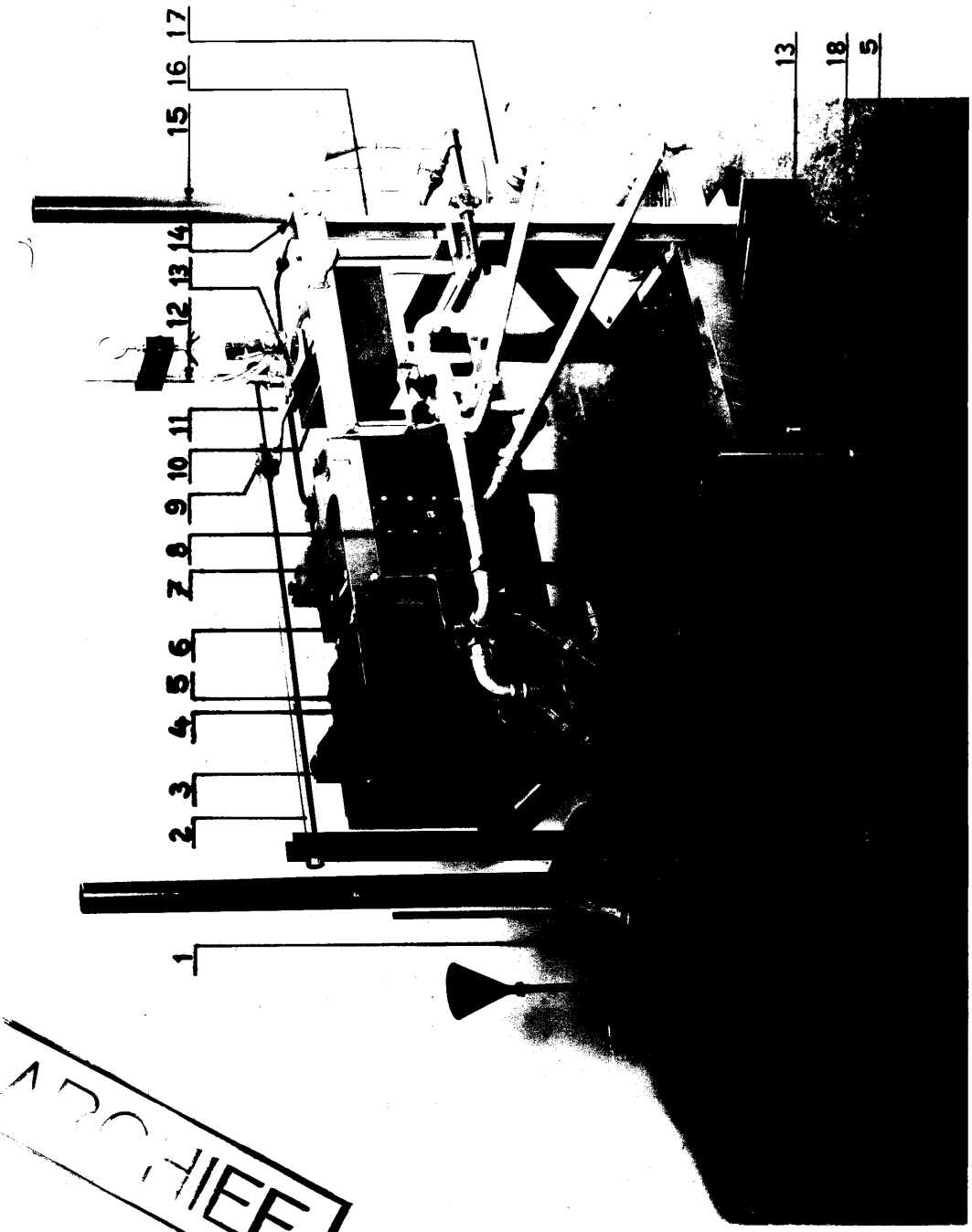
When the frosting paste or the treating liquid are not spouted into the bulb with sufficient force this may have the following causes:

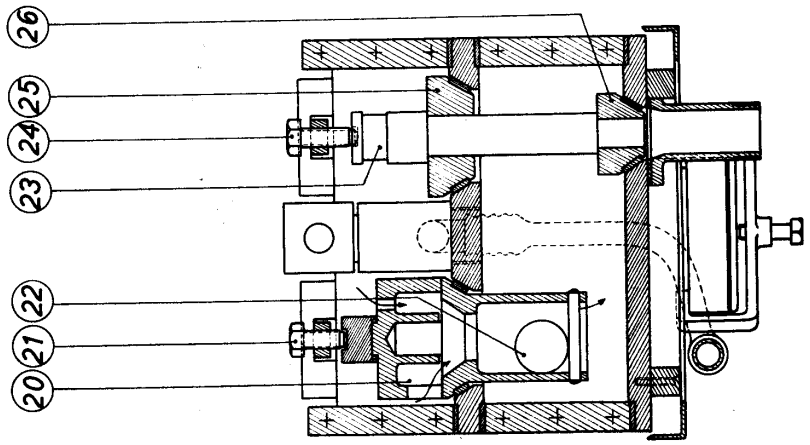
1. The air-valve between upper- and lower part of the tank does not shut off sufficiently for some reason or other.
2. The air-outlet is clogged, so the liquid can not return to the lower part of the tank quickly enough.

3. One or both jet-pipes are torn.
4. The air-pressure is too low and the conducts or cocks are partly clogged.

FLOOR SURFACE AND WEIGHT:

Floor surface 2,1 x 0,9 m^2. Weight 370 kg.





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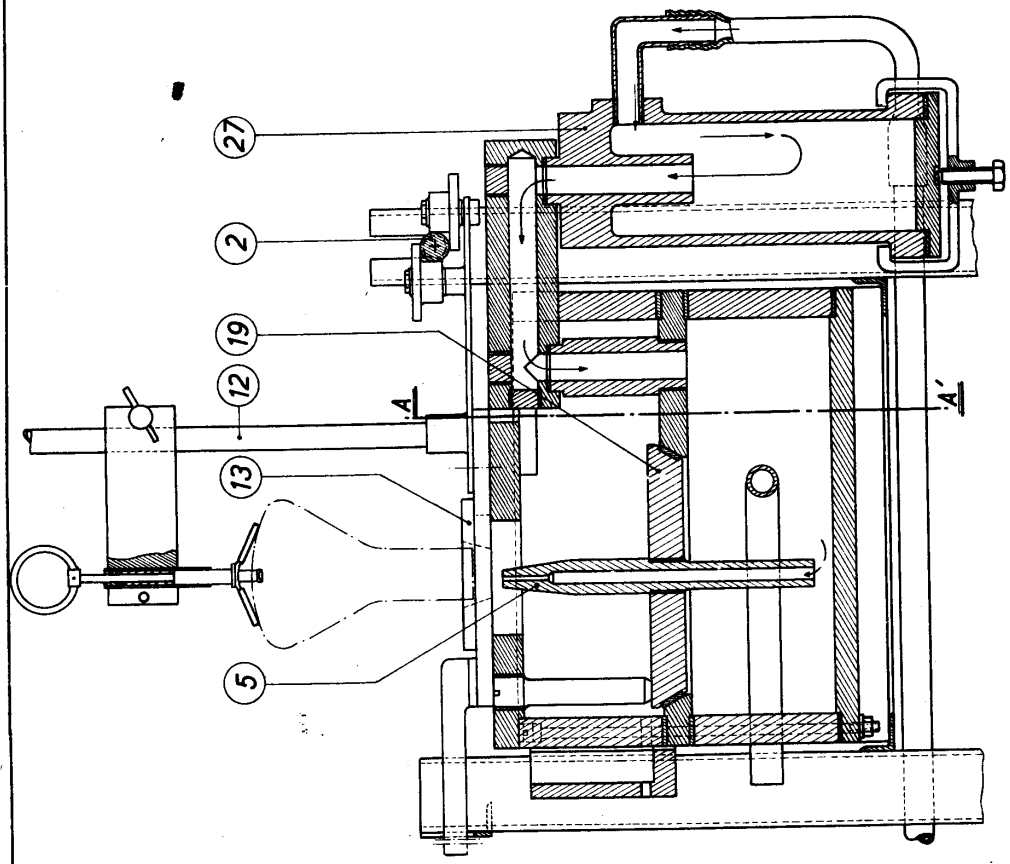


SEALING-IN THE BEADS OF THE "GUN" FOR CATHODE-RAY TUBES.

APPARATUS:

Installation I (semi-automatic))
" II (hand apparatus)) R 5-8-21
" III (hand-apparatus))

ADDITIONAL APPARATUS:

Tweezers) R 5-1-1
Bending pliers)

PROCEDURE:

1. Fix the parts to be sealed, in the jig mentioned in the mounting-instructions.
2. Adjust the rods which are to be sealed into the bead and cut them to equal lengths.
3. Place the jig in the apparatus (only for semi-automatic installation).
4. Place the bead in the boat (use tweezers).
5. Turn the gasflames higher.
   This should not be done suddenly, but gradually (taking abt. 5 minutes for it.)
6. Heat the bead until it is sufficiently soft.
   When the bead has been heated too long the glass will stick to the boat thus causing great trouble (this does not take place with coranite-boats).
   Meanwhile care should be taken that the heating on the top side of the bead takes place equally. If not enough care has been taken, then:
   1. the bead will get insufficiently hot at several places and e.g. will not be sealed to a rod and as the other rods are sealed in well, the gun has to be dismounted altogether and be repaired.
   2. the bead will get too hot at several places and will stick to the boat, at least it will cause remainder of glass to stick to the boat which has to be removed.
7. Turn the gas-flames down again.
8. Press the parts to be sealed in, quickly into the bead and wait for about 2 seconds.
9. Treat the other beads in a similar way.
10. Similarly repeat all operations with new set of parts using an other (cold) jig.

11. Take the"gun" out of the jig used first.
12. Remove the spacers from the "gun" (use pliers).

Remark:

When the bead is loose or when it is not fixed sufficiently this may result from:

1. Insufficient heating of the bead.
2. Too much cooling of the bead before the rods were pressed into it.
3. Not pressing the rods deep enough into the bead.

Date: 13/2/'39

INSTALLATION FOR SEALING BEADS TO THE "GUN" OF CATHODE-RAY TUBES.

TYPES:

Of this installation following types are used:

Installation I (semi automatic)consisting of:

Sealing-in apparatus	M6 408 44
Valve	1 053 38
Pedal	
Hose-clips	

For above-mentioned apparatus see:
Photo on sheet 6.
Description on sheet 2.

Installation I is the latest design.

Installation II (hand-apparatus) consisting of:

Sealing-in apparatus	M6 348 80
Valve	1 053 38
Pedal	
Hose-clips	

For above mentioned apparatus see:
Photo on sheet 7.
Description on sheet 3.

Installation III (hand apparatus)

Of this installation, in principle the same as installation II, no photos or sketches are given in these specifications.

The removable plate (2) of this installation has here been replaced by a narrow metal sliding-lid provided with upright edges and a handle. In a similar way it suits the same purpose as the plate mentioned.

The sealing-in apparatus is of older construction than the one of installation II and has been coded: M6 348 53

The other parts of this installation equal or correspond with those of installation II.

INSTALLATION I (Semi-automatic)

The figures, between brackets, refer to the numbers in the photo on page 6.

In order to heat the bead that has to be sealed to the "gun" sufficiently, without having the melting glass stick any where, the bead is heated in a socalled "boat" (1) clamped in the holder (2). This holder can turn round a pin so the "boat" can be turned away from the burners. As the holder is within reach, the boat can easily be unscrewed from the holder and replaced by an other one (which may be desirable incase of wear and tear or for putting in a boat with either a shorter or a longer groove, in connection with the length of the bead). When turned inside, the position of the holder is determined by a stop fixed on the bottom-plate (not visible in photo).

Two groups of burners (3) serve to heat the bead. They are fed by gas (4), and a mixture of oxygen and air (5). In connection with the length of the bead, when desired, some of these burners can be taken out of service by means of the hose-clips (6). It is possible to regulate the intensity of the flames by means of a pedal (not visible in the photo).

A jig (8), containing the parts of the "gun", can be clamped in the holder (7). The jig is connected with a distribution-sheave (9), which makes it possible to turn the jig either through 90° or through 120°, as desired, (in connection with the number of beads to be sealed in - either 3 or 4 -). The holder has been mounted resiliently and can be turned in the direction of the boat. Thus the parts to be sealed in, can be pressed into the beads.

A green glass-plate (10) has further been mounted to protect the eyes from the strong and sharp light the melting beads are spreading.

The burners are coded: M6 407 50

The numbers of the boats are mentioned for each type in the Mounting Instructions.

The burners can be turned in any direction. They should point to the hollowing of the boat. In a mixing-valve, not visible in the photo, the oxygen is mixed with the air. The addition of the air prevents the danger of explosion. In the mixing-valve also a closing-device has been made which can be operated by a pedal. In this way it is possible to regulate the intensity of the flames. When the pedal is not pressed down, only a mixture of little gas and little air is admitted and the burners only burn in small and loose flames.

The maximum intensity of the flames can be altered either by the main-cocks or by the adjusting-screws (11). It is advisable always to open the main cocks of gas and oxygen entirely and to regulate the maximum intensity of the flames by means of the adjusting-screws.
The air-supply is regulated with the main-cocks and only needs to be small.

The boat (1) has been cast from coranite. In the photo graphite boats are shown, having a very limited length of life and no practical advantages. Also boats made of brass prove to give satisfaction. These boats also have a long life. A piece of asbestos on a metal plate and provided with a hole for the boat has been placed round the boat to prevent too great heating of metal underneath. (Asbestos plate + metal plate were removed before the photo was taken with a view to the description).

The holder (7), for the clamping of the jig, is limited in its up- and downwards movements by a stop (12) and (13) respectively. The sketch on sheet 5 shows distinctly how the jig (8) is fastened into the holder. After pulling the wheel (14) to the right, the jig can be removed. The jig is coupled to the distribution-sheave (9) by means of the stud (15). The position of the sheave is controlled by the pawl (16).
On one side the distributing-sheave shows four notches at angles of 90° and on the other side 3 notches at angles of 120°.
The pawl (14) is movable in an axial direction so that either the one or the other side of the distributing-sheave can be used dependent on the use of either 3 or 4 beads.

INSTALLATION II (hand-apparatus)

The figures between brackets refer to the numbers in the photo of sheet 7.

With the exception of the holder of the jig and the holder of the boat, which are not used, this installation is in principle the same as installation I.
So the description of this installation is the same as for installation II.

In this apparatus the boat is placed on the two pins of a removable plate (2) (only one pin is visible in the photo). After the bead has been heated sufficiently, the plate (2) is quickly drawn out and the parts to be sealed in (already placed in a jig) are pressed into the bead by hand.

Following parts have been coded:

Burner	M6 407 50
Boat	M6 348 57

The burners: See installation I

The boat: In contrast with installation I, one boat provided with a prolonged groove will be suitable for the various lengths of beads with installation II. This is possible, because the bead can always be put in the correct place under the burners by means of the sliding-plate.
For informations concerning the material of the boat, see installation I.

PREPARING FOR USE: (installation I, II and III)

New boats (graphite ones excepted) should be heated intensily and cooled down again several times in order to increase the oxidization of the metal. The thus formed layer of oxide prevents "sticking" (i.e. the sticking of the soft glass of the bead to the metal).

UPKEEP:

When the glass sticks to the groove of the boat it should be scraped off and removed in cooled condition.

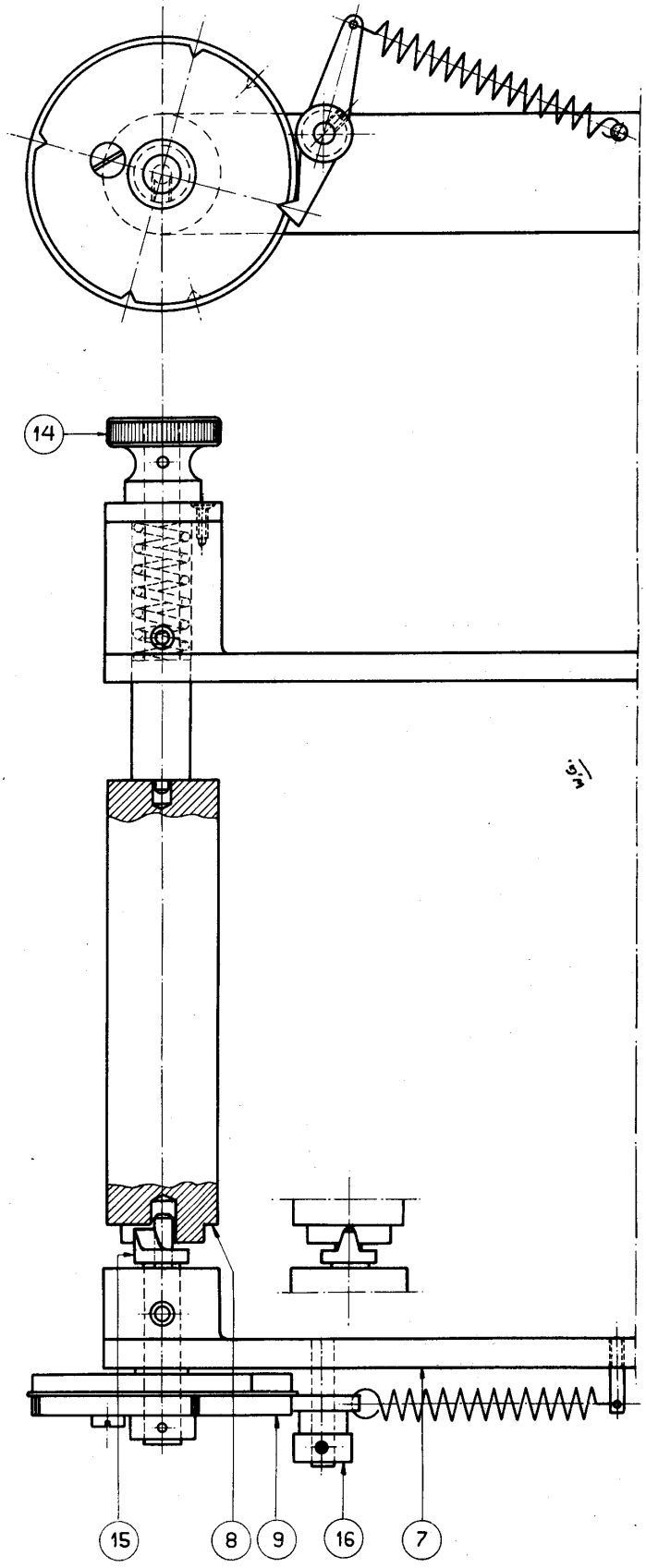
Once a week the movable parts should be lubricated with thick oil.

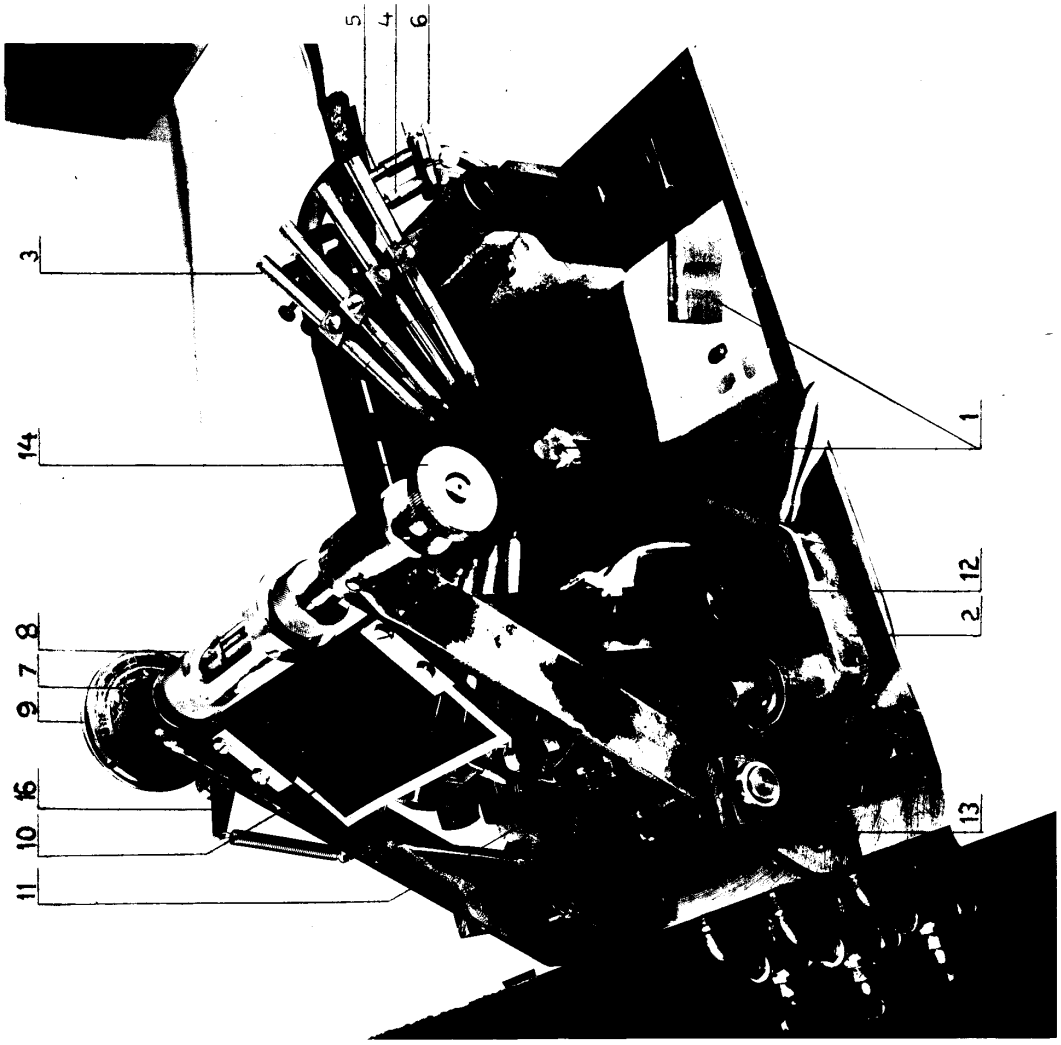
TABLE SPACE AND WEIGHT:

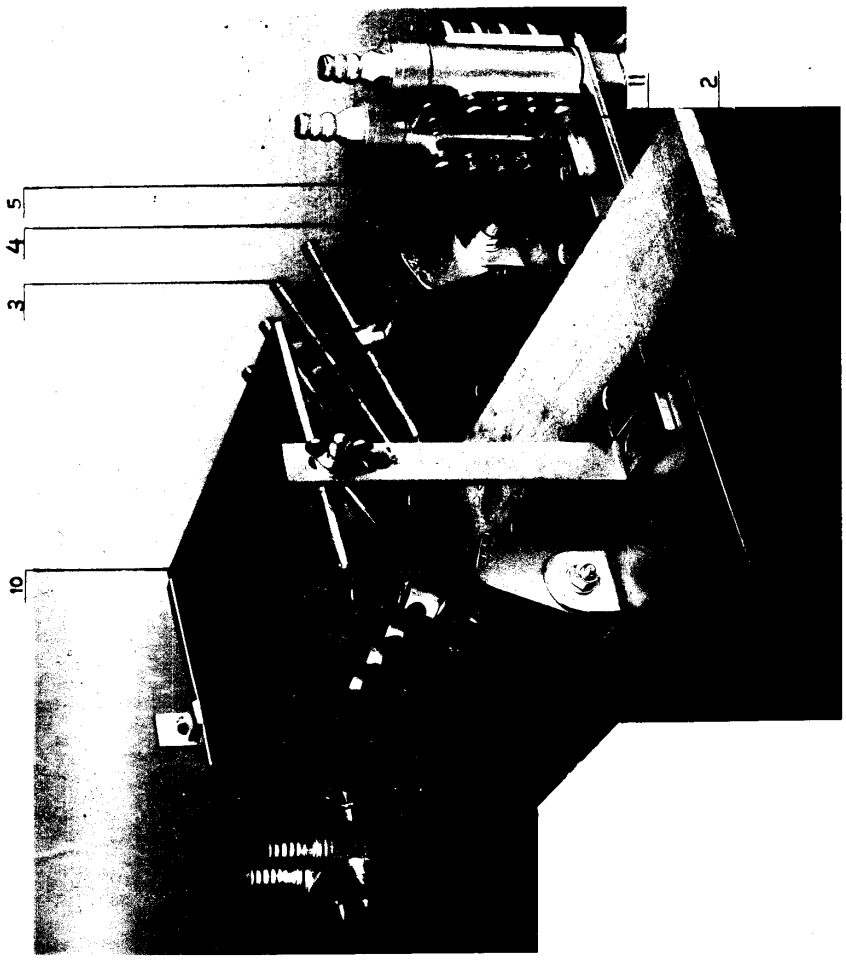
Table space:		Weight:
Installation I	0,31x0,41 m^2	abt. kg,
" II		abt. kg.
" III	0,48x0,59 m^2	abt. kg.

Datum: 13/2/'39

R 5-8-21
Blz. 5







CENTRING AND WELDING PARTS OF CATHODE-RAY TUBES ON A CENTRING LATHE.

OBJECT:

A. Positioning, spacing accurately and welding the cathode and the "gun" with respect to each other.

B. Positioning the mount with regards to the sealing-in jig.

APPARATUS:

Centring lathe provided with welding installation for cathode-ray tubes R 5-1-53

Flat brush.

REQUIRED MATERIALS:

Asbestos plate.

PROCEDURE:

A. Positioning, spacing accurately and welding the cathode and the "gun" with respect to each other.

1. Fasten the jigs (see Mounting-instruction R 5-1-) in the centring-heads.
2. Fasten the mount- with the mounted cathode - on the jig by means of the asbestos plate.
3. Centre the cathode.
   a. Direct the centring pin on the outer rim of the cathode.
   b. Switch on the motor (or turn the gear wheel by hand).
   c. Adjust the cathode with a pair of pliers (e.g. Nr.12 of R 5-1-1) or with tweezers in such a way that it is running dead true with the point of the centring pin. (When centring, hold one toothed wheel, or switched the motor off). It is preferable to put a small piece of white paper under the cathode, for better noticing the eccentricity.
   d. Inspection (when necessary use a magnifying glass).
   e. Switch off the motor.
4. Bend the lids of the spy-holes in the grid away, so that it is possible to look through the holes.
5. Fasten the "gun" loosely in or on the jig.

6. Centre the "gun" in the same way as the cathode, without bending it however but by adjusting it in - or on - the jig.
7. Fasten the "gun" well in or on the jig.
8. Place the rods to be welded without tension against the tags of the grid.

When using Installation I:

a. Unscrew the lock of the cathode jig a little.
b. Turn the cathode jig in the required position.
c. Fasten the cathode jig again.

When using Installation II:

Turn the "gun"-jig in the desired position by the use of the slipping connection.

9. Adjust the "gun" at the exact distance of the cathode. This distance is adjusted either visually or by means of the vernier (see the mounting instructions concerned).
10. Weld the "gun" to the mount.
11. Remove the mount from the centring lathe.

B. Positioning the mount with regards to the sealing-in jig.

1. Fasten the sealing-in jig (containing the centring jig) in the centring head.
2. Fasten the mount to the jig (by means of the asbestos plate).
   Remove the asbestos sticking out of the mount with tweezers and wipe the asbestos threads away with a brush.
3. Centre by means of a centring pin, without bending the mount however, but by adjusting the centring jig with regards to the sealing-in jig.
4. Take the assembly "mount - sealing-in jig and centring jig" out of the centring lathe.

After some experience the"gun" may be centred, visually instead of with the use of the centring pin.

CENTRING LATHE PROVIDED WITH WELDING MACHINE FOR CATHODE-RAY TUBES.

TYPES:

The following types of this installation may be used:

Installation I.

Centring lathe	M6 505 79
Welding transformer	IKVA
D.C.-motor	n=1500 90 W
Resistance	250 1,5 A

For the above mentioned apparatus see:
Photo on page 13.
Description on page 3.

Installation I is the latest design.

Installation II.

Centring lathe	M6 348 09
Welding transformer	IKVA
D.C.-motor	n=1500 90 W
Resistance	250 1,5 A

In principle this installation is the same as Installation I. The differences are of little importance, except for the following:

1. The left centring head is not provided with a fine-adjustment.
2. The left centring head is provided with a slipping-connection.
3. The toothed wheel of the left centring lathe can be put out of the reach of the motor-driven pinion.
4. The centring pin is placed on the mounting bench instead of being fixed on the lathe.

For the above-mentioned apparatus see:
Photo on page 14.
Description on page 5.

Applications:

1. Centring and spacing the "gun" with regard to the cathode and the welding of these two parts.
2. Centring the "gun" - (mounted on the foot) - with regard to the sealing-in jig.

TOOLS REQUIRED:

Installation I (see sketches on page 9)

Fastening pins	M6 505 75
" "	M6 505 76
Holder	M6 502 81

Installation II (see sketches on pages 10 and 11)

Fastening pins	M6 348 81 or M6 348 82
" "	M6 502 83
Holder	M6 348 19

Installations I and II (see sketches on pages 12 and 9).

Bending pin	M6 348 86
" "	M6 348 87
Sealing-in jig	M6 502 81

INSTALLATION I:

The figures between brackets refer to the numbers in the photo on page 13 and the sketch on page 6.

The centring heads (5,12) carry the hollow shafts (24) in which the parts to be centred are fastened by means of the jigs (6,11). These hollow shafts are brought to rotation by the motor (15) via the gear wheels (4,13), the pinions (7) and the endless belt (1).
The speed of the motor can be adjusted (regulated) by the resistance (19).
As the pinions (7) for both heads are fixed to the same shaft, both jigs (6,11) rotate in the same direction with the same speed.

The heads can slide over the shafts (17,18) in an axial direction, the right hand one by means of a fine adjustment and handwheel (14) and a vernier, the left one by means of a fine adjustment (2).
On page 7 a sketch is given of the latter. When loosening screw (16) it is possible to move the left head over a longer distance.

The jigs can be fastened in the hollow shafts (24) in various ways, dependent upon the construction.

a. Jigs provided with cones are pressed into the hollow shaft with a slight turn and then are fastened sufficiently. By means of a copper pin (through the hollow shaft) they can easily be removed again.

b. Jigs provided with screw-thread can be screwed fast with the key (3).

c. Jigs without cones and screw-thread are fastened between the jig and the key by the latter with the aid of an axiliary piece (see the mounting instructions concerned).

On the foremost shaft two bushes (20,21), placed one over the other, have been applied. An adjusting pin (8) is fastened on the outer bush.

Finally a rail has been applied to the frame of the lathe, over which an adjusting pin (9) and a magnifying glass (10) can be moved to and fro.

The welding installation consists of a welding transformer, not visible in the photo, a pedal-switch (23) and the welding pliers (22).
The lathe has been earthed.

To this installation also two bending pins belong, which are used to make the diameter of the ends of the jigs, to which the mount is fastened, either larger or smaller in connection with:
The mount diameter not being constant.
The jig becoming too small by continually clamping the mounts to it.

PROCEDURE:

Centring:

1. Bring the part to be centred into rotation.
2. Apply the point of the adjusting pin (9) close to the turning part, which makes it easier to find an eccentricity.
3. Take the eccentricity away. See R 5-11-2.

Spacing the cathode and the gun.

See the sketches on page 8.

1. When the "gun" and the cathode are centred separately and are brought close enough to each other, the inner bush (20) is pushed against the left centring head and screwed to the shaft. The outer bush (21) is then placed so far to the left, that the point of the pin connected to it touches the bottom of the grid. Because the touching may not cause any tension in the gun or in the pin the beginning of the touching is ascertained electrically (dry battery + lamp). Then the outer bush is screwed to the shaft.
2. With the aid of the fine adjustment the left centring head is shifted to the left until the edge of the grid and the point of the pin are in one plane.(This may be ascertained by means of a magnifying glass). So the distance between the head and the inner bush is the same as the inner-length of the grid. (This distance is marked in the sketch with "a").
3. With the aid of the fine- adjustment on the right head, the emitting layer of the cathode is brought in the plane of the edge of the grid, while the indicator of the vernier is put at "0". (As a result of the - practically unavoidable - play in the fine adjustment, care should always be taken that the division of the vernier comes into movement at the same time as the hand wheel.
4. With the aid of the fine adjustment, the cathode is turned away from the grid over a distance, equalling the ultimate distance - given in the assembly drawing - between the grid and the cathode and which is determined with the aid of the vernier. (The distance concerned is marked "b" in the sketch).
5. The left head is placed against the inner bush. In this way the cathode is brought at the desired distance from the grid.

INSTALLATION II:

See photo on page 14.

The most important differences with installation I have already been given on page 1. About the slipping-connection following may be said:

Against the gear-wheel of the left head a felt ring has been clamped (corresponding with the metal ring (25) in the sketch on page 6). This makes it possible to make the hollow shaft (24) slip with regards to the gear-wheel (13)

UPKEEP:

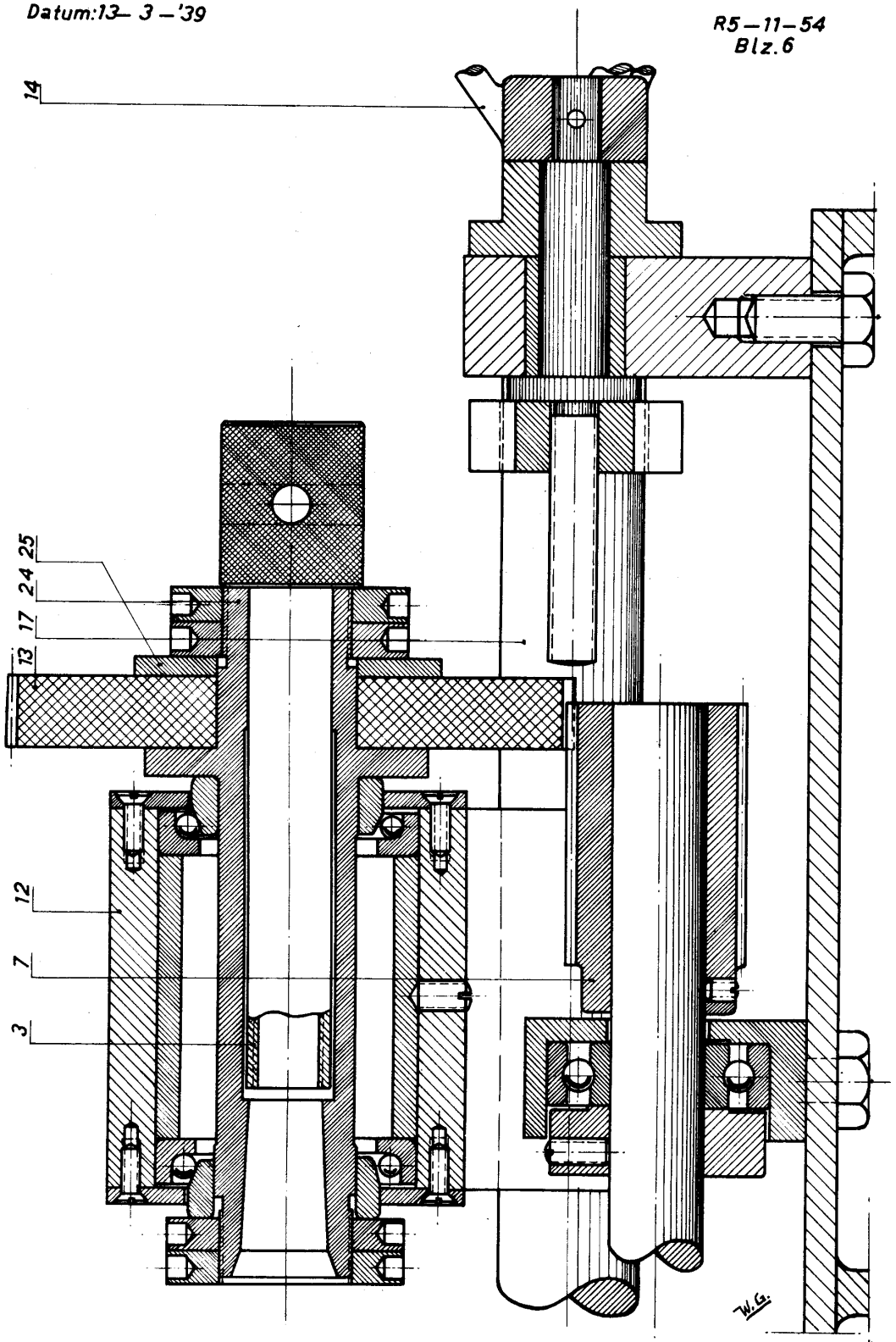
Lubricate the running parts once a week with oil.

TABLE SPACE AND WEIGHT:

Table space 1 x 0,25 m^2. Weight.

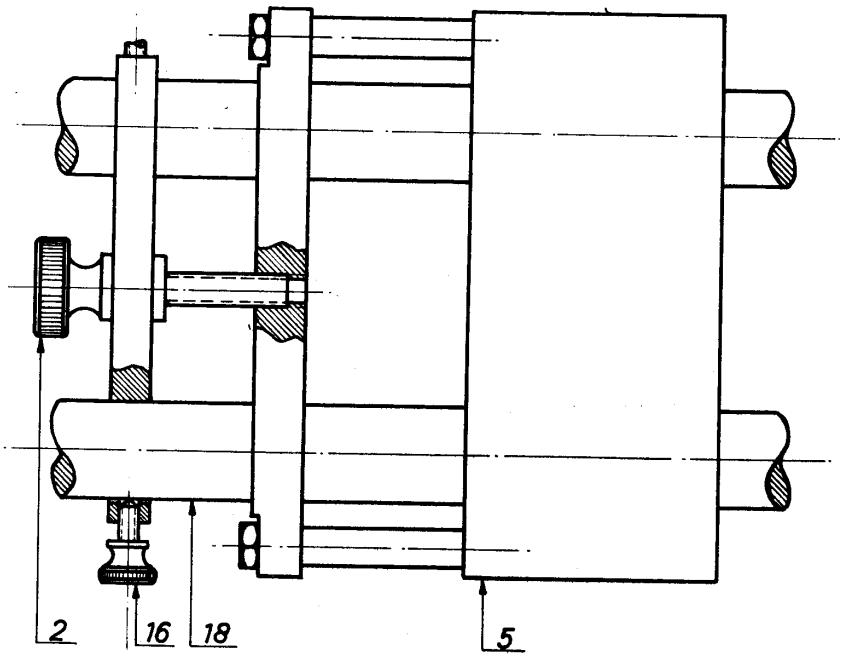
Datum:13– 3 –'39

R5–11–54
Blz.6



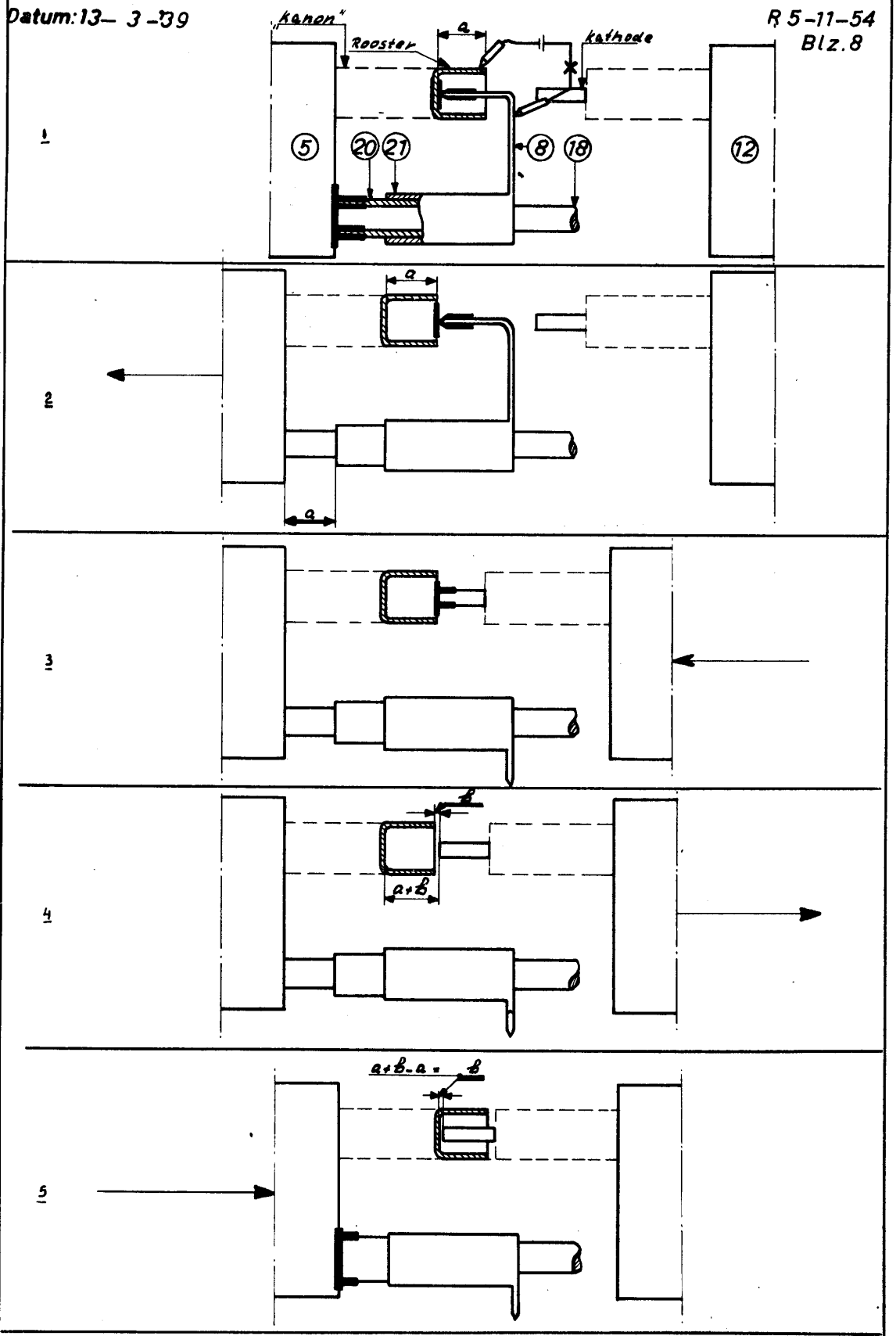
Datum: 13– 3 –'39

R 5–11–54
Blz. 7



Datum: 13- 3-39

R 5-11-54
Blz. 8



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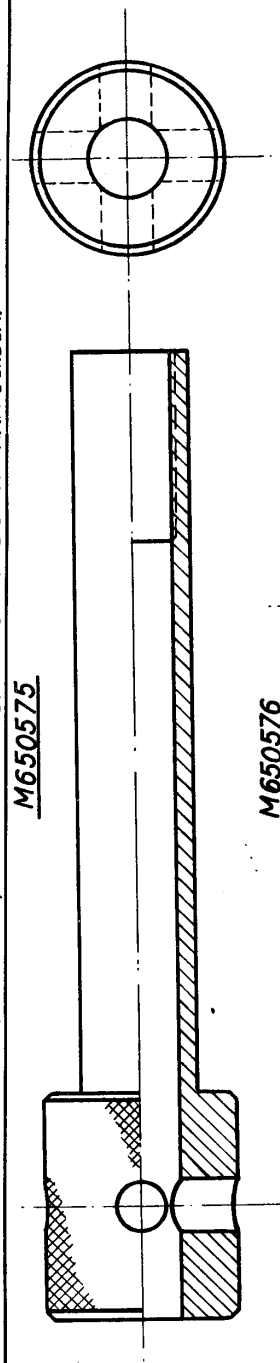
R5 –11–54
Blz.9

M650575



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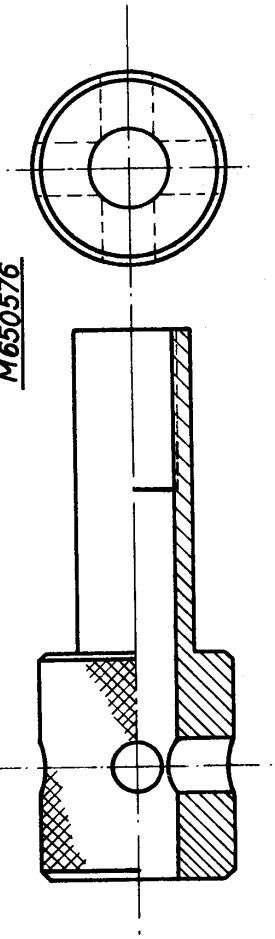

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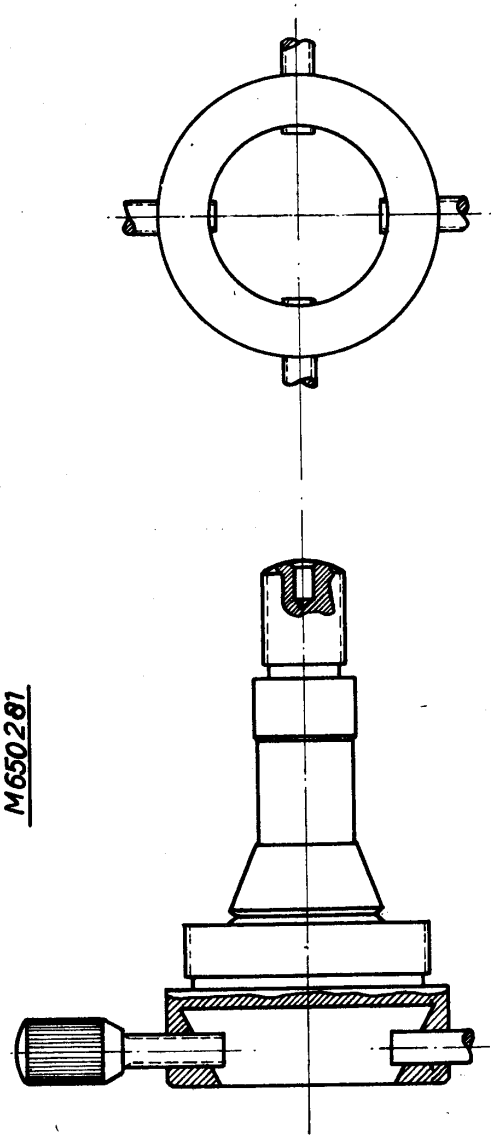

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R5 -11 - 54
Blz. 10

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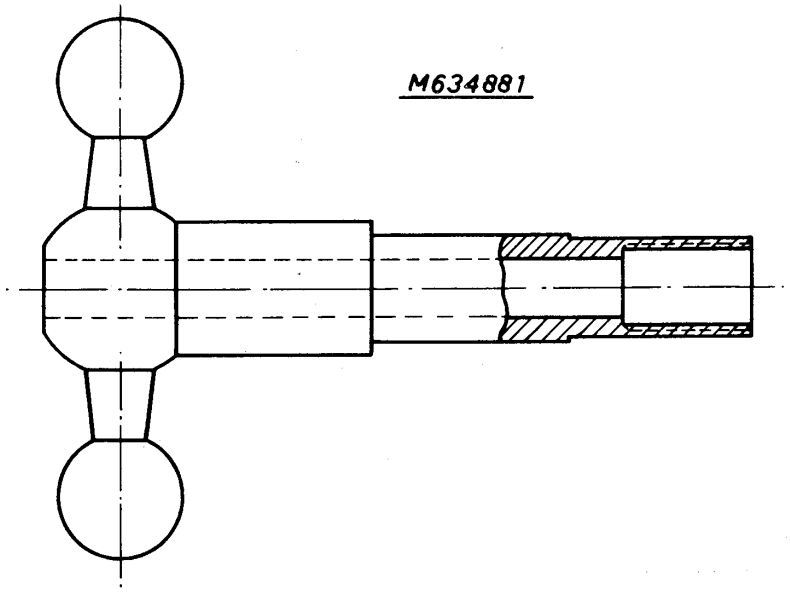

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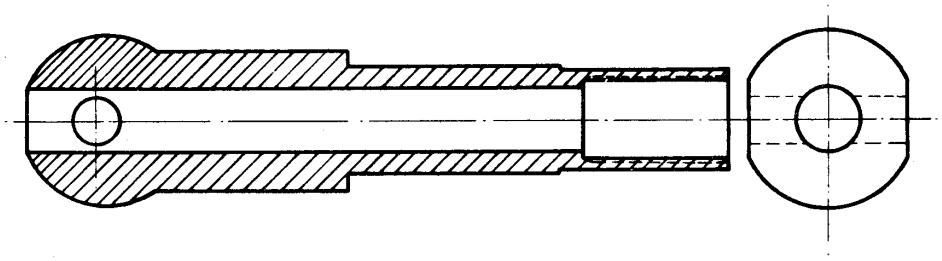

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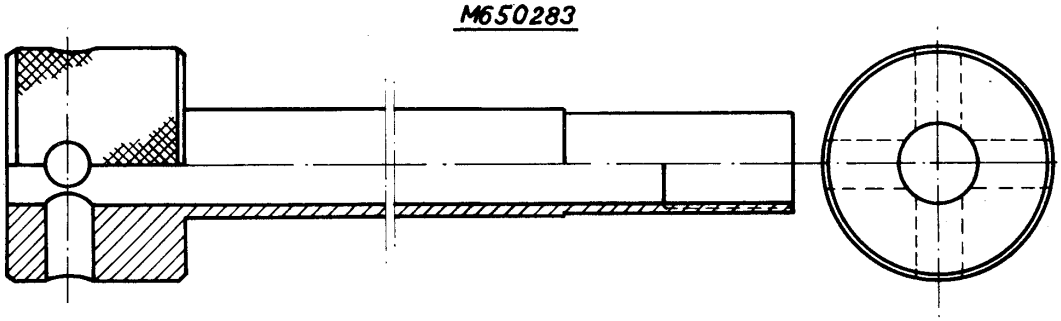
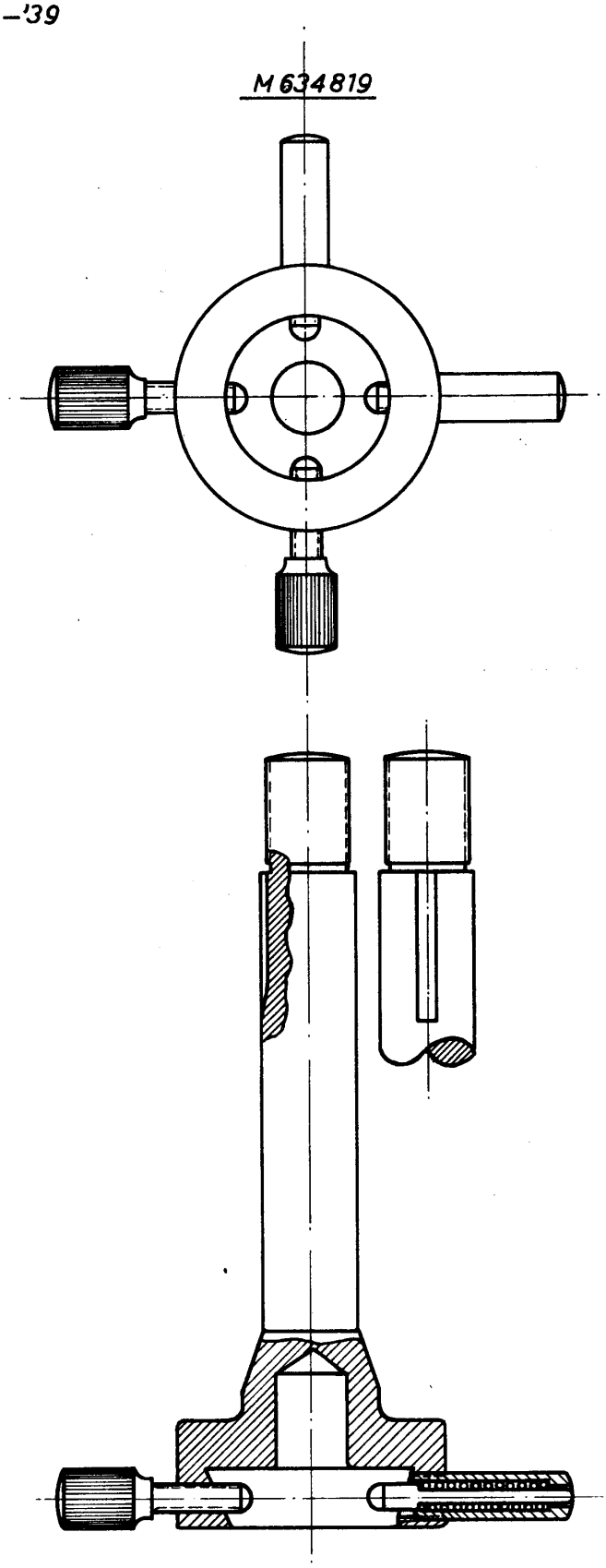


M 634819



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R5—11-54
Blz. 12

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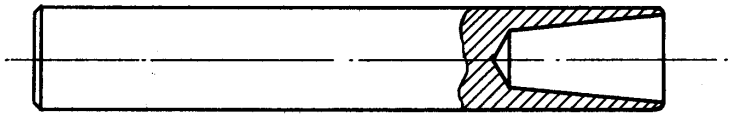

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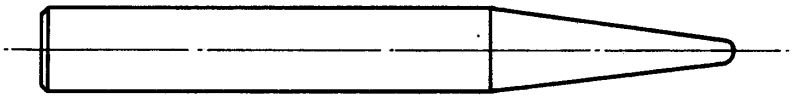

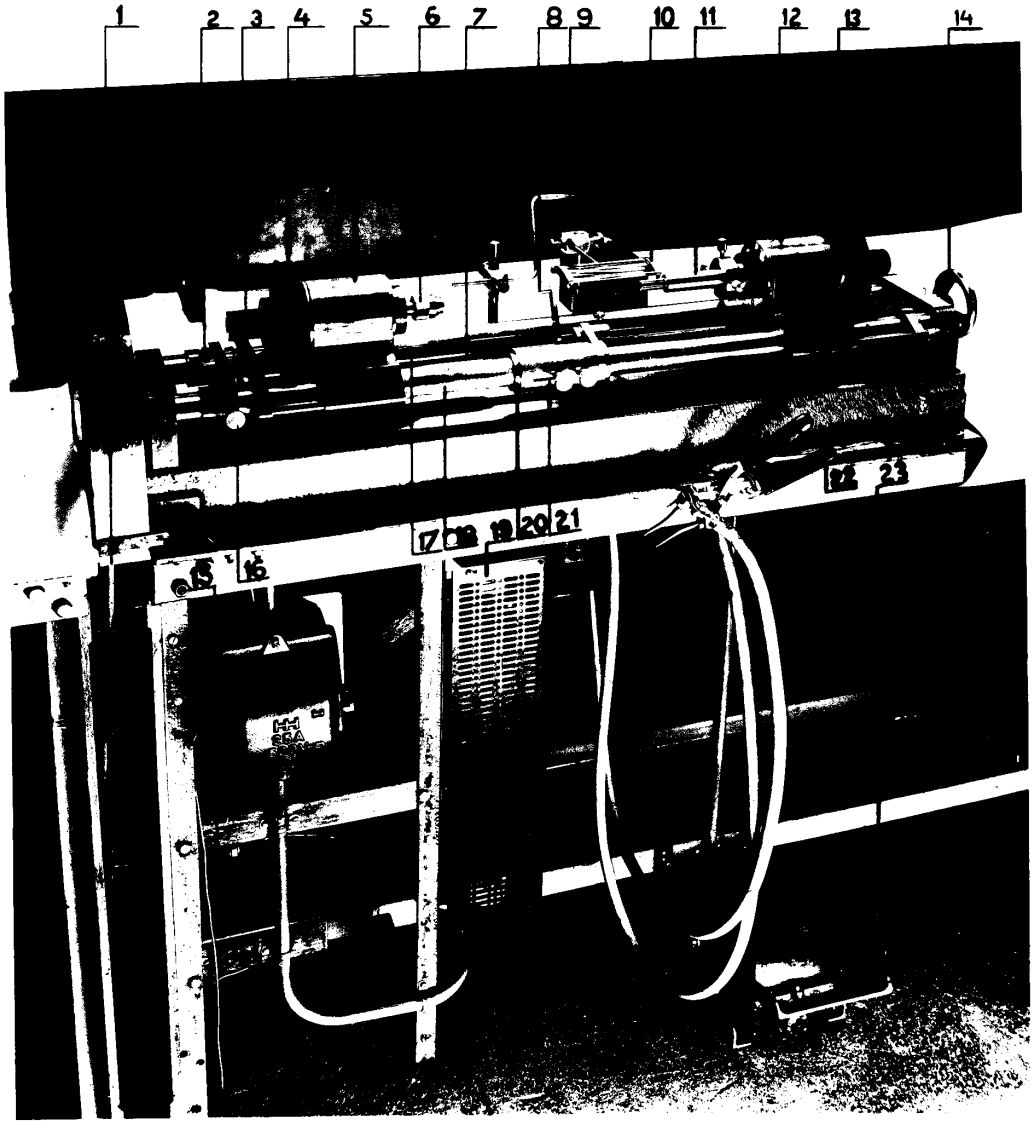

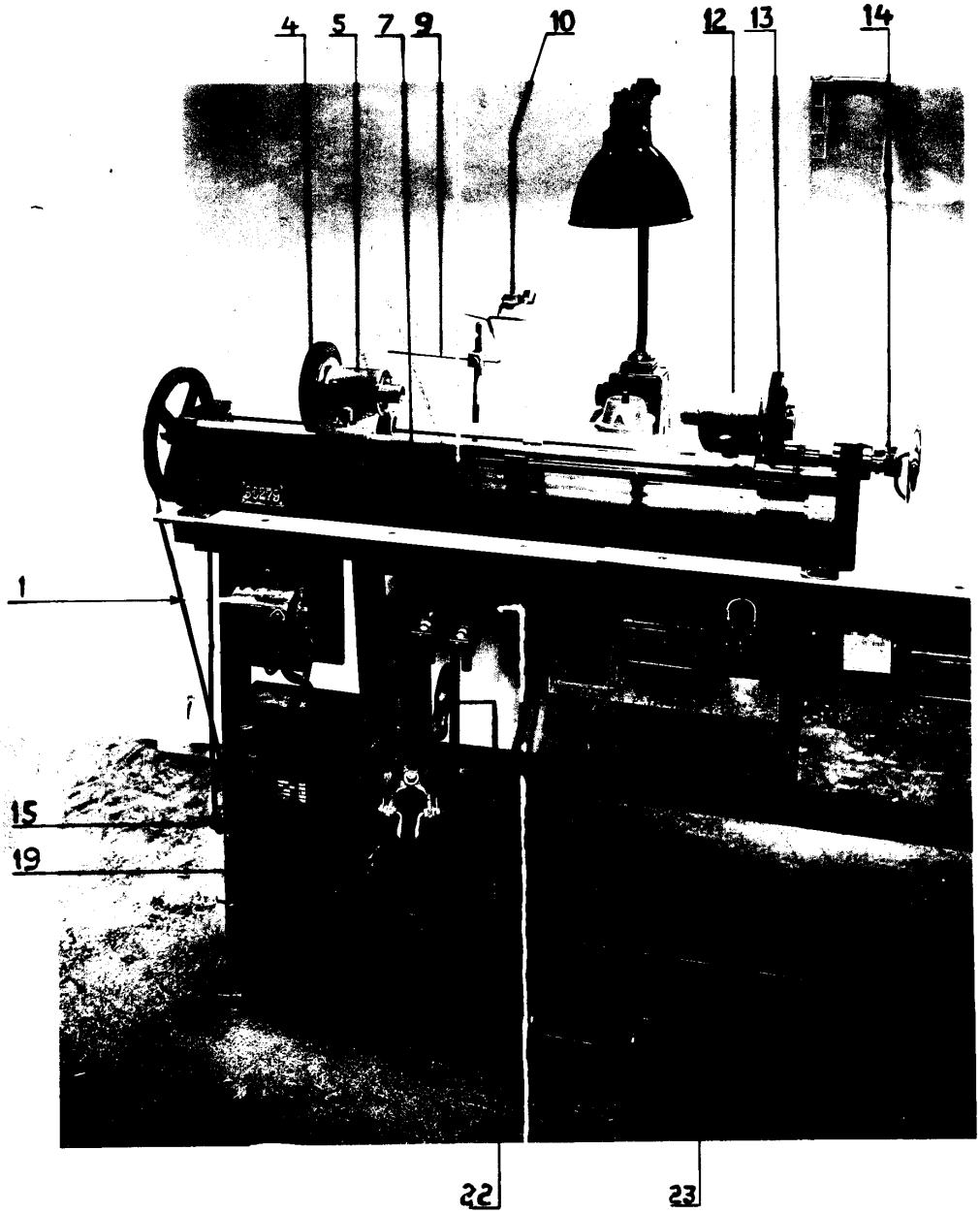

21/2/'39
17/1/'39

R 6-2-1

LIST OF STAMPING MATERIALS.

Stamping material	Code no.	Instructions	Application and details
Cold stamping acid	02 931 20	R 2-15-6	Indelible stamps on glass.
Stamping salt	02 930 00	R 2-15-5	Indelible stamps on glass of finished tubes.
Stamping fat	02 931 00	R 2-15-13	When using stamping salt.
Silver stamping paste No 40	02 060 10	R 2-15-4	For burning in indelible stamps when sealing-in.
Silver stamping paste no 42	02 060 42	R 2-15-14	As paste No 40 but for a somewhat lower temperature.
Black stamping paint	02 060 27	R 2-15-9	For indelible stamps on metallisation and on valves in a shield.
Quickly drying black stamping paint	02 060 19	R 2-15-11	Ditto, but only used in urgent cases.
Quickly drying mixed aluminium stamping paint	02 060 37	R 2-15-10	Effaceable marks on philite bases, clear bulb and lacquer lacquer layer.
Aluminium powder	02 070 90	R 16-11-4	Suppliers: Deuba, Nürnberg. Used for ~~Valvitrin~~ stamps on glass bulbs of unjumped transmitting tubes.
Dilufod Japan lacquer	02 060 12	R 2-15-21	When stamping with aluminium powder.
Stamping ink No 3 (without glycerine)	02 932 00	R 12-15-12	Effaceable marks on nickeled bases.
Stamping ink No 31A 10% glycerine	02 932 07	R 2-15-1	Effaceable marks on metals.
Blue stamping paint	02 060 26	R 16-11-9	Suppliers: Gravol, Berlin. Indelible marks on metallised cathode-ray tubes.
Marking ink No 7	02 932 10	R 2-15-16	Effaceable marks on metals.

Wilhelmsen

R 7-3

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VOOR POMP EN ONTGASVOORSCHRIFT ZIE TYPE MW 22-1.

For specification s see type MW 22-1

POMP EN ONTGASVOORSCHRIFT		TYPE NR. MW 18-2		
DATUM 29/5/'39	DOORGEG. J.	AANTAL BLADEN 1	TEEK. NR. VOORSCHR. NR. 1	BLAD: 1

N.V. PHILIPS' GLOEILAMPENFABRIEKEN TE EINDHOVEN, HOLLAND; AFD. FABRICAGE-VOORSCHRIFTEN A.R.

APPARATUS:

Exhaust bench (as per R 7-5-24
(as per R 7-5-25 (with liquid oxygen round the mercury trap)
H.F. coil as per R 8-2-3 type z
H.F. installation as per R 8-2-5
Treating installation as per R 7-3-6
Cylinder (filled with nitrogen) provided with tubing (pure nitrogen).
Glass-knife or file
Tweezers

Remark: 1. Untwist the leadwires.
The lead wires of cathode and a1 are connected to each other (only with hexodes).
2. As already mentioned before these tubes can be exhausted on two different kinds of exhaust benches; viz a/ on an exhaust bench without mercury traps, without main-cocks and for each tube an exhaust installation (R 7-5-24) and b/ on an installation provided with mercury traps with main cocks and 3 tubes for 2 pumps-combined (R 7-5-25).
The tubes as per R 7-5-24 are always kept on the right temperature after the glass has been heated, which is not the case with R 7-5-25.

PROCEDURE:

A. Sealing the tube on and exhausting it (duration abt. 45 min.)

1. Seal three tubes on perpendicularly, with the exhaust tubes pointing to the front.
When working as per R 7-5-24 the neck of each tube should be exactly above the hole in the bottom plate of the furnace used for this purpose.
During the sealing-on process nitrogen is supplied through the exhaust tube into the filament mount. The pressure of the nitrogen however should be so low that the flow of nitrogen is hardly perceptible when the rubber tube through which flows the gas is kept before the opened eye so that the stream of gas can be felt on the cornea. Nitrogen is used in order to prevent any damp to set on the screen. Seal off this exhaust tube as short as possible immediately after sealing the valve on. Seal off the blowing tube.
2. Connect the tubes with the preliminary vacuum (via capillary tubes).
3. Leave things so for 20 min.
It is advisable to put the furnace over the tubes already now (to prevent any danger of explosion).
4. When the mercury in the manometer (between valve and capillary tube) has fallen abt. 5 cm (in the closed arm) pump the valves high vacuum (open the cocks slowly).
5. Switch on the tension for the heating elements of the pumps.
When working as per R 7-5-25:
a. The operation sub 5/ is not necessary.
b. A vacuum glass filled with liquid oxygen is placed round each mercury trap. This should be done slowly, as otherwise the mercury traps will crack.
6. When the vacuum is abt. 5 units:

B. Annealing the glass (duration abt. 3 hours):

1. Light the furnace and pull it down altogether and when necessary fasten the plate of the furnace to the furnace.
2. Raise the temperature in such a way that the temperature is abt. 400°C after abt. 1½ hour.
3. Leave things so for 1½ hour.
When working as per R 7-5-24:

EXHAUST- AND GAS- EXPELLING SCHEDULE		TYPE NR. MW 18-1 MW 18-2 MW 22-5 MW 22-3 MW 22-4 MW 22-2 MW 22-1		
DATUM 3/7/'39	DOORGEG. W.H.	AANTAL BLADEN 3	TEEK. NR. VOORSCHR. NR. 4	BLAD:1

4. Reduce the supply of gas and let the furnace cool down to 300-350°C. Then the furnace with the furnace plate is raised so high that the neck of the tubes is sufficiently below the furnace plate to degas the "gun" with H.F.
During all operations, mentioned below, the tubes remain in the furnace in this way on a temperature of 300-350°C.
When working as per R 7-5-25.
4a. Shut off the supply of gas and allow the furnace to cool down to abt. 200°C.
Then raise the furnace until its bottom end is almost level with the bottom end of the tubes.
The furnace can be raised altogether after abt. 10 min.

C. Eddy currenting the "gun" (duration abt. 15 min.):

1. Switch on the H.F. as low as possible.
2. Bring the H.F. coil, to which an insulated rod is connected (to hold it), carefully below round the neck of one of the tubes. Move this coil up and down, so that the "gun" gradually gets red hot glowing, (not too hot to prevent evaporation of the copper).
Care should be taken to prevent the getter holders from getting too hot.
3. Degas in this way for 2 minutes.
4. Then treat the next valve in the same way.
5. After having treated the third tube, the first one is eddy- currented again in the same way for 2 min., then the getter holders are preliminarily degassed (no atomizing).
6. Then again treat the two other valves in the same way.
7. Then switch off the H.F.

D. Degassing the filaments (duration abt. 10 min.):

1. Connect the filaments (shunt)

For filaments of 6,3 V ~ :

2. Switch on filament voltage of 3,0 V ~ . .4 Amp
Raise this current every 2 min. by 1,0 V upto 5,5 V. In the range from 4,5 to 6,0 V the voltage may only be raised by 0,5 V in each stage.
(When using a Philips' vacuum meter, the neon tube may not indicate more than 25 units during the gradual increase of the filament voltage).

For filament of 4,0 V ~ :

3. Switch on filament voltage of 2,0 V ~ .
4. Raise it to 3,0 V after 2 min.
5. Then raise it every 2 minutes by $\frac{1}{2}$ V upto 4,0 V.
6. Then raise it every 2 minutes by $\frac{1}{4}$ V upto 5,5 V.
(When using a Philips'vacuum meter, the neon tube may not indicate more than 25 units during the gradual increase of the filament-voltage).

For filaments of 2,0 V ~ :

7. Switch on filament voltage of 1,0 V ~ .
8. Raise this voltage every 2 min. by 0,5 V upto 2,7 V.
Between 1,5 and 2,0 V raise only very slowly (maximum 0,2 V).
When using a Philips' vacuum meter the neon tube may not indicate more than 25 units during the gradual increase of the filament voltage.
9. After having burnt on the highest value for 2 min.

E. Treating the cathodes (duration abt. 15 min.):

1. See R 7-3-6.
2. Then remove the connections.

F. Atomizing the getters (duration abt. 1 min.)

1. Switch on the H.F., bring the coil opposite the getters and atomize the getters slowly and on a low temperature until a good mirrior has formed in the seal of the valve.
2. Remove the coils and switch off the H.F. (shut the gas cocks when necessary).

H. Sealing-off:

1. Pull the furnace down altogether, disconnect the furnace plate and raise the furnace abt. 25 cm.
   Raise it altogether after abt. 5 min.
2. Seal the tubes off.
3. Shut the cocks after the sealing-off process and switch off the pumps.
   When working as per R 7-5-25:
   1a. Seal the valves off.
   2a. Then shut the cocks and remove the vacuum bottles filled with liquid oxygen.

Remark:
1. When switched off, the pyrometer of the furnace should indicate the temperature of the surroundings, so it may not point at zero (0).
2. An eternite screen plate consisting of two halves (hinged together) are tied against the bulb, during the sealing-off process.
3. Wear well enclosed safety goggles during the exhausting process.

VOOR POMP EN ONTGASVOORSCHRIFT ZIE TYPE MW 22-1.

For specifications see type MW 22-1

POMP EN ONTGASVOORSCHRIFT		TYPE NR. MW 22-2		
DATUM 29/5/'39	DOORGEG. J.	AANTAL BLADEN 1	TEEK. NR. VOORSCHR. NR. 1	BLAD: 1

VOOR POMP EN ONTGASVOORSCHRIFT ZIE TYPE MW 22-1.

For specifications see type MW 22-1

POMP EN ONTGASVOORSCHRIFT		TYPE NR. MW 22-3		
DATUM 29/5/'39	DOORGEG. J.	AANTAL BLADEN 1	TEEK. NR. VOORSCHR. NR. 1	BLAD: 1

N.V. PHILIPS' GLOEILAMPENFABRIEKEN TE EINDHOVEN, HOLLAND; AFD. FABRICAGE-VOORSCHRIFTEN A.R.

VOOR POMP- EN ONTGASVOORSCHRIFT ZIE TYPE MW22-1

For exhaust- and gas-expelling schedule see type MW 22-1

POMP- EN ONTGASVOORSCHRIFT		TYPE NR. MW22-5		
DATUM 3-7-39	DOORGEG. J	AANTAL BLADEN 1	TEEK. NR. VOORSCHR. NR. 1	BLAD: 1

N.V. PHILIPS' GLOEILAMPENFABRIEKEN TE EINDHOVEN, HOLLAND; AFD. FABRICAGE-VOORSCHRIFTEN A.R.

APPARATUS:

Exhaust bench	: as per R 7-5-22 with liquid oxygen round the mercury trap.
Furnace	: as per R 7-4-14 type BB
H.F. coil	: as per R 8-2-3 Degassing: Type Lo (For tubes with thick necks and for type DW 31-1) Type Lx (tubes with thin neck) Atomizing getter: Type Ln.
H.F. installation	: as per R 8-2-5
Treating installation	: as per R 7-3-6
Manometer	: as per R 1-9-35
Pressure of cooling air	: abt. 100 cm water
Stand	: This stand, in which the tube is placed is fixed to the exhaust plate.

PROCEDURE:

Remark: 1. Before sealing tubes on the bench (e.g. like type DW 31-2), the wire connected to the contact spring of the black coating should be burnt through. This may be done by the filament voltage (9 V). For the electrodes concerned, see Assembly Drawing.
Before sealing on this type, the H.F. coil, type Lo should be put round the exhaust tube, with the cooling ring below.

A. Preheating the tube: (duration abt. 15 min.)

1. Place the tube in the stand, ready for sealing.
2. Put the furnace so far over the tube that the screen is entirely in the furnace.
Then connect the furnace and switch the current on.
3. Raise the temperature to 100-150°C.
Switch off the current, before this temperature is reached, because the latter will continue rising after the current is switched off.
4. Seal off the tube abt. 5 min. after this temperature is reached.
Remark: This prevents any damp from setting on the screen during the sealing-in process (when blowing).

B. Sealing-on and evacuating the tube: (duration abt. ½ hour)

1. Seal the tube on in an upright position, in such a way that it rests in the stand, and pull the furnace down altogether (blow through drying bottle with calcium chloride).
2. Let the mercury in the Mc Leod rise to 8 cm above the reservoir.
3. Open the main cock of the exhaust bench a little, very slowly. As soon as the mercury in the Mc Leod falls back (even with the slightest fall), it is not allowed to open the cock of the exhaust bench any further.
After abt. 5 min., when the mercury has risen, open the cock slightly further again (very slowly), so that the tube is evacuated, after this has been repeated a couple of times without causing damage to the screen.
4. When the light-column in the neon tube of the manometer is still up to the half height (abt. 40 units):

C. Heating the glass (duration abt. 4 hours):

1. Switch the current of the furnace on again and raise the temperature to 370°C in such a way that the light column in the neon tube of the manometer is never longer than the half height. (By switching the current in and out).
2. After the temperature, mentioned above, has been reached, keep this temperature constant till the vacuum is as good as possible. Then switch off the current and let the furnace cool down. When the temp. is abt. 170°C raise the furnace until its bottom end is abt. 10 cm under the bottom end of the tube.

3. After abt. 5 minutes the furnace can be raised altogether. If however a getter is present in the top of the bulb (as e.g. with the DW 31-2), the screen should remain in the furnace on a temperature of abt. 150°C.

D. Degassing the getter holder preliminarily (duration for upper getter abt. 5 min) (duration for lower getter abt. 1 min)

If a getter holder is present in the top of the bulb:

1. Connect this getter to the filament terminals and switch on such a current that the spiral gets so hot that the getter atomizes not yet and the light column in the neon tube of the manometer does not get longer than half height. Leave things so for abt. 5 min. Then switch off the current and remove the terminals.

If the "gun" is degassed with the H.F. coil type Lx:

2. When using this coil it is not necessary to degas the getter holder in the bottom end of the tube (fixed to the foot) preliminarily, because they will get sufficiently hot when degassing "the gun".

If the "gun" is degassed with the H.F. coil type Lo:

3. Connect the H.F. coil, type Ln, switch on the H.F. and keep it in front of the getter holders.
Degas the getter holders for abt. 1 min. in such a way that the getter does not atomize and the light column in the neon tube of the manometer does not reach further than half height.
Then switch off H.F. and remove the coil.

When both getter holders are used, combine D1 and D3.

E. Eddy currenting (duration abt. 30 min.)

1. Place the H.F. coil, type Lo, cooling ring downwards, in such a way that the top turn comes about level with the edge of the black coating.
1a. Place the H.F. coil, type Lx, cooling ring downwards, in such a way that the bottom turn comes about level with the bottom edge of the Wehnelt cylinder.
2. Apply air cooling, connected to a single ½" air pipe, on the cooling ring.
3. Switch on the H.F. and increase it slowly until the "gun" gets dark red hot. The H.F. should be increased in such a way that the light column in the neon tube of the manometer does not come any further than the half height.
4. Leave it so for about 20 min. till the vacuum is as good as possible.

F. Degassing the filament (duration abt. 10 min.)

1. Connect the filament.
2. For types such as MW31-3 (filament 6,3 V):
Switch on a filament voltage of 3,5 V ~ .
Raise the voltage by leaps and bounds to 9,0 V ~ , in such a way, that the light column in the neon tube of the manometer does not come further than the half height. (.95μ)
3. For types such as MW31-5 (filament 2,0 V):
Switch on a filament voltage of 1,0 V ~ .
Raise the voltage by leaps and bounds up to 3,0 V ~ , as mentioned above.
4. For the other types (filament 4,0 V):
Switch on a filament voltage of 2 V ~ .
Raise the voltage (as mentioned above) by leaps and bounds to 6,0 V ~ .

EXHAUST- AND GAS- EXPELLING SCHEDULE		TYPE NR. DW31-1 DW31-2 MW31-6 MW31-5 MW31-4 MW31-1 MW31-2	MW31-3
DATUM 3/7/'39	DOORGEG. W.N.	AANTAL BLADEN 3	TEEK. NR. VOORSCHR. NR. 2	BLAD: 2

Generally speaking: switch on the filament voltage on half of the measuring voltage and raise it to 50% above the measuring voltage.

5. Leave it so for 5 min. until the vacuum is as good as possible.

H. Treating the cathode (duration abt. 15 min.)

1. See R 7-3-6.

J. Atomizing the getters: (duration abt. 1 min.)

1. As D, but in such a way that the getter atomizes.
2. Then switch off the H.F., remove the connections and the H.F. coil and let the tube cool down.
   When both getters are to be atomized, first the getter at the bottom of the bulb should be atomized, whereafter it is necessary to wait until the vacuum is as good as possible again.
   Then atomize the getter in the top of the bulb.

K. Sealing off the tube:

Thereafter close the exhaust cock.

Protection during the sealing-off process:

During the sealing-off process an eternite screen plate 8 cm diam. and thickness 3 mm, consisting of two halves (hinged together), is tied against the seal of the bulb to protect the latter from getting too hot.

Remark:

1. The pyrometer of the furnace should indicate the temperature of the surroundings when sealing-off, so it may not point at 0.

VOOR POMP- EN ONTGASVOORSCHRIFT ZIE TYPE MW 31-3

For specifications see type MW 31-3

POMP- EN ONTGASVOORSCHRIFT			TYPE NR.	MW 31 – 5	
DATUM 3-4-39	DOORGEG. J		AANTAL BLADEN	TEEK. NR. VOORSCHR. NR. 1	BL.

R 7-3

VOOR POMP- EN ONTGASVOORSCHRIFT ZIE TYPE MW31-5

For exhaust- and gas-expelling schedule see type MW 31-5

POMP- EN ONTGASVOORSCHRIFT		TYPE NR. MW31-6		
DATUM 3-7-39	DOORGEG. J	AANTAL BLADEN 1	TEEK. NR. VOORSCHR. NR. 1	BLAD: 1

N.V. PHILIPS' GLOEILAMPENFABRIEKEN TE EINDHOVEN, HOLLAND, AFD. FABRICAGE-VOORSCHRIFTEN A.R.

Exhaust-installation as per R 7-5-11.
H.F. coil 45m as per R 8-2-3.

1. Evacuate the exhaust-installation and the filling-conduct and inspect.
2. Seal on the valves. Connect them to the preliminary vacuum for a moment and thereafter pump them high-vacuum.
3. Inspect as to leakage. The vacuum must amount to abt. 2 units.

Annealing the glass (duration 4 min.):

1. Place the furnace round the valves to make the glass free of gas; the temperature of the furnace is abt. 450°C.
2. When the furnace has been removed, after 1 to 2 minutes the vacuum may not surpass 5 units.

Eddy-currenting, degassing the filament, emitting the valves and atomising the getter:

1. Place the H.F. coils round the valves, switch on the H.F. and adjust it in such a way that the temperature of the anode is dark red hot (duration abt. 1 min.).
2. When the anode has reached this temperature, switch on the Vf and adjust it to 6 V ~ until the blue shine has disappeared.
3. Make each valve emit at the under mentioned voltages for ½ minute:
   Vf = 6 V ~ ; V(a+g) = 200 V=; load lamp V(a+g) = 220V/40 W (= 160 mA max.)
   Adjust the H.F. such that the anode is just visible red.
4. Evacuate to abt. 5 units at a Vf = 6 V ~ ; switch off Vf; wait 3 minutes and sheet the pump.
5. Fill the tube with 100000 units of helium.
6. Vf = 8,0 V ~ for 1½ minute.
7. Open the exhaust-cocks, Vf = 6 V ~ until the vacuum has become abt. 1 unit. Switch off Vf and wait 2 minutes.
8. Atomise getter.
9. Inspect as to leakage. The vacuum must amount to abt. 1 unit.

Filling the tube with helium:

1. Shut the pump.
2. After 1 minute, fill the tube with 100000 units of helium.
3. After 1 minute inspect whether the pressure has remained steady.

Seal the tube off.

SCREENING

Load lamps: Va 110V/40 W; Vg 220V/15 W; Vk/f 110V/60 W

I	15 min.	Vf	8 V ~	
		Va	127 V ~	Ia = ± 170 mA
		Vg	127 V ~	Ig = ± 24 mA
II	40 min.	Vf	7 V ~	
		Va	127 V ~	Ia = ± 170 mA
		Vg	0 V	

Spark the valves between anode and grid.

	20 min.	Vf	7 V ~	
		Va	127 V ~	Ia = ± 170 mA
		Vg	0 V	
		Vk/f	60 V ~	

INFORMATION:
Vf = measured on heaters
Va+Vg voltage against anode or grid + series-lamps.
Vg = 0 grid connected to cathode
Vg = ... grid not connected.

PUMPING AND SCREENING		TYPE NR.	EC 50
7/12/42	DOPENG. W.Na	KANTAAR NR. 1	TEEK. NR.

Date: 19-6-39. * R 7-3-6
Supersedes entire notice dated 26-7-37.

TREATING THE CATHODE OF CATHODE-RAY TUBES DURING EXHAUSTING.

APPARATUS:

Treating apparatus R 7-5-23.

PROCEDURE:

Remark: The filament voltage for each tube type has been stated in the relevant pumping and gas-expelling schedule.

1. All the switches are off.
2. Connect the cathode of the tube to be treated with the - and the remaining lead-wires (with the exception of the filament-leads) to the +.
3. Apply 130 Volts = to the apparatus.
4. Short-circuit the interrupter.
5. Switch on the 130 V= and slowly raise the voltage by means of the potentiometer.
   The meters are on the small measuring-range. This voltage must be raised very slowly, until the current recedes. If this should be so, slightly reduce the voltage until the current has become steady. Wait for 1 minute.
6. Thereafter again slowly raise the current until the potentiometer is fully switched off.
   During raising inspect every now and then, whether the current of one of the tubes recedes. If this should be the case, slightly reduce the voltage and stop raising for a moment.
   If the highest position has been attained, keep it so during 1 minute. Now the meters are on the large measuring-range.
7. Then switch on the motor and the interrupter.
   With good tubes the current will be abt. 15 mA (i.e. 1/10 of the real value).
8. As soon as the current keeps steady or recedes, switch off the 130 Volts= and the filament voltage

Date: 26-7-'37.

TREATING THE CATHODE OF CATHODE-RAY TUBES DURING EXHAUSTING.

INSTALLATION: T 713600.

The installation is represented in the diagram on page 3 and in the photograph on page 4. The following parts are distinguished:

A 1	Switch	Switching on and off 130 V=
A 2	Switch	Converter for larger and smaller measuring-range (mA-meter)
A 3	Switch	Switching the motor on and off.
A 4	Switch	Switching the interrupter on and off.
A 5	Switch	Converter for larger and smaller measuring-range (V-meter).
L 1	Glowlamp	40 watts 220 volts
M 1	Meter 50 and 150V=	Measuring the treating-voltage
M 2	Meter 25 and 250 mA=	Measuring the emission
Mo 1	Motor 90 watts 1500 rev./min.	
O 1	Interrupter	9/10 interrupted
R 1	Slide resistance 1050 Ohms/0,43 A	For regulating the 130 V=
Z 1	2 fuses 6 amps.	

The valve to be exhausted is connected at B.

The feeding-line is connected at C.

The case is earthed at D.

PROCEDURE:

1. All the switches are off.
2. Connect the - of B with the cathode of the valve to be exhausted. Connect the + with the other leads.
3. Apply 130 volts= to C.
4. Turn on switch A4.
5. Turn on switch A 1 and slowly raise the voltage with the aid of the slide resistance R 1. Switches A 2 and A 5 on small measuring-range. This voltage must be raised so slowly that the current does not recede. If this should be so, however, maintain the current at its highest value for 1 minute.

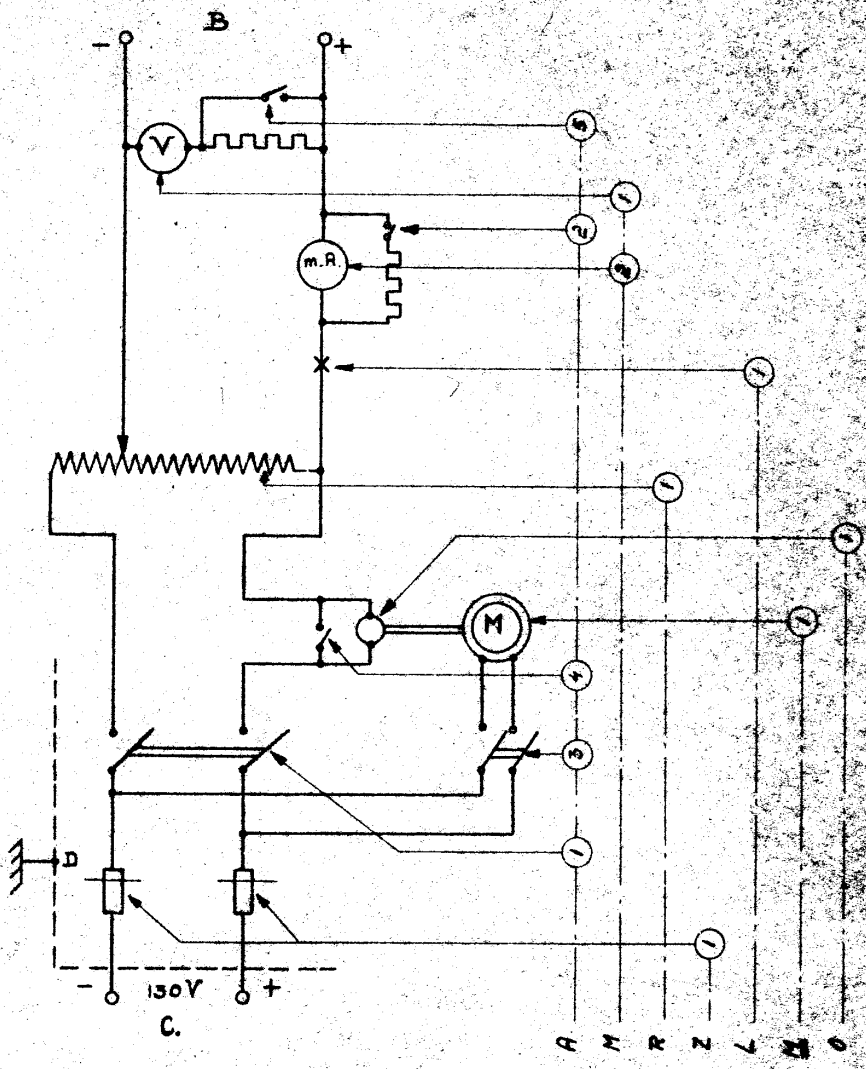
Then raise it once more slowly until the resistance R 1 is fully switched off (to the right). Maintain this state 1 min. The switches A 5 and A 2 are used for higher or lower voltages or currents.

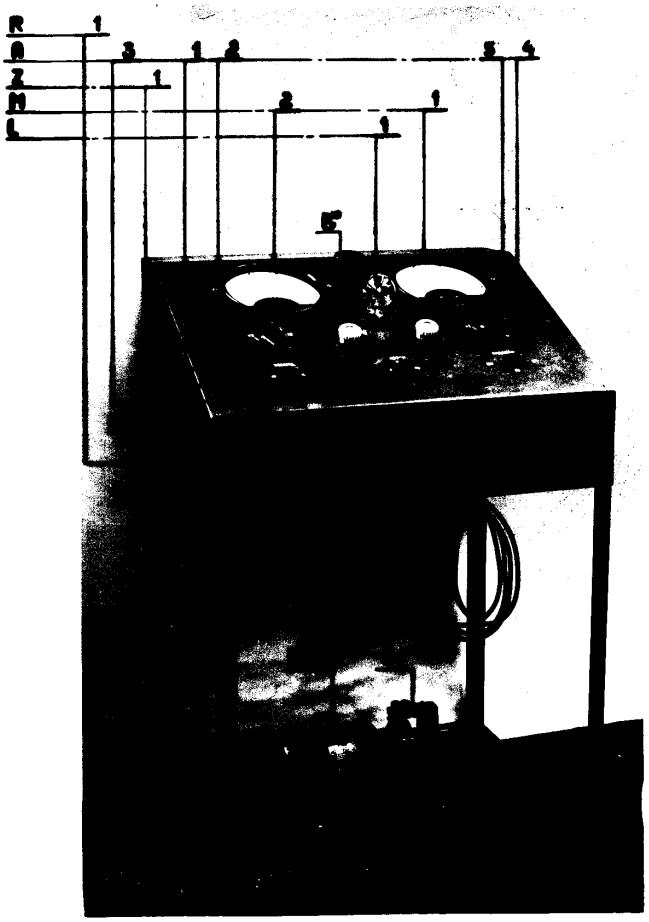
6. Switch on the motor M 1 with the aid of switch A 3 and open A 4. The current of good valves is abt. 15 mA. Take into account that this value is to be multiplied by 10, since the interrupter A 6 unterrupts the current for 9/10 of the time. If the current rises at this voltage, first wait until it has become steady. If the current remains constant or if it decreases, shut switch A 4 and switch off the meter.
7. Fully drop the 130 V voltage and switch off the heating-voltage.

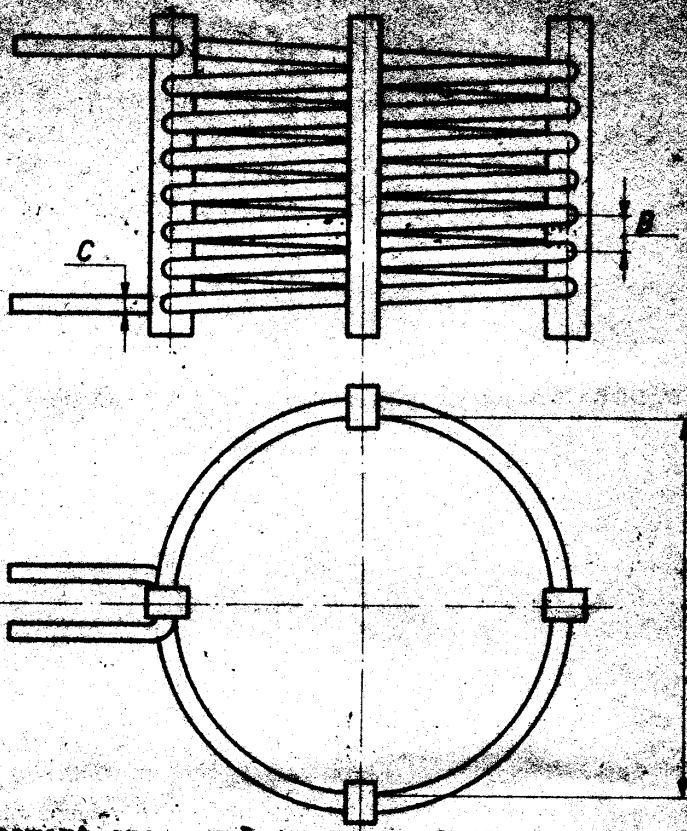
FLOOR SPACE: 70 x 60 cm.

Datum: 26/7/'37.

Blz. 3.







asbest cement spoe. volgens norm. N 53

spoel; Vertind koperdraad

Spoel Type	A	aantal windingen	B	C
La	75	12	6,-	3
Lb	80	16	3,5	2
Lc	95	13	4,-	2
Ld	100	13	4,-	2
Le	120	22	5,-	3
Lg	130	30	4,-	2
Lh	135	12	3,5	2
Li	100	16	5,5	2
Lk	125	20	5,5	2
Ll	135	21	5,5	2
Lq	125	28	5,5	3
Lo	95	11½	6,5	3

Spoel Type	A	aantal windingen	B
Lm	170	30	5,-
Ln	65	22	4,-
Lo	85	20	4,-
Lp	145	14	5,-
Lr	125	10	5,-
Ls	24	12	4,-
Lt	85	10	5
Lu	60	8	5,-
Lv	90	15	5
Lw	65	4	5,5
Lx	55	12	4,5
Ly	55	6 2/3	5

I	Vf	5,0	V~	¼ uur
II	Vf	5,0	V~	¾ uur
	Vg	+15	V	
III	Vf	4,2	V~	½ uur
	Va_1	180-200	V=	
	Va_2	3000	V=	
	Ia_2	30	µA (per buis)	
	Afbuigspoelen	50 perioden en 500 perioden		
	Vg_1	negatief + H.F. (van een zendertje λ = ca. 20m) De-Vg moet steeds iets hooger liggen dan de afknyp-spanning, welke van te voren bepaald is.		
IV	Als III doch:			
	Va_2	5000	V=	½ uur
	Ia_2	50	µA (per buis)	

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BRANDVOORSCHRIFT		TYPE NR.	NW 22-1	
DATUM 29/5/'39	DOORGEG.	AANTAL BLADEN 1	TEEK. NR. VOORSCHR. NR. 2	BLAD NR. 1

I	V_f	7,0	V~	½ uur
II	V_f	7,0	V~	½ uur
	V_g	+15	V	
III	V_f	6,5	V~	½ uur
	V_{a_1}	180-200	V=	
	V_{a_2}	3000	V=	
	I_{a_2}	30	µA	
	Afbuigspoelen	50 perioden en 500 perioden		
	V_g	negatief + H.F. (van een zendertje λ = ca. 20 m) De -Vg moet steeds iets hooger liggen dan de afknyp-spanning, welke van te voren bepaald is.		
IV	Als III doch:			
	V_{a_2}	5000	V=	
	I_{a_2}	50	µA	(per buis)

BRANDVOORSCHRIFT		TYPE NR. MW22-5- MW 22-2		
DATUM 3-7-39	DOORGEG. J.	AANTAL BLADEN 1	TEEK. NR. VOORSCHR. NR. 2	BLAD: 1

VOOR BRANDVOORSCHRIFT ZIE TYPE MW22-2

BRANDVOORSCHRIFT		TYPE NR. MW22-5		
DATUM 3-7-39	DOORGEG. J	AANTAL BLADEN 1	TEEK. NR. VOORSCHR. NR. 1	BLAD: 1

N.V. PHILIPS' GLOEILAMPENFABRIEKEN TE EINDHOVEN, HOLLAND; AFD. FABRICAGE-VOORSCHRIFTEN A.R.

I	Vf	= 5,0	V~	½ uur
II	Vf	= 4,0	V~	½ uur
	Va1	=en 100	V=	
	Vg	= 0		
III	Vf	= 4,0	V~	½ uur
	Va1	= 120	V=	
	Va2	= 2000	V=	
	Ia2	= zoodanig, dat de Ig meter juist niet uitslaat		
	afbuigspoelen: 50~en 500~			
	Vg	= negatief + H.F.(van een zendertje, λ = ca 20 m)		
		De -Vg moet steeds iets hooger liggen dan de afknijp-spanning, welke van te voren bepaald is		
IV	Als II			½ uur
V	Als III doch Va2 = 4000 V=			½ uur
VI	Als II			
VII	Als III doch Va2 = 5000 V=			½ uur
VIII	Als II			½ uur

BEDIENINGSVOORSCHRIFT			TYPE NR. MW 31-2-MW 31-1		
DATUM 3-4-39	DOORGEG. J	AANTAL BLADEN 1	TEEK. NR. VOORSCHR. NR. 1	BLAD: 1	

I	Vf	=	7,0	V~	½ uur
II	Vf	=	6,3	V~	½ uur
	Va1	=ca	180	V=	
	Vg	=	0		
III	Vf	=	6,3	V~	½ uur
	Va1	=	120	V=	
	Va2	=	2000	V=	
	Ia2	=	zoodanig dat de Ig meter juist niet uitslaat		
	Afbuigspoelen 50~ en 500~				
	Vg	=	negatief + H.F. (van een zendertje, λ = ca 20 m) De -Vg moet steeds iets hooger liggen dan de afknijpspanning, welke van te voren bepaald is		
IV	Als II				½ uur
V	Als III doch Va2 = 4000 V=				½ uur
VI	Als II				½ uur
VII	Als III, doch Va = 5000 V=				½ uur
VIII	Als II				½ uur

BRANDVOORSCHRIFT		TYPE NR. MW31-6- MW 31-3		
DATUM 3-7-39	DOORGEG. J	AANTAL BLADEN 1	TEEK. NR. VOORSCHR. NR. 2	BLAD: 1
N.V. PHILIPS' GLOEILAMPENFABRIEKEN TE EINDHOVEN, HOLLAND; AFD. FABRICAGE-VOORSCHRIFTEN A.R.				

I	Vf	= 2,5	V~	½ uur
II	Vf	= 2,0	V~	½ uur
	Vg	= + 30	V	
	Ig	= ca 15	mA	
III	Vf	= 2,0	V~	½ uur
	Va	= 2000	V=	
	Ia	= zoodanig, dat Ig meter juist niet uitslaat		
	afbuigspoelen: 50~ en 500~			
	Vg	= negatief + H.F.(van een zendertje, λ = ca 20 m)		
		De -Vg moet steeds iets hooger liggen dan de afknijpspanning, welke van te voren bepaald is		
IV	Als II			½ uur
V	Als III, doch Va = 4000 V=			½ uur
VI	Als II			½ uur
VII	Als III, doch Va = 5000 V=			½ uur
VIII	Als II			½ uur

VOOR BRANDVOORSCHRIFT ZIE TYPE MW 31-3

BRANDVOORSCHRIFT			TYPE NR. MW31-6		
DATUM 3-7-39	DOORGEG. J.		AANTAL BLADEN 1	TEEK. NR. VOORSCHR. NR. 1	BLAD 1

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R 10-3-7

	I	II								III								IV				V		VI		VII		VIII
	Vi ~	Vf ~	Val V=	Vg V=	Ie mA	dupr min.	Vf ~	Val V=	Va2 kV=	Vg V=	Ia2 µA	opm.	dupr min.	Va2 kV=	Vg V=	Ia2 µA	opm.	dupr min.	Va2 kV=	Vg V=	Ia2 µA	opm.	dupr min.	Va2 kV=	Vg V=	Ia2 µA	opm.	dupr min.	Va2 kV=	Vg V=	Ia2 µA	opm.	dupr min.
	7,5																											
	5,0																											
	4-4,2																											
KW32-1	5,0	5,0	-	+15	-	45	4,2	180-200	3	opm.2	30	opm.1	45	5	50	III												
KW32-2	7,0	7,0	-	+15	-	45	6,5	"	3	" 2	30	" 1	45	5	50	III												
KW32-3	5,0	5,0	-	+15	-	45	4,2	"	3	" 2	30	" 1	45	5	50	III												
KW31-1	5,0	4,0	ca 180	0	-	30	4,0	120	2	opm.2	opm.3	opm.1	30				II	4	III	5	III	II							
KW31-2	5,0	4,0	ca 180	0	-	30	4,0	120	2	" 2	" 3	" 1	30				II	4	III	5	III	II							
KW31-3	7,0	6,3	ca 180	0	-	30	6,3	120	2	" 2	" 3	" 1	30				II	4	III	5	III	II							
KW31-4	7,0	6,3	-	+30	ca 15	30	6,3	2000		opm.2	opm.3	opm.1	30				II	4	III	5	III	II							
KW31-5	2,0	2,0	-	+30	ca 15	30	2,0	2000		" 2	" 3	" 1	30				II	4	III	5	III	II							
KW31-6	7,0	6,3	ca 180	0	-	30	6,3	120	2	" 2	" 3	" 1	30				II	4	III	5	III	II							

1. Afbuigpunten 50 en 500 Ω
2. 76 = negatief, HF (van anodespanning) = ca 20 mV. De -Vg moet steeds iets hoger liggen dan de afknijpspanning, die tevoren bepaald is.
3. Tag/nacht) resp. ta (anode) is zoodanig, dat de ja-meter juist niet uitslaat.

DATUM

DOORGEC.

AANTAL BLADEN 1

TEEK. NR.

VOORSCHR. NR. 2

BLAD: 1

N.V. PHILIPS' GLOEILAMPENFABRIEKEN EINDHOVEN, HOLLAND, AFD. FABRICAGE-VOORSCHRIFTEN A.R.

NR	METING	INSTELLING								EISCH			PRINCIPE SCHEMA	OPMERKINGEN
		Vf V	Va V=	Vg V=	Beeld	Ia µA	&W focus	V V	Vk/f V=	1e CONTROLE	2e CONTROLE	EENHEID		
1	Voorwarmen	2,2												1
2	Isolatie:													
	k/ga	2,2						-300 =	100	≤ 8,0	≤ 10	µA	672	
	kg/a	2,2						-300 =	100	≤ 8,0	≤ 10	µA	672	
	+k/-f	2,2							100	≤ 10	≤ 12	µA	670	
	-k/+f	2,2							100	≤ 50	≤ 60	µA	670	
3	Is	2,0						50 ~		≥ 3,0	≥ 2,5	mA	671	2
4	If	2,0								1,1-1,3	1,05-1,35	A	140	*
5	Excentriciteit	2,0	4000	inst	PJZ					≤ 12	≤ 13	mm	669	3+4+5+6
6	Puntafbeelding	2,0	4000	"	"		foc.			zie opm 7			669	3+6+7
7	Strooistr	2,0	4000	"	"		defoc			zie opm 6			669	6+8+9
8	-Vg	2,0	4000	a	rast		foc.			28-40	25-42	V	663	8+10+6
9	Modulatie bij	2,0	4000	b	"	150	"			≤ 22	≤ 23	%	663	6+11+11
10	Oversp test	2,0		inst	"	10	"			5000	4000	V	663	
11	Ionenvlek	2,0	1500	"	"	100	defoc			Geen vlek in het midden v/h scherm			663	6+10
12	Schermkwal				"	10-70	foc			Geen vlekken of inbrandlijnen			/	6+11+13
13	Schermkleur				"		"			Moet wit zijn			/	6+12
14	Lijnbreedte				ged rast	10	"				1,5		/	14+15+16
15	Afschaduwer				rast	10	"			≥ 164	≥ 162	mm	/	6+17
16	Ontvanget				rast beeld	inst	"						/	
17	Stand capillair									verticaal maar beneden			/	18

P J Z = Punt juist zichtbaar

/ = Testen in apparaat EKCO TA 501

Voor opmerkingen zie blz 2

TOELICHTINGEN IN R 11-3-1.

MEETVOORSCHRIFT (Fabriek) | Type: M 18-2

DAT. 22-5-39 | DOORGEG.: J. | 2 BLADEN | BLAD 1 | NR 2 | R 11-3-

N.V. PHILIPS' GLOEILAMPENFABRIEKEN TE EINDHOVEN, HOLLAND; AFD. FABRICAGE-VOORSCHRIFTEN A.R.

Remarks:

1. Preheat for 30 minutes.
2. Read Is immediately after switching V.
   The value should answer the requirement.
3. Leave the fluorescent spot as short as possible on the screen to avoid burning-in.
4. Measure to centre of the light spot.
5. Remove the coils.
6. Check the tube in complete darkness.
7. A passable burr is allowed (at the utmost). The spot should be almost round.
8. Adjust Vg in such a way that the scanning grating (raster) is just invisible.
9. No stray-rays may become visible when defocussing or suppressing thoroughly.
10. Produce a scanning grating (raster) over the whole screen.
11. Modulation voltage = a-b (allow for leaking)
12. Scanning grating (raster) 15x11,5 cm 400 lines 50 pictures/second.
13. Check as to line width.
14. Check the tube in semi darkness, note the total width (centre + edges).
15. Suppress periodically 7 of the 8 lines. 200 lines.
16. Ia = 10 µA top value.
17. Before corner cutting, see that the spot is in the centre of the screen when the deflection voltage = 0.
18. Check as to defocussing (unsharpness) of the edges.

Uitbergen

TEST-SPECIFICATION (FACTORY)		TYPE NR. MW18-2		
DATUM 3/4/'39	DOORGEG. W.N.	AANTAL BLADEN 2	TEEK. NR. VOORSCHR. NR. 1	BLAD: 2

N.V. PHILIPS' GLOEILAMPENFABRIEKEN TE EINDHOVEN, HOLLAND; AFD. FABRICAGE-VOORSCHRIFTEN A.R.

R 11-3

NR	METING	INSTELLING Vf V~	Val V=	Va2 V=	Vg V=	Beeld	Ia2 µA	A W Focus	V V	Vk-f V=	EISCH 1e CONTROLE	2e CONTROLE	EENHEID	PRINCIPE SCHEMA	OPMERKINGEN
1	Voorwarmen	4,5													1
2	Isolatie														
*	$k a_2/g a_1$	4,5							-300	100	≦ 8,0	≦ 10	µA	672	
*	$k g/a_1 a_2$	4,5							-300	100	≦ 8,0	≦ 10	µA	672	
*	$k g a_1/a_2$	4,5							-300	100	≦ 8,0	≦ 10	µA	672	
*	+k/-f	4,5								100	≦ 10	≦ 12	µA	670	
*	-k/+f	4,5								100	≦ 50	≦ 60	µA	670	
* 3	Is	4,0							50~	100	≧ 3,0	≧ 2,5	mA	671	2
* 4	If	4,0									0,9-1,1	0,85-1,15	A	140	
* 5	Excentriciteit	4,0	250	5000	inst	PJZ					≦ 15	≦ 16	mm	667	3+4+5+6
* 6	Puntafbeelding	4,0	250	5000	"	"		focus						669	3+6+7
* 7	Strooistralen	4,0	130	5000	"	"		"						669	6+8+14
* 8	-Vg	4,0	250	5000	"	raster		"			≦ 95	≦ 100	V	663	6+9+10
* 9	Steilheid (-Vg)	4,0	130	5000	a	"	5,0	"			≦ 50	≦ 55	V	663	9
* 10	Steilheid (Ia2)	4,0	130	5000	a+10	"		"			≧ 105	≧ 100	µA	663	9
* 11	Ia1	4,0	130	5000	a+10	"		"			≦ 700	≦ 730	µA	663	9
* 12	Overspann. test	4,0	130		inst	"	10	"			6000	5500	V	663	9+11
* 13	Ionenvlek	4,0	130	1500	"	"	100	de focus			Geen vlek in het midden v/h scherm			663	8+9
* 14	Schermkwaliteit					"	10-70	focus			Geen vlekken of inbrandlijnen			/	6+13+15
* 15	Schermkleur					"		"			Moet wit zijn			/	6+13+
* 16	Lijnbreedte					ged raster	10	"					mm	/	12+16+17
* 17	Defocusseren (Ia2					raster		"				≧ 80	µA	/	18
* 18	Afschaduwen					"	10	"			≧ 200	≧ 198	mm	/	9+6+19

/ Testen in Pye apparaat type 815
PJZ Punt juist zichtbaar.

Voor opmerkingen zie blad 2
VOOR TOELICHTINGEN ZIE FV.R 11- 3-1

Aantal bladen 2 blad 1

OMSCHRIJVING	MEETVOORSCHRIFT (FABRIEK)	TYPE MW 22-1
DATUM 3-4-39	DOORGEG. J	VOORSCHR.NR 4 / CODE NR

N.V. PHILIPS' GLOEILAMPENFABRIEKEN TE EINDHOVEN, HOLLAND; AFD. FABRICAGE-VOORSCHRIFTEN A.R.

Remarks:

1. Preheat for 30 min.
2. Read Is immediately after V is switched on. This value should lie within the limits.
3. Leave the fluorescent spot as short as possible on the screen to avoid burning-in.
4. Measure to the centre of the spot.
5. Remove the coils.
6. Check the tube in complete darkness.
7. A passable burr is allowed at the utmost. The spot should be almost round.
8. No stray rays may become visible when defocussing or suppressing thoroughly (may be recognized from light spots and streaks on the screen).
9. Scanning grating (raster) over the entire screen.
10. Adjust Vg in such a way that the whole scanning grating (raster) is just invisible.
11. No arcing over.
12. Check the tube in half darkness.
13. Scanning grating (raster) 18x14 cm.
    400 lines.
    50 pictures/sec.
14. Bring the coils so high that they touch the bulb.
15. Check as to line width.
16. Suppress periodically 7 of the 8 lines. 200 lines 50 pictures/sec. scanning grating (raster) 14x18.
17. Ia2 = 10 µA top value.
18. Increase the ray current until the lines of the scanning grating (raster) touch in the centre.
19. Before corner cutting, see that the spot is in the centre of the screen when the deflection voltage = 0.

Uriberga

TYPE	I				II					III							IV			V	VI	VII	
	Vz V~		Va V~		Vc V~	Val V~	Vg V~	Ig mA		Vz V~	Val V~		Vg V~	Ia2 µA	opm.									
DG 3-2	6,3-6,5	130	0	30																			
DR,DG 7-1																							
DR,DG,DN 7-2																							
DR,DG,DN 9-3 ne.																							
DR 9-4																							
DG 9-4 G	4-4,2	180	0	30																			
DR,DG,DN 16-1																							
DR,DG,DN 16-2																							
DR,DG,DN 25-1																							
DN31-1																							
DN31-2																							
MR22-1	5,0			45	5,0	-	+15	-	45	4,2	180-200	3	opm.2	30	opm.1	45	5	50	III				
MR22-2	7,0			45	7,0	-	+15	-	45	6,3	"	3	" 2	30	" 1	45	5	50	III				
MR22-3	5,0			45	5,0	-	+15	-	45	4,2	"	3	" 2	30	" 1	45	5	50	III				
MR31-1	5,0			30	4,0	on 180	0	-	30	4,0	120	2	opm.2	opm.3	opm.1	30			II	4	III	II	5	III	II
MR31-2	5,8			30	4,8	on 180	0	-	30	4,0	120	2	" 2	" 3	" 1	30			II	4	III	II	5	III	II
MR31-3	7,0			30	6,3	on 180	0	-	30	6,3	120	2	" 2	" 3	" 1	30			II	4	III	II	5	III	II
MR31-4	7,0			30	6,3	-	+30	on 15	30	6,3	2000		opm.2	opm.3	opm.1	30			II	4	III	II	5	III	II
MR31-5	2,5			30	2,0	-	+30	on 15	30	2,0	2000		" 2	" 3	" 1	30			II	4	III	II	5	III	II
MR31-6	7,0			30	6,3	on 180	0	-	30	6,3	120	2	" 2	" 3	" 1	30			II	4	III	II	5	III	II

1. Afstelgegevens 50 Hz en 500 Hz.
2. Vz = negatief t.o.v. 0V (van een weerstand van ca. 50 mA. De vz moet steeds
3. Log (Lineair) regel. De (lineair) is gekenmerkt door een 2e-orde (parel door de bocht).

NR	METING	INSTELLING									EISCH			PRINCIPE SCHEMA	OPMERKINGEN
		Vf V~	Va1 V=	Va2 V=	Vg V=	Beeld	Ia2 µA	AW focus	V V~	Vk/f V=	1e CONTROLE	2e CONTROLE	EENHEID		
1	Voorwarmen	7,0													1
2	Isolatie:														
	kala2/g	7,0							-300 =	100	≦ 8,0	≦ 10	µA	672	
	kg/ala2	7,0							-300 =	100	≦ 8,0	≦ 10	µA	672	
	kgal/a2	7,0							-300 =	100	≦ 8,0	≦ 10	µA	672	
	+k/-f	7,0								100	≦ 10	≦ 12	µA	670	
	-k/+f	7,0								100	≦ 50	≦ 60	µA	670	
3	Is	6,3							50~	100	≧ 3,0	≧ 2,5	mA	671	2
4	If	6,3									0,56-0,68	0,53-0,71	A	140	
5	Excentri-citeit	6,3	250	5000	inst	PJZ					≦ 15	≦ 16	mm	667	3+4+5+6
6	Puntaf-beelding	6,3	250	5000	"	"		focus			zie opm 7			669	3+5+7
7	Strooi-stralen	6,3	130	5000	"	"		"			zie opm 8			669	6+8+9
8	-Vg *cut off*	6,3	250	5000	"	raster		"			≦ 95	≦ 100	V	663	6+10+11
9	Steilheid (-Vg)	6,3	130	5000	a	"	5,0	"			≦ 50	≦ 55	V	663	10
10	Steilheid (Ia2)	6,3	130	5000	a+10	"		"			≧ 105	≧ 100	µA	663	10
11	Ia1	6,3	130	5000	a+10	"		"			≦ 700	≦ 730	µA	663	10
12	Overspann test	6,3	130		inst	"	10	"			6000	5500	V	663	10+12
13	Ionenvlek	6,3	130	1500	"	"	100	de-focus			Geen vlek in het midden v/h scherm			663	6+10
14	Scherm-kwaliteit	*Line Width*				"	10-70	focus			Geen vlekken of inbrandlijnen			/‾	6+13+14
15	Schermkleur					"		"			Moet wit zijn			/‾	6+13
16	Lijnbreedte					ged raster	10	"						/‾	15+16+17
17	Defocus-seeren (Ia2)					ras-ter		"			≧ 120	≧ 110	µA	/‾	13+18
18	Afschaduwen					"	10	"			≧ 200	≧ 198	mm	/‾	6+10+13+19

P J Z = Punt juist zichtbaar

/‾ Testen in Eye apparaat type 815 (gloeidraad voeden met een andere trafo, waarvan midden aan kathode)

Voor opmerkingen zie blad 2

TOELICHTINGEN IN R 11-3-1.

MEETVOORSCHRIFT (Fabriek)		Type: *MW22-5-* MW 22-2		
DAT. 3-7-39	DOORGEG.: J	2 BLADEN	BLAD 1	NR 3	R 11-3.

Remarks:

1. Preheat for 30 minutes.
2. Read Is immediately after switching on V.
   This reading should lie within the limits.
3. Leave the fluorescent spot on the screen as short as possible to prevent burning in.
4. Measure to the centre of the light spot.
5. Remove the coils.
6. Test the tube in complete darkness.
7. A passable burr is allowed (at the utmost). The spot should be almost round.
8. No stray rays must be visible when defocussing or suppressing thoroughly (to be recognized from light stains or streaks on the screen).
9. Bring the coils as high as possible (until they touch the bulb).
10. Bring a scanning grating (raster) over the whole screen.
11. Adjust Vg in such a way that the entire raster is just invisible.
12. No arcing-over.
13. Raster 18x14 400 lines 50 pictures/sec.
14. Check on line width.
15. Check in half darkness.
16. Suppress periodically 7 of the 8 lines. 200 lines. 50 pictures/sec. raster 14x18.
17. Ia2 = 10 µA top value .
18. Increase the ray-current until the lines of the raster touch each other (meet) in the centre.
19. Before corner cutting see that the spot is in the centre of the screen when the deflection voltage = 0.

* For explanations see R 11-3-1

TEST-SPECIFICATION (FACTORY)		TYPE NR. * MW22-5 - MW22-2		
DATUM 3/7/'59	DOORGEG. W.N.	AANTAL BLADEN 2	TEEK. NR. VOORSCHR. NR. 2	BLAD: 2

N.V. PHILIPS' GLOEILAMPENFABRIEKEN TE EINDHOVEN, HOLLAND; AFD. FABRICAGE-VOORSCHRIFTEN A.R.

NR	METING	INSTELLING								EISCH			PRINCIPE SCHEMA	OPMERKINGEN
		Vf V	Va V-	Vg V=	Beeld	Ia	AW focus	Vk/f V=		1e CONTROLE	2e CONTROLE	EENHEID		
1	Voorwarmen	2,2												1
2	Isolatie													
	k/ga	2,2					-300	100		≦ 8,0	≦ 10	µA	672	
	kg/a	2,2					-300	100		≦ 8,0	≦ 10	µA	672	
	+k/-f	2,2						100		≦ 10	≦ 12	µA	670	
	-k/+f	2,2						100		≦ 50	≦ 60	µA	670	
3	Is	2,0					50	100		≧3,0	≧ 2,5	mA	671	2
4	If	2,0								1,1-1,3	1,05-1,35	A	140	
5	Excentriciteit	2,0	5000	inst	PJZ					≦15	≦16	mm	667	3+4+5+6
6	Punt-afbeelding	2,0	5000	"	"		focus			zie opm 7			669	3+6+7
7	Strooistralen	2,0	5000	"	"		"			zie opm 8			669	6+8+9
8	-Vg	2,0	5000	a	raster		"			33-52	31-54	V	669	6+10+11
9	Modulatie-spanning	2,0	5000	b	"	150	"			≦ 24	≦ 25	V	669	6+10+12
10	Overspann. test	2.0		inst	"	10	"			6000	5500		669	10+13
11	Ionenvlek	2,0	1500	"	"	100	defoc			Geen vlek in het midden v/h scherm			669	6+10
12	Scherm-kwaliteit				"	10-70	focus			Geen vlekken of inbrandlijnen			/-	6+14+15
13	Schermkleur				"		"			Moet wit zijn			/-	6+15
14	Lijnbreedte				ged raster	10	"						/-	16+17+18
15	Afschaduwen				raster	10	"			≧200	≧198	mm	/-	6+10+15+19
16	Ontvangst				raster+beeld	10	"			Zie opm 19			/-	20

PJZ = punt juist zichtbaar

/- Testen in Pye apparaat type 815 (gloeidraadvoeder met een andere trafo, waarvan midden aan kathode)

Voor opmerkingen zie blad 2
TOELICHTINGEN IN R 11-3-1.

MEETVOORSCHRIFT (Fabriek)			Type: MW 22-3		
DAT. 3-4-39	DOORGEG.: J	2 BLADEN	BLAD 1	NR 1	R 11-3-

N.V. PHILIPS' GLOEILAMPENFABRIEKEN TE EINDHOVEN, HOLLAND; AFD. FABRICAGE-VOORSCHRIFTEN A.R.

Remarks:

1. Preheat for 30 minutes.
2. Read Is immediately after switching on V.
   The value of Is should lie within the limits.
3. Leave the fluorescent spot on as short as possible to prevent its burning in.
4. Measure to the centre of the spot.
5. Remove the coils.
6. Test the tube in complete darkness.
7. A passable burr is allowed (at the utmost). The point should be almost round.
8. No stray rays should be visible when defocussing or suppressing thoroughly (to be recognised from light stains or streaks on the screen.
9. Bring the coils as high as possible (until they touch the bulb).
10. Produce a scanning grating (raster) over the whole screen.
11. Adjust Vg in such a way that the entire raster is just invisible.
12. Modulation current = a-b (allow for possible leaking).
13. No arcing over.
14. Check on sharpness of lines.
15. Scanning grating 18x14. 400 lines. 50 pictures/sec.
16. Check in half-darkness.
17. Periodical suppression of 7 of the 8 lines. 200 lines. Scanning grating (raster) 14x18. 50 pictures/sec.
18. Ia = 10 µA top value.
19. Before corner cutting, see that the spot is in the centre of the screen, when the deflection current = 0.
20. Check for unsharpness of the outlines.

TEST- SPECIFICATION (FACTORY)		TYPE NR. MW 22-3		
DATUM 3/4/'39	DOORGEG. W.N.	AANTAL BLADEN 2	TEEK. NR. VOORSCHR. NR. 1	BLAD: 2

R 11-3

VOOR LEETVOORSCHRIFT (FABRIEK) ZIE TYPE MW22-2

For factory test specifications see type MW 22-2

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LEETVOORSCHRIFT (FABRIEK)		TYPE NR. MW22-5		
DATUM 3-7-39	DOORGEG. J	AANTAL BLADEN 1	TEEK. NR. VOORSCHR. NR. 1	BLAD: 1

N.V. PHILIPS' GLOEILAMPENFABRIEKEN TE EINDHOVEN, HOLLAND; AFD. FABRICAGE-VOORSCHRIFTEN A.R.

NR	METING	INSTELLING									EISCH			PRINCIPE SCHEMA	OPMERKINGEN
		Vf V~	Va1 V=	Va2 V=	Vg V=	Beeld	Ia2 µA	AW focus	V V	Vk/f V=	1e CONTROLE	2e CONTROLE	EENHEID		
1	Voorwarmen	7,0													1
2	Isolatie:														
	kala2/g	7,0							-300 =	100	≤ 8,0	≤ 10	µA	672	
	kg/ala2	7,0							-300 =	100	≤ 8,0	≤ 10	µA	672	
	kgal/a2	7,0							-300 =	100	≤ 8,0	≤ 10	µA	672	
	+k/-f	7,0								100	≤ 10	≤ 12	µA	670	
	-k/+f	7,0								100	≤ 50	≤ 60	µA	670	
3	Is	6,3							50~	100	≥ 3,0	≥ 2,5	mA	671	2
4	If	6,3									0,59-0,71	0,56-0,74	A	140	
5	Excentriciteit	6,3	250	5000	inst	PJZ					12	13	mm	667	3+4+5+6
6	Puntafbeelding	6,3	250	5000	"	"		focus			zie opm 7			66	3+6+7
7	Strooi-stralen	6,3	130	5000	"	"		"			zie opm 8			66	6+8+9
8	-Vg	6,3	250	5000	"	raster		"			≤ 95	≤ 100	V	663	6+10+11
9	Steilheid (-Vg)	6,3	130	5000	a	"	5,0	"			≤ 50	≤ 55	V	663	10
10	Steilheid (Ia2)	6,3	130	5000	a+10	"		"			≥ 105	≥ 100	µA	663	10
11	Ial	6,3	130	5000	a+10	"		"			≤ 700	≤ 730	µA	663	10
12	Overspann. test	6,3	130		inst	"	10	"			6000 5000	5500 4500	V	663	12
13	Ionenvlek	6,3	130	1500	"	"	100	defoc			geen vlek i/h midden v/h scherm			663	5+10
14	Scherm-kwaliteit	Scherm qualiteit				"	10-70	focus			geen vlekken of inbrandlijnen			/-	6+12+13
15	Schermkleur	Scherm				"		"			moet wit zijn			/-	6+13
16	Lijnbreedte	lijnenbreedte				ged raster	10	"					mm	/-	15+16+17
17	Defocus-seeren(Ia2)					raster		"					µA	/-	13+18
18	Afschaduwen					"	10	"					mm	/-	6+14+19+18

PJZ = punt juist zichtbaar
/- Testen in Pye apparaat type 815 (gloeidraad voeden met een andere trafo, waarvan midden aan kathode)

TOELICHTINGEN IN R 11-3-1. Voor opmerkingen zie blad 2

MEETVOORSCHRIFT (Fabriek) VOORLOOPIG			Type: MW31-6 - MW31-3			
DAT. 3-7-39	DOORGEG. J	2 BLADEN	BLAD 1	NR 2	R 11-3-	

N.V. PHILIPS' GLOEILAMPENFABRIEKEN TE EINDHOVEN, HOLLAND; AFD. FABRICAGE-VOORSCHRIFTEN A.R.

Remarks:

1. Preheat during 30 min.
2. Read Is immediately after switching on V.
   The value of Is should answer the requirements.
3. Only leave the fluorescent spot as short as possible on the screen.
4. Measure to the centre of the light spot.
5. Remove the coils.
6. Check the tube in complete darkness.
7. A passable burr is allowed (at the utmost). The spot should be almost round.
8. No stray-rays may become visible when defocussing or suppressing thoroughly (may be recoguized from light spots or streaks on the screen).
9. Bring the coils as high as possible (until they touch the bulb).
10. Produce a scanning grating (raster) over the whole screen.
11. Adjust Vg in such a way that the whole scanning grating (raster) is just invisible.
12. No flash-over.
13. Scanning grating (raster) 18x14 400 lines 50 pictures/sec.
14. Check as to line-width.
15. Check the tube in semi darkness.
16. Suppress periodically 7 of the 8 lines 200 lines 50 pictures/sec.
    Scanning grating (raster) 14x18.
17. Ia2 = 10 µA top value.

TEST-SPECIFICATION (FACTORY)		TYPE NR. * MW31-6 - MW31-3		
DATUM 3/7/'39	DOORGEG. W.N.	AANTAL BLADEN 2	TEEK. NR. VOORSCHR. NR. 2	BLAD 2

N.V. PHILIPS' GLOEILAMPENFABRIEKEN TE EINDHOVEN, HOLLAND; AFD. FABRICAGE-VOORSCHRIFTEN A.R.

VOOR LEETVOORSCHRIFT (FABRIEK) ZIE TYPE MW31-3

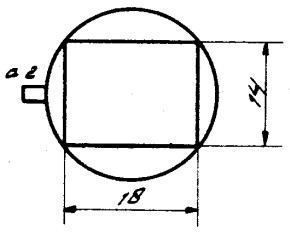
For factory test specifications see type MW 31-3

LEETVOORSCHRIFT (FABRIEK)		TYPE NR. MW31-6		
DATUM 3-7-39	DOORGEG.	AANTAL BLADEN 1	TEEK. NR. VOORSCHR. NR. 1	BLAD: 1

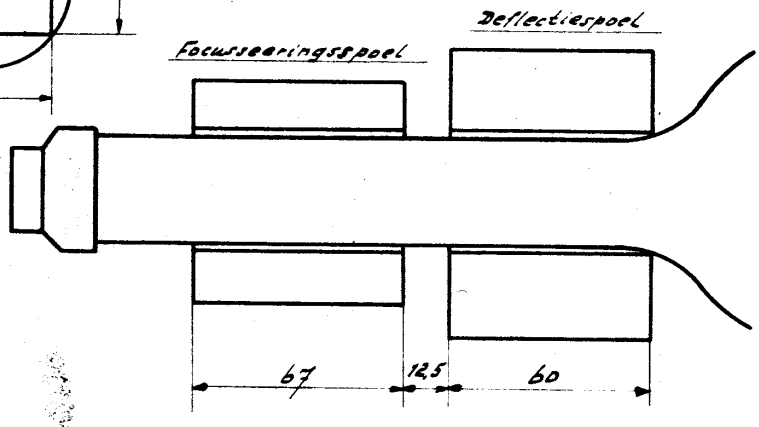
Opmerkingen:

1. Gedurende 30 min voorwarmen
2. Direct na het inschakelen van V de Ia aflezen. Deze waarde moet aan de eisch voldoen.
3. Lichtvlek zoo kort mogelijk in laten staan om inbranden te voorkomen.
4. Het hart van de lichtvlek is maatgevend.
5. Spoelen verwijderen.
6. In volkomen duister controleeren.
7. Hoogstens een niet ernstige vlag. Punt moet nagenoeg rond zijn.
8. Bij flink defocusseeren mogen geen strooistralen zichtbaar worden (kenbaar aan lichtvlekken of strepen op het scherm)
9. Raster over het geheele scherm.
10. Vg zoodanig instellen, dat het geheele raster juist onzichtbaar is.
11. Geen overslag
12. Controleeren in half duister
13. Raster 18x14 cm.
    400 beeldlijnen
    25 beelden/sec
14. Zie schets I
15. Spoelen plaatsen vlg schets II
16. Controleeren op lijnscherpte
17. Periodiek van 8 beeldlijnen 7 onderdrukken
18. Ia_2 is 10 µA topwaarde
19. Straalstroomsterkte opvoeren tot de lijnen van het raster in het midden in elkaar loopen
20. Vóór afschaduwen te controleeren, dat bij deflectiespanning = 0 de punt in het midden van het scherm staat.

SCHETS I



SCHETS II



MEETVOORSCHRIFT (FABRIEK)		TYPE NR. MW22-1		
DATUM 6-2-39	DOORGEG. J	AANTAL BLADEN 2	TEEK. NR. VOORSCHR. NR. 3	BLAD: 2

N.V. PHILIPS' GLOEILAMPENFABRIEKEN TE EINDHOVEN, HOLLAND; AFD. FABRICAGE-VOORSCHRIFTEN A.R.

NR.	METING	INSTELLING							Eisch			PRIN-CIPE-SCHEMA.	OPMERKING
		Vf V~		Vg V=					1ste controle	2de controle	Eenheid		
1	If	4,0							0,9-1,1	0,85-1,15	A		1
2	Sluiting	4,5		10									2
3	Vg a. b. c. d.	Vf= 4,0 V ;Va1= 250 V, Va3= 5000 V. De focuseerspoel, welke 1 cm boven de aquadagrand om de buis bevestigd is, zoodanig regelen, dat de straal gefocuseerd is. De scanningspoel, welke tot voor de verwijding van de buis geschoven wordt, zoodanig regelen, dat het scherm geheel bedekt is. Ia= 0.											
4	Ia	Geheel ingesteld als in 3, doch de Vg op 0 brengen,							zie opm. 7		µA		3
5	Oversp. meting.	Geheel als 3 doch Va3=5500V en Ia=5 µA							Geen overslag				4
6	a. Kathode b. oppervlak schetsen. c.	Scanningspoel uitschakelen Aantal A/W der focuseerspoel omlaag brengen tot het kathodeoppervlak voldoende groot afgebeeld is. Vg variëeren							evnt. vlekken noteeren				
7	Astigmatisme	Geheel ingesteld als in 3 doch de uitwykspanning van de scanningspoel om beurten uit- en inschakelen. Hierbij de focuseerspanning op lijnscherpte instellen. Ia = ca. 30 µA											
8	Is	Vf = 4,0 V Vg = 50 V							zie opm. 7		mA		6

OPMERKINGEN:

1. Vf lager instellen en opvoeren tot 4,0 V. Zoo eerst ca. 5 minuten laten branden.
2. Overslag of sluiting is te controleeren door het wegvallen van de roosterspanning. Bij sluiting valt de lamp uit.
3. Hierbij mogen geen witte stippen in het midden van de curve voorkomen. Is dit wel het geval, dan wyst dit op gas en moet de getterhouder H.F. verstoven worden. Hierna moet de gloeidraad eerst weer ca. 5 minuten branden.
4. Gedurende 15 sec.
5. Het kruispunt van deze lynen mag niet meer dan 12mm uit het hart van de lamp liggen.
6. Interrupter 1:20
7. a. Indien Ia ≧ 20 mA is, moet Ia ≧ 150 µA zijn.
   b. Indien Ia 10-19mA is, moet Ia ≧ 200 µA zijn
   c. Indien Is < 10 mA is, moet de buis overbrandden tot a of b bereikt is.

TOELICHTINGEN IN .R. 11-3

OMSCHRIJVING: MEETVOORSCHRIFT. (FABRIEK)		TYPE: MW 31-2
DATUM: 9-5-30	VOORSCHR.NR. 4	CODE NR.:

N.V. PHILIPS' GLOEILAMPENFABRIEKEN, EINDHOVEN, HOLLAND. AFD. FABRICAGE-VOORSCHRIFTEN A.R.

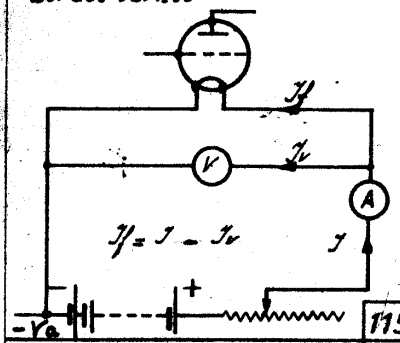
Datum : 28/2/'39 (Nr. 1 - 135) R 11 - 3 - 1
Verv. alle vroegere uitgaven

Oud. nr.	Nieuw nr.	Oud nr.	Nieuw nr.	Oud nr.	Nieuw nr.	Oud nr.	Nieuw nr.
1	136	38		75	139	112	
2		39	137	76	180	113	166
3	137	40	148	77		114	
4		41	136	78	136	115	140
5	136	42	139	79	139	116	140
6		43	137	80	229	117	141
7	137	44	verv.	81		118	147
8		45	136	82	136	119	142
9	136	46		83		120	143
10		47	137	84	138	121	137
11	137	48	148	85		122	145
12		49	136	86		123	144
13	136	50		87		124	141
14		51	175	88		125	146
15	187	52		89		126	143
16		53	136	90	236	127	410
17	136	54		91	235	128	411
18		55	217	92	139	129	355
19	137	56		93	237	130	412
20		57	136	94	143	131	356
21	136	58		95	136	132	penth. 467 triod. 414
22		59	172	96		133	414
23	137	60		97	138	134	405
24		61	208	98		135	
25	136	62		99	136		
26		63	209	100			
27	137	64		101	138		
28		65	136	102	141		
29	136	66	139	103	136	F 93 a	237
30		67	223	104			
31	199	68		105	163		
32		69		106	163		
33	136	70		107	136		
34		71		108			
35	137	72		109	166		
36	148	73	179	110			
37	136	74	178	111	136		

N.V. PHILIPS' GLOEILAMPENFABRIEKEN, EINDHOVEN, HOLLAND; AFD. FABRICAGE-VOORSCHRIFTEN A.R.

If METING

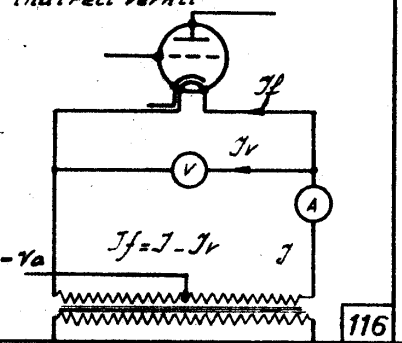
direct verhit



115

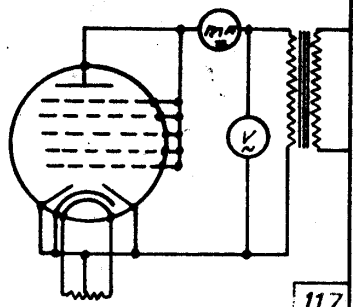
If METING

indirect verhit



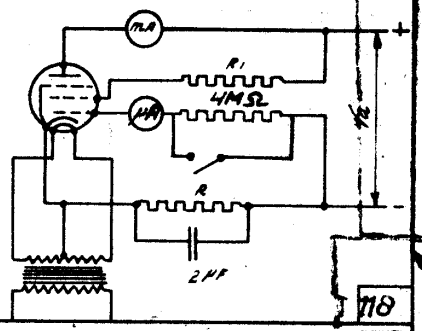
116

Is METING



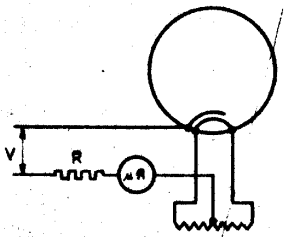
117

Ia EN-Ig METING BIJ AUT. Vg



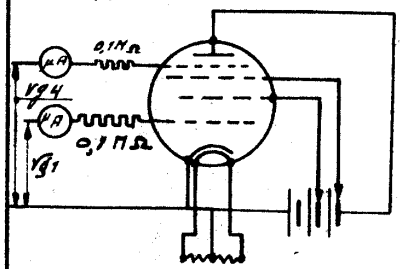
118

ISOLATIEMETING K/F



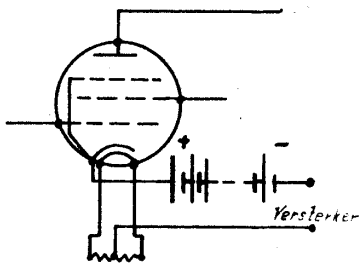
119

- Ig METING BIJ VASTE VG1



120

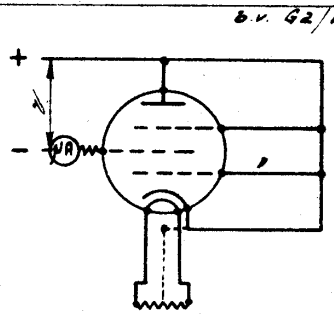
KRASSCHEMA



121

ISOLATIE

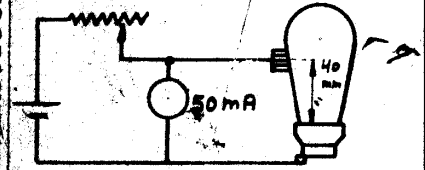
b.v. G2/rest



....alleen voor direct verhitte lampen.

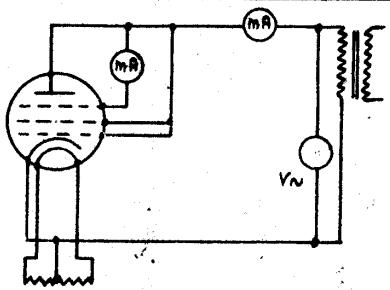
122

WEERSTAND M/PEN



123

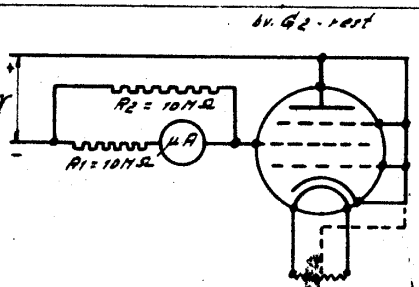
IS METING G3 UITGEVOERD



124

ISOLATIE

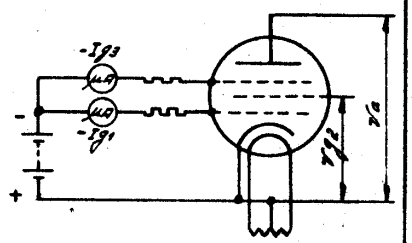
b.v. G2 - rest



...Alleen voor direct verhitte [illegible]

125

Ig1 EN -Ig3 METING



126

ALGEMEENE SCHEMA'S

2-5-38
28-3-38

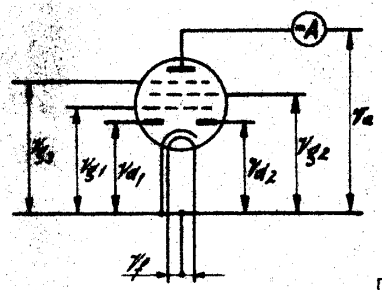
R 11-34

(schema nr. [illegible] 126)

SOORT

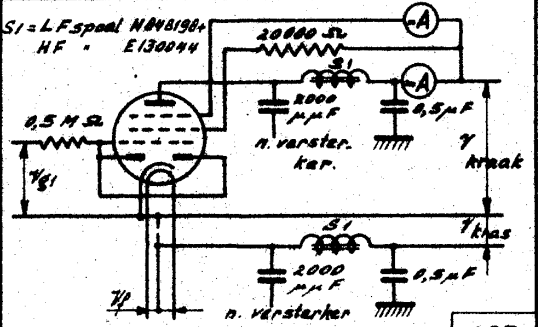
ALGEMEENE SCHEMA'S

Meten



136

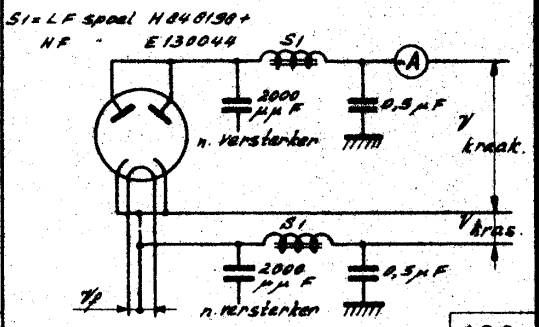
Krassen + kraken + contr. g3



---- alleen voor direct verhitte buizen

137

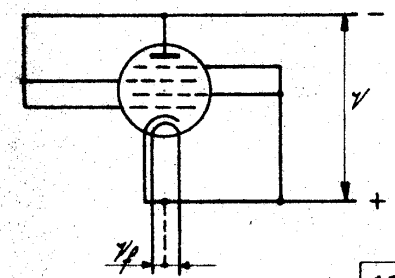
Krassen + kraken



----alleen voor direct verhitte buizen

138

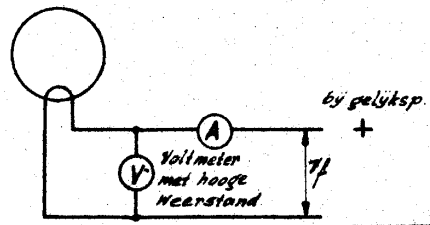
Sluiting



---- alleen voor direkt verhitte buizen

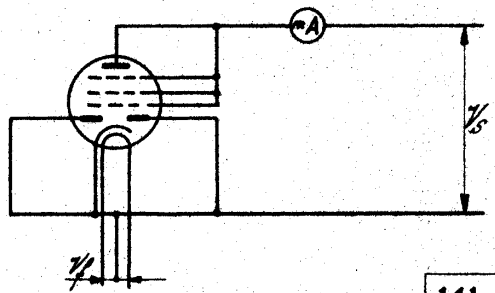
139

Gloeistroom



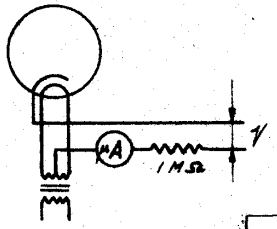
140

Verzadiging



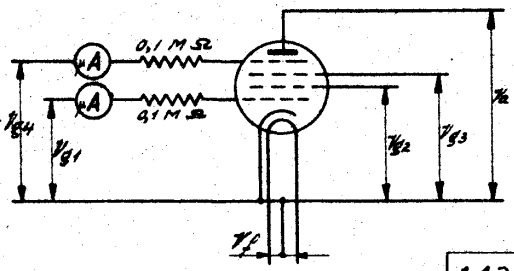
141

Isolatie k - f



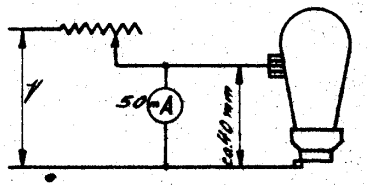
142

- I g bij vaste Vg



143

Weerstand m-pen



144

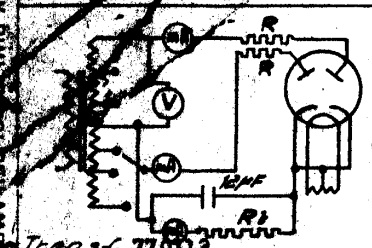
N.V. PHILIPS' GLOEILAMPENFABRIEKEN TE EINDHOVEN, HOLLAND. AFD. FABRICAGE VOORSCHRIFTEN A.R.

Datum: 28/2/'39
Verv. alle vroegere uitgaven
(Nr. 136 - 144)
R 11 - 3 - 1

N.V. PHILIPS' GLOEILAMPENFABRIEKEN TE EINDHOVEN, HOLLAND, AFD. FABRICAGE-VOORSCHRIFTEN K.R.

Datum: 22-3-38
Vervangt FV R 11-4-1 dd. 31-1-38
Schema 301 t/m. 313
A II-7-IV

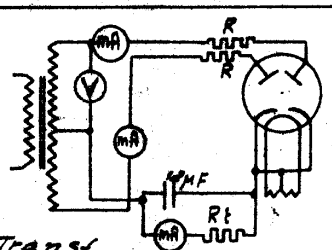
MEETSCHEMA



Transf. T7032

301

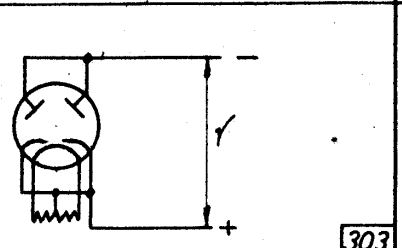
MEETSCHEMA



Transf.

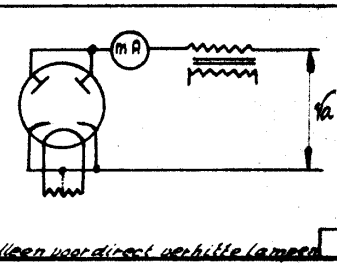
302

SLUITINGSCHEMA



303

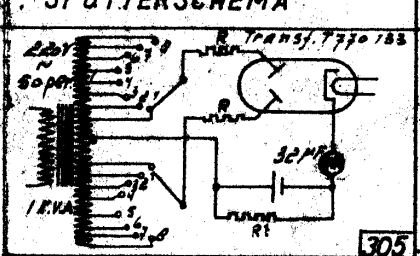
KRAAKSCHEMA



--- alleen voor direct verhitte lampen

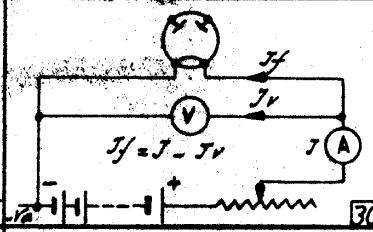
304

SPUTTERSCHEMA



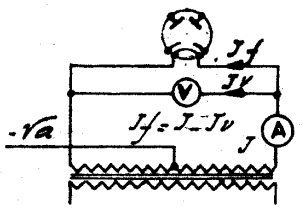
305

If METING



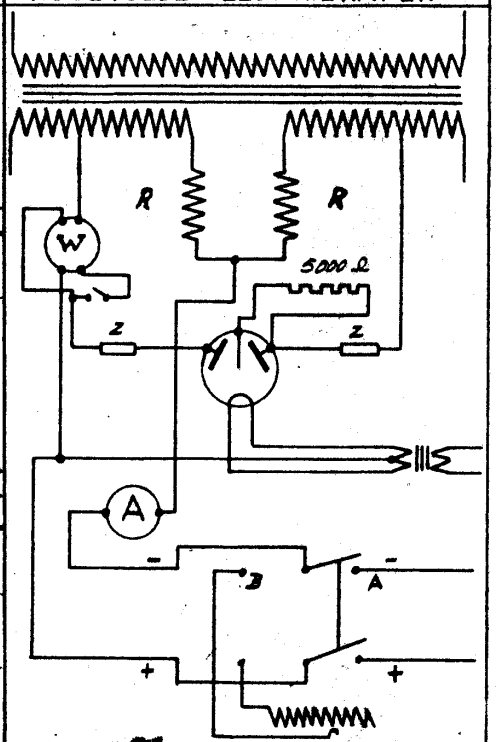
306

If METING



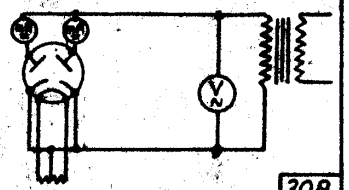
307

MEETSCHEMA VOOR GASGEVULDE GELIJKR. LAMPEN



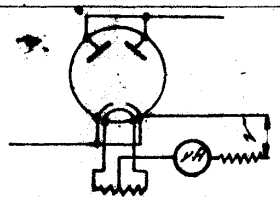
313

VERZADIGING



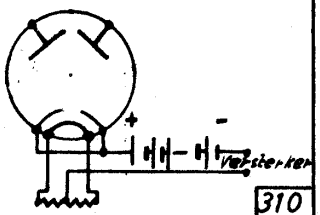
308

ISOLATIE KATH.—GLOEIDR.



309

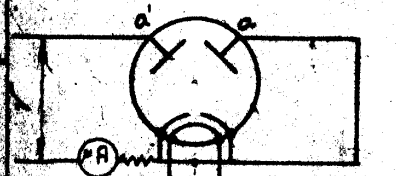
KRASSCHEMA



310

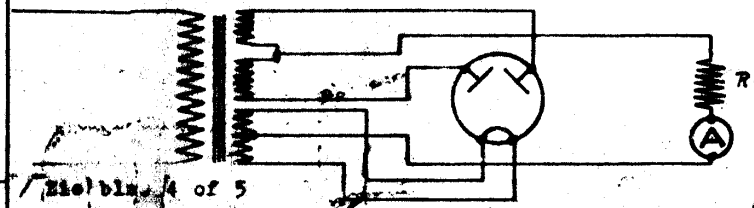
ISOLATIE

kr. als rest



311

MEETSCHEMA VOOR GASGEVULDE GELIJKRICHTLAMPEN.



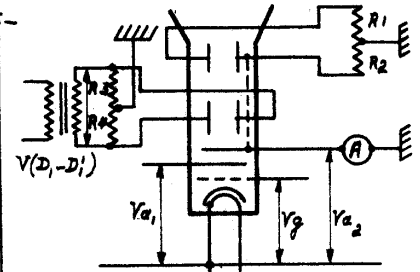
(Zie) blz. 4 of 5

312

XX

SOORT KATHODE-STRAAL-BUIZEN

MEETSCHEMA'S



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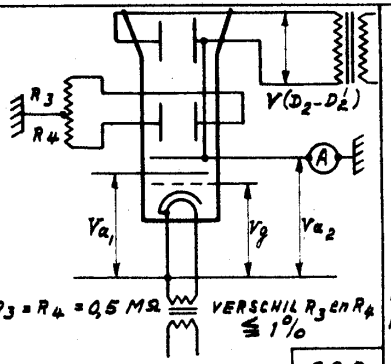

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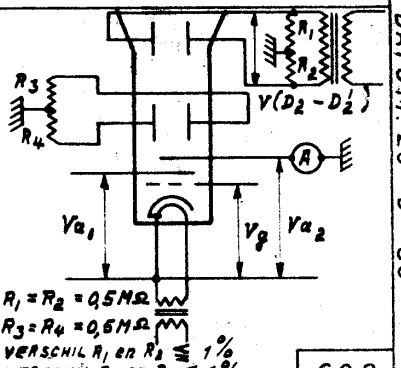

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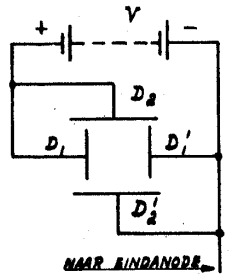

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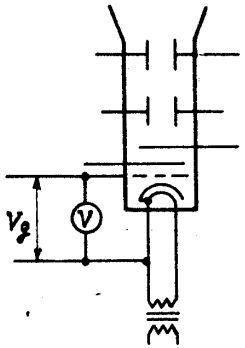

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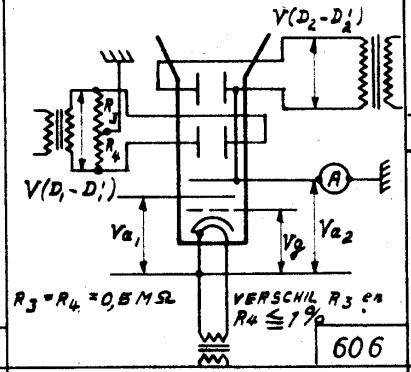

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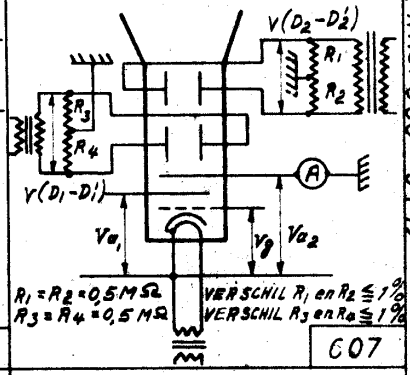

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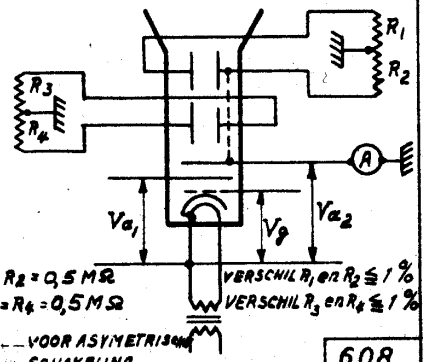

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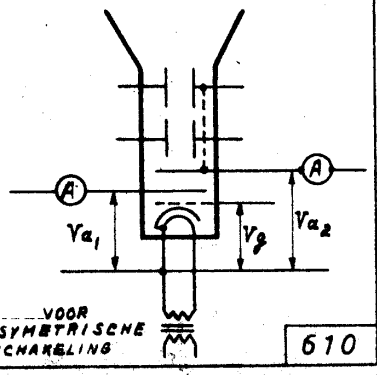

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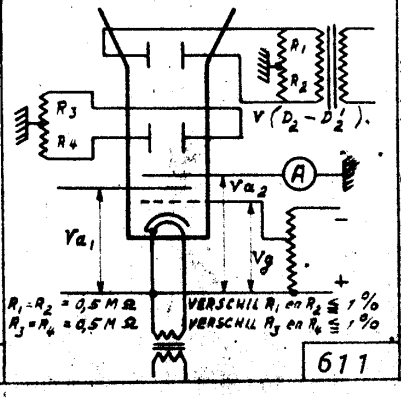

611

DATUM: 26-9-38 (NRS. 600-611) R 11-3-1-

N.V. PHILIPS' GLOEILAMPENFABRIEKEN TE EINDHOVEN, HOLLAND; AFD. FABRICAGE-VOORSCHRIFTEN A.R.

Datum 28/2/'39 (Nr. 627 - 662) R 11-3-1

Verv. alle vroegere uitgaven

Oud nr.	Nieuw nr.
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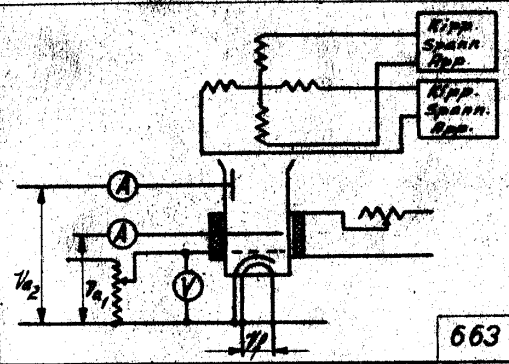
SOORT

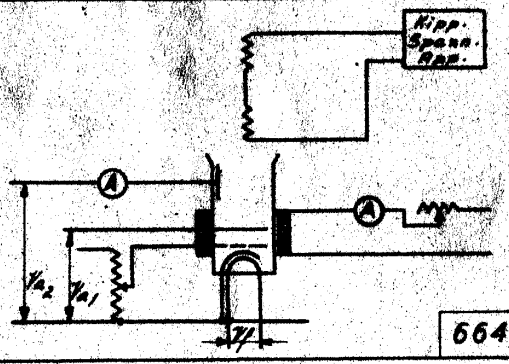
KATHODE - STRAAL - BUIZEN

Karakteristiek e.d.



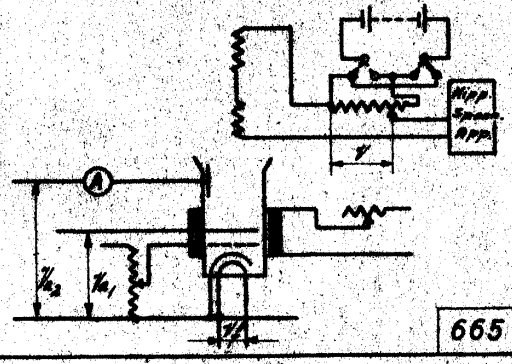
663

Lijnbreedte



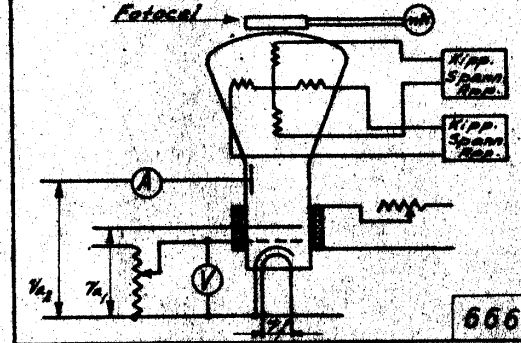
664

Karakteristiek v.d. lijnbreedte



665

Lichtsterkte



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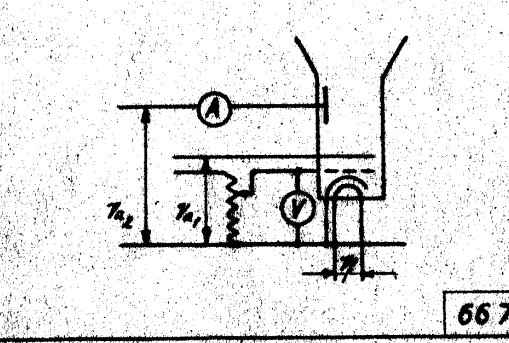
Excentriciteit



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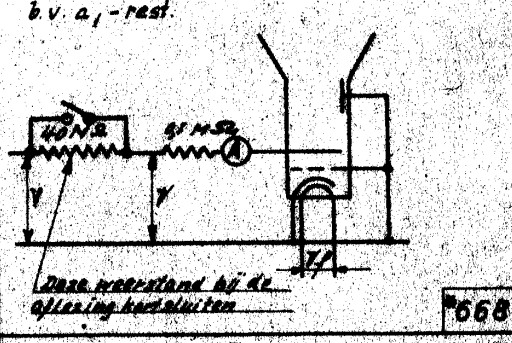
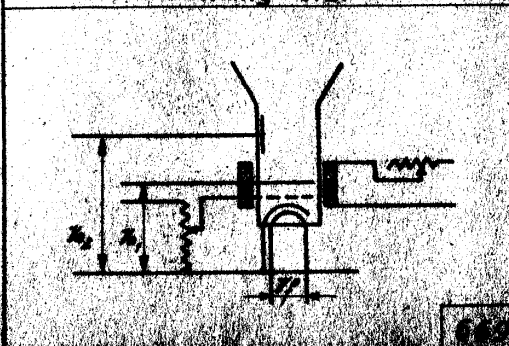
Isolatie



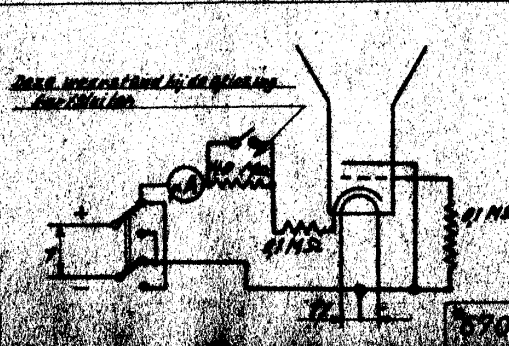
668

Punt afbeelding e.d.



669

Isolatie k-f



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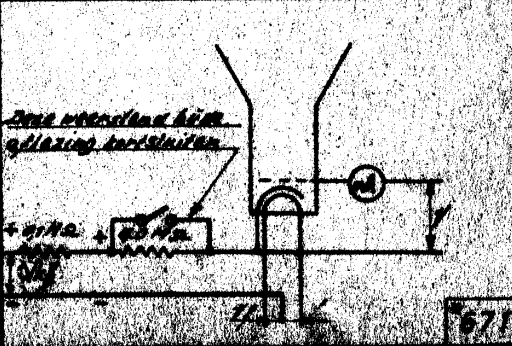
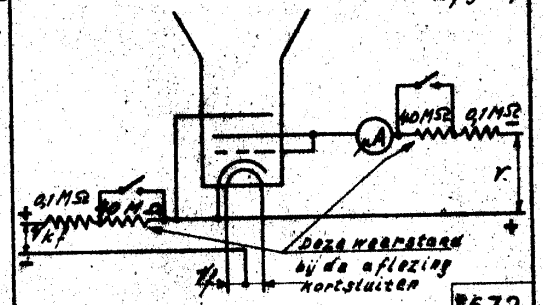


671

Datum: 12/6/39
Verv. Datum: 10/4/39

(Nr. 663 - 671)

N.V. PHILIPS' GLOEILAMPENFABRIEKEN TE EINDHOVEN, HOLLAND, AFD. FABRICAGE-VOORSCHRIFTEN

SOORT KATHODE-STRAAL-BUIZEN	Isolatie		
	b.v. k+a2/g+a1  672	673	674
	675	676	677
	678	679	680

Datum: 12/6/'39
Verv. datum: 28 - 2 - '39

(Nr. 672 - 680)

R 11 - 3 - 1

Date : 19/4/38 R 16-1-3
Date superseded sheet: 23/2/37

TESTING NICKEL TUBING FOR CATHODES.

TESTS OF THE MATERIAL OF WHICH THE CATHODE TUBING IS DRAWN.

SUPPLIER:

General Plate Co., Alteboro Mass. U.S.A.

COMPOSITION:

Nickel + Cobalt	min.	99,15%
Iron	max.	0,20%
Manganese	min.	0,03% - max. 0,20%
Copper	max.	0,20%
Silicium	"	0,05%
Further ingredients	"	0,10%

TESTING THE MATERIAL:

1. The tubes are inspected as to mechanical faults; they also should be bare and smooth inside and outside.
2. An analysis is made of each lot.
3. Of each lot a practical test of abt. 100 cathodes is made.

JUDGMENT OF MATERIAL:

The lot is accepted if the above requirements are satisfied; especially the practical test should be taken into account.

TESTS TO THE DRAWN CATHODE TUBING:

SUPPLIER:

Philips, Eindhoven.

REQUIREMENTS:

1. The tubing may not show mechanical faults.
2. The tubing must be bare and smooth and may not exhibit black spots.

TOLERANCES:

Tolerance to the outside diameter = + and - 0,01 mm
" " " wall-thickness = + and - 0,005 mm.

TESTING TUNGSTEN WIRE, RIBBON AND INGOT.

SUPPLIED:

Philips, Eindhoven.

A. REQUIREMENTS TO BE FULFILLED BY WIRE FOR IND.HEATED VALVES.

Before delivering a spool of tungsten wire destined for heater coils, a length of abt. 200 m is examined.

A. **Testing by the coiling dept.**

Of these 200 m 100 coils of the type for which the wire is destined, are wound.

Requirement: maximum 5% splicing or breakage.

B. **Testing by the Radio Valve Works:**

20 of these approved coils are normally treated (see the coil data (R3-1-...)). Thereafter the brittleness of the coils is tested, by stretching them and bending the straight ends through 90°, after annealing at 1700° C in moist H2.

Requirement: Maximum 15% of breakage.

Application:

Code Nr.	Designation	Operation	Application
33 926 ..	Ddr	Washed	Double helical coil
33 927 ..	Ddr	Washed (or annealed) and centred	Single helical coil
33 928 ..	Ddr	Washed (or annealed) and centred	W- and V-shape (straight wire)
33 929 ..	Ddr	Washed	1.V-shape single coil 2 parts 2.One-part single coil 3.Single coil on spool

Allowances:

The allowances for weight amount to ± 2%.

Orders:

On orders always state:
1. The designation Ddr.
2. The diameter
3. The code number
4. The weight limits in mg/200 mm of wire length.

B. REQUIREMENTS TO BE FULFILLED BY WIRE USED IN DIRECTLY HEATED VALVES:

BB-wire and D-wire (30% acid-treated and annealed).

The wire must be straight and bare.

APPLICATION:

BB-wire is used if the diameter is $\leq$ 0,023
D-wire is used if the diameter is $\geq$ 0,023

Allowances:

The allowances for weight amount to ± 2%

Orders:

On orders always state:
1. The designation Wodr.
2. The diameter
3. The code number.
4. The weight limits in mg/200 mm of wire length

C. REQUIREMENTS TO BE FULFILLED BY SEALING-IN WIRE, GROUND CENTERLESS.

The surface of the wire may not exhibit cracks and must be smooth. The wire is supplied in straight lengths of maximum 2 meters.

Allowances:

The allowances to the diameter amount to ± 3%.

Orders:

On orders always state:
1, The designation Ddr D.S.
2. The code number
3. The diameter.

TESTING MANGANESE NICKEL WIRE AND RIBBON (1,5-2% OF Mn).

REQUIREMENTS TO THE MATERIAL BEFORE IT HAS BEEN DRAWN TO THICKNESS.

SUPPLIER:

Driver Harris, U.S.A.

COMPOSITION:

Technical nickel with 1,5-2% Of Mn.

TESTING THE MATERIAL:

With a view to ascertaining the manganese grade, the specific resistance is measured; this amounts to abt. 0,120-0,150 Ohm per mm^2/m.

COMMENTS:

An analysis is only rarely made seeing that we have never detected any relation between the analysis and the practical test. The metal invariably contains some cobalt and iron, which constitute serious drawbacks in analysing the Mn. This is the reason that divergent results are obtained when analyzing on different methods. Besides, it seems to be impossible to maintain the manganese grade at a constant figure. In our analyses the manganese grade varies between 1,5-4,0%

REQUIREMENTS TO THE MATERIAL AFTER IT HAS BEEN DRAWN TO THICKNESS AND ROLLED.

SUPPLIER:

Philips, Eindhoven.

REQUIREMENTS:

1. Ni-wire that is used for grid-backbones:
   a. The wire should be as soft as possible; the stretch must be minimum 25% (indication Ni-wire soft).
   b. For some grids the wire must be specially soft. This is attained be reducing the wire slightly longer and at a somewhat higher temperature than soft wire. (Denotation Ni-wire specially soft).
   c. The wire must be without coils and be wound on big reels.
   d. The surface of the wire must be smooth.

Date: 13-9-38. R 16-1-10.
Date superseded sheet: 14-12-37.

TESTING E-WIRE AND RIBBON.

SUPPLIER:

For wire: Heraeus, Hanau a/M.
For ribbon: Philips, Eindhoven.

COMPOSITION:

Iron	abt. 50%
Nickel	abt. 48%
Manganese	abt. 1%
Further ingredients	abt. 1%

REQUIREMENTS:

1. The surface of the wire must be bare and smooth.

Special requirements to wire for electrodes.

1. A sealing-in test must be made of each bobbin.
2. Seal-in at least 20 electrodes; 24 hours after foot-making, the pinches may not be cracked and abnormal bubbles may not present themselves.

ALLOWANCES.

1. For wire	± 0,02 mm
2. For ribbon:	
to a width up to 1 mm	± 0,05 mm
to a width >1 up to 2 mm	± 0,1 mm
to a thickness up to 0,25 mm	± 0,01 mm
to a thickness >0,25 up to 0,5 mm	± 0,015mm
to a thickness >0,5 mm	± 0,02 mm

Date: 3-10-39.
Date superseded sheet: 13-9-38.

R 16-1-14
Page 1.

TESTING MOLYBDENUM WIRE, STRIP AND INGOTS.

SUPPLIER:

Philips, Eindhoven.

REQUIREMENTS:

1. Winding-wire for grids may be supplied soft or hard.
   The elongation of these kinds is as stated below:
   hard wire (stretched) 1-3%
   soft wire (sintered) $\leq$ 60 microns 15-20%
   soft wire (sintered) $\geq$ 60 microns 20-25%
   Soft wire of a diameter $\geq$ 60 microns and with a stretch of 20-25% can only be supplied with great difficulty. Because of this our valve factory will put into work wire having a stretch of abt. 15-20%, except for those cases where wire with a stretch of 20-25% is strictly necessary. This must then be indicated on the orders.
   However, the supplier should endeavour to supply the soft wire $\geq$ 60 microns ar a rule with a stretch of 20-25%, as best results are obtained herewith.
2. Ribbon is only supplied hard.
3. Winding-wire for grids must be perfectly round.
   The wire must be examined as to roundness as per R2-18-9.
4. The wire must be free from bucklings and kicks.
5. Winding-wire for grids must be bright, free from stains and may not exhibit a dull grey colour or any other colour.

ALLOWANCES:

* 1. For winding-wire for grids having a diameter:

up to and incl. 0,040 mm:	± 0,002 mm
0,041-0,080 mm:	± 0,003 mm
0,081-0,100 mm:	± 0,004 mm
> 0,100 mm:	± 0,005 mm

2. For ribbon:

to a width up to and incl. 1 mm:	± 0,05 mm
>1 up to and incl. 2 mm:	± 0,1 mm
to a thickness up to and incl. 0,25 mm	±0,01 mm
>0,25 up to and incl. 0,5 mm	± 0,015 mm
>0,5 mm	± 0,02 mm

REMARKS:

1. On orders the hardness of the wire must be indicated, e.g. Mo-wire hard 0,1 as per R 16-1-14.
2. On orders the stretch should only be indicated, if a stretch of 20-25% is required. This is stated in the relevant instructions.
3. On the labels of the spools has been indicated:
   A. the nominal dimensions
   B. the real dimensions,

REQUIREMENTS TO Mo-WIRE, GROUND CENTERLESS.

Wire used for grid backbones:
The surface of the wire may not exhibit cracks and should be smooth.
The wire is supplied in straight ends of max. 2 metres.

Remark:

When ordering state: e.g. Mo-wire C.S. 2ø as per R 16-1-14.

ALLOWANCES:

The allowances to the diameter are ± 0,01 mm.

Date: 4/4/38 R 16-1-23

TESTING COPPER NICKEL SHEET.

SUPPLIER:

United German Metal Works
United German Nickel Works
Wiggin, England.

COMPOSITION:

Nickel	: 44-48%
Impurities	: max.2%
Rest	: copper
Zinc	: must be absent

REQUIREMENTS:

The surface must be bright and smooth.

ALLOWANCES:

up to and incl. 0,2 mm	± 0,015 mm
>0,2 up to and incl. 0,3	" 0,02 mm
0,5 mm	" 0,035 mm
1,0 mm	" 0,04 mm

TESTING MATERIAL RECEIVED:

Test a sample of every consignment.

JUDGMENT:

If this random test does not satisfy the above requirements, a second test of the same extent must be made. If this test does not satisfy either, the whole consignment must be rejected.

Date: 4/4/38 R 16-1-36

TESTING COPPER NICKEL ROD AND WIRE.

SUPPLIER:

United German Metal Works
United German Nickel Works
Wiggin, England

COMPOSITION:

Nickel	: 44-48%
Impurities	: max. 2%
Rest	: copper
Zinc	: must be absent

REQUIREMENTS:

The surface of rods up to a thickness of 25 mm ø and of wire must be bright and smooth.
The surface of rods of upwards 25 mm ø must be smooth, and may be black.

ALLOWANCES:

Under 3 mm ø	- 0,05 mm
From 3 to 6 mm ø	- 0,08 mm
From 6-18 mm ø	- 0,10 mm
From 18-50 mm ø	- 0,15 mm
Above 50 mm ø	- 0,2 mm

TESTING MATERIAL RECEIVED:

Test a sample of every consignment.

JUDGMENT:

If this random test does not satisfy the above requirements, a second test of the same extent must be made. If this test does not satisfy either, the whole consignment must be rejected.

Date: 26-9-38. R 16-2-16.

ASSAYING FLUORESCENT POWDER Z64 (LEVY).

SUPPLIER:

Levy, 31 Shoot up Hill, London N.W.2.

REQUIREMENTS:

1. The grain size must be 10-30 u
2. When viewed under a microscope and lighted by an Ultrasol lamp the sulphide may consist of two components only, viz. yellow and blue.

EXAMINING MATERIAL RECEIVED:

Draw a random sample of every consignment.

JUDGMENT:

If this sample does not answer the above mentioned requirement, a second sample of the same extent must be drawn. If the latter sample is not approved of either, the whole lot must be rejected.

STORAGE:

Keep the fluorescent powder Z64 in a well-closed stoppered bottle.

USE:

Fluorescent powder Z64 is used a.o. in applying white fluorescent screens in cathode-ray tubes.

CODE NUMBER:

Fluorescent powder Z64 02 800 26.

te: 5-4-'36. R 16-4-1
te superseded sheet: 18-8-'33.

TESTING AMYL ACETATE.

Supplier:

"Gembo", Winschoten, and others.

Requirements:

1. Specific gravity at 15° c = 0,871-0,878
2. Below 130°C only 30% may be distilled.
   Below 141°C the entire quantity must be distilled.
3. When mixed with water it must react neutrally.
4. When evaporating 100 cc the residue may only amount to 10 mg.
* 5. It must be clear and colourless.

Checking material received:

Of every parcel a test must be made.

Judgment:

In case the test at random does not satisfy one of the above exigences, a second test of the same extent must be made. If this test is again rejected, the whole parcel must be refused.

Code number:

Amyl acetate 02 752 95

Date. 5-4-'36. R 16-4-3
Date superseded sheet: 12-11-35.

TESTING METHYLIC GLYCOL ACETATE

Supplier:

I.G.Farben and others.

Requirements:

1. Boiling limits 138-152° C.
2. Specific gravity at 20° C = abt. 1.00.
3. After evaporation the residue of 100 cc may not exceed 10 mg.
* **4. It must be clear and colourless.**

Testing the material received:

A sample must be drawn from every lot.

Judgment:

If the judgment does not satisfy one of the above requirements a second sample of the same extent must be taken.
If the latest is rejected again, the whole lot must be refused.

Code numbers:

Methylic glycol acetate 0287035.

Date: 10/5/38 + R 16-4-4
Date superseded sheet: 25/2/37

TESTING NITROCELLULOSE.

SUPPLIER:

I.G.Farben a.o.

DESCRIPTION.

Nitrate of cellulose containing 11,8-12,3 % of nitrogen.

REQUIREMENTS:

The butanol content of the nitrocellulose to be supplied must be 30% (American specification) or 35% (German specification) of the total weight. If necessary, the material may also be moistened with ethylic alcohol or isopropyl alcohol. This is dependent upon the customs and excise specifications. The material is not tested further.

REMARK:

The composition of the nitrocellulose (in particular the nitrogen content) is a measure of its solubility in different solvents. Therefore a certain nitrogen content is specified in this notice. The molecular structure, however, is decisive for the viscosity of the solutions. For this reason we should use the right type of cellulose. This is denoted by the suppliers by a type number as: E 1160, E 950, RS ½ sec., RS 3-4 sec.
Nitrocellulose E 510 is approximately equal to the RS ½ sec. as supplied by the Hercules Powder Cy., E 950 is equal to RS 20-30 sec. and E 1160 to RS 125-175 sec.
However, the American viscosity limits do not quite agree with the German ones. When preparing lacquer or binder this must sometimes be considered if one wants to get the right viscosity with the percentage of nitrocellulose used.

CODE NUMBERS:

Nitrocellulose	E 510	02 771 86
"	E 620	02 770 93
"	E 950	02 771 09
"	E 1160	02 771 13

Date: 5-4-'36. P 16-4-5
Date superseded sheet: 14-8-35.

TESTING BUTHYLCELLOSOLVE ($C_4H_9OCH_2CH_2OH$)

Supplier

I.G. Farbenindustrie represented by "Defa" at Arnhem.

Exigences.

1. Specific gravity at 15° C = abt. 0,908.
2. It must completely distil at 163-175° C.
3. After evaporation the residue of 100 cc may not be in excess of 10 mg.
* 4. **It must be clear and colourless.**

Testing the material received:

A sample must be taken of every lot.

Judgment.

If the sample does not answer one of the abovementioned exigences, a second test of the same extent must be made. If this is unsatisfactory again, the whole lot must be rejected.

Use:

Buthylcellosolve is used in the preparation of binders.

Code number:

Buthylcellosolve 0276210

Date: 18-10-38. R 16-5-2

TESTING GOLD BRONZE.

SUPPLIER:

Georg Benda, Nürnberg.

REQUIREMENTS:

A sample of the fresh shipment is compared with a sample of the previous parcel on colour and grain size. This test may be carried out easily with the naked eye.

STORAGE:

Gold bronze is kept in oiled paper on a dry place.

USE:

Gold bronze is used a.o. in metallizing radio tubes.

CODE NUMBER:

Gold bronze 02 070 00

Date : 15/2/38 R 16-10-3
Date superseded sheet: 5/4/36 Page 1.

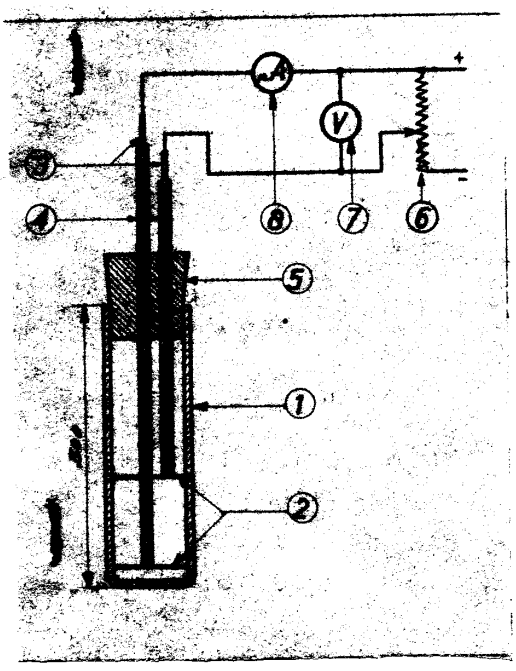
EXAMINING OF METHYLIC ALCOHOL.

SUPPLIER:

Müller & Peters, Amsterdam.

REQUIREMENTS:

1. Boiling-point limits 64-65° C.
2. Spec.gravity at 15° C = abt. 0.796; it may not exceed 0.802.
3. The residue of 100 cc after evaporation may not be in excess of 10 mg.
4. It must be clear and colourless.
5. Methylic alcohol must have been synthetically prepared
6. If methylic alcohol is to be used in the preparation of alundum paste for the cataphoretization of coils, it must also be subjected to a practical test.
7. If methylic alcohol is to be used in the preparation of alundum paste for the cataphoretization of coils, it must also be tested on its electric resistance.
   This is done in the apparatus sketched below.
   The numbers in the sketch denote:
   1. Glass tube 20x23 mm. Ø
   2. Contact plate Ni/0,3 mm thick, 20 mm Ø
   3. Electrodes Ni/1,8 mm Ø, soldered to (2)
   4. Glass insulation tubes 2,4x4 mm Ø
   5. Stopper
   6. Potentiometer
   7. Voltmeter =
   8. Micro-amp.meter =



Requirement: The current must be under 12 micro-amps. at a contact plate spacing of 300 mm and a voltage of 100 volts =

EXAMINING OF MATERIAL RECEIVED:

A sample must be drawn of every lot.

JUDGMENT:

If the random sample does not answer the above requirements, a second sample of the same extent must be drawn. If the latter sample is also rejected, the whole lot must be refused.

CODE NUMBERS

Methylic alcohol	02 870 40
Methylic alcohol	02 870 41

02 870 40
tested on its electric resistance

Date: 2-3-'37 R 16-10-5

TESTING DIXON GRAPHITE.

Supplier:

Dixons Lamp Graphite Cement, represented by the firm of Eibink, Haarlem.

Requirements:

Dixon graphite is tested as to its ash-grade. Dixon graphite Nr.1365 should have an ash-grade of abt. 15%.

Use:

Dixon graphite nr. 1365 is used in blackening metal sheet for radio valve parts.

Code number:

Dixon graphite Nr.1365 02 810 42.

Date: 22/2/38

G E Spec D5 B24-S2 v
R 16-10-8

TESTING ACETONE (CH_3COCH_3)

SUPPLIER:

B.I.M. Hague

REQUIREMENTS:

1. Specific gravity : abt. 0,8 — 0.791 t/ 0.799
2. Residue : not more than 10^{-5} mg per 100 cc.
3. Distillation : must distil totally at the boiling-point of 56° C. Staf 755 57

TESTING THE MATERIAL RECEIVED:

Draw a sample of every lot.

JUDGMENT:

If the random test does not come up to the above requirements, a second test of the same extent must be made. If the results of this test are unacceptable again, the whole lot must be rejected.

STORAGE:

Keep in a cool place, which is fire-proof.

USE:

Acetone is used a.o. as diluent in the preparation of different coatings.

CODE NUMBERS:

Acetone	02 752 85

te: 17-11-'36. R 16-10-11

TESTING DIETHYLOXALATE.

Supplier:

I.G. Farben, represented by "Defa", Arnhem.

Requirements:

1. Specific gravity at 15,5° C = 1,084
2. Boiling-point = 185° C.
3. The residue of 100 cc after evaporation may not exceed 10 mg.
4. Acid may not be present.

Testing the material received:

Draw a sample from every lot.

Judgment:

If the random test does not come up to the above requirements, a second test of the same extent must be made. If the results of this test are unacceptable again, the whole lot must be rejected.

Use:

Diethyloxalate is used in the preparation of spraying-liquid for cathodes.

Code number:

Diethyloxalate: 02 780 12.

Date: 24-3-'36.
Date superseded sheet: 30/10'35.

R 16-10-17
* Page 1.

TESTING ALCOHOL.

Supplier:

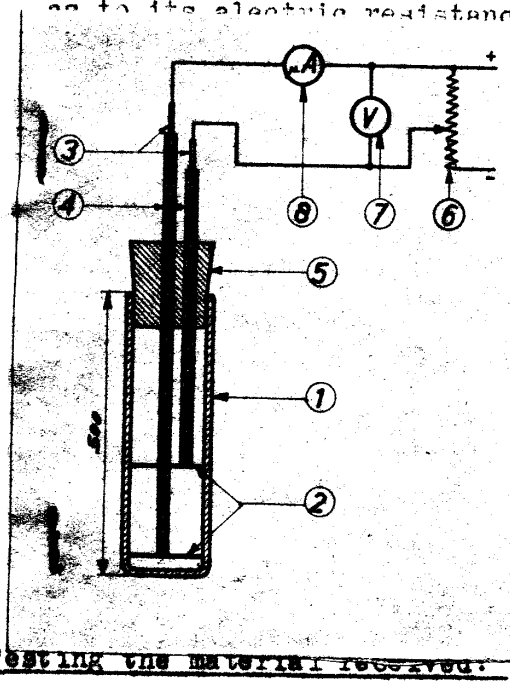
Zuid-Nederlandsche Spiritusfabriek at Bergen op Zoom.

Chemical composition:

Ethyl alcohol min. 96% by volume
This must be verified by ascertaining the specific gravity.

Requirements:

1. Specific gravity at 15° C is abt. 0,81.
2. Boiling-point 78° C.
3. After being concentrated by evaporation 100 cc may have no greater residue than 2 mg.
4. Ethyl alcohol may not be denatured with crude wood-spirit, pyridine or petroleum hydrocarbons.
   Ethyl alcohol used in the preparation of basing-cements and used as a cleaning-means, may be denatured by any denaturation means.
5. It must be clear and colourless.
6. The ethyl alcohol used for the cataphoretization of filaments (mounted on a foot), for the continuous cataphoretization of wire and for the cataphoretization of cathodes, is also tested as to its electric resistance.



represented on the sketch below:

The following parts may be distinguished:

1. Glass tube 20x23 mm ∅
2. Contact plate, Ni 0,3 mm thickness; diam. 20 mm.
3. Leads Ni/1,8 mm ∅, soldered on (2).
4. Glass insulation tubes 2,4x4 mm ∅
5. Stopper.
6. Potentiometer
7. Voltmeter =
8. Micro-ammeter =.

Requirement: If the distance between the contact plates is 300 mm and the voltage applied is 100 V=, the current must be under 7 µA

Testing the material received:

A sample must be drawn from every lot.

Judgment:

If the sample does not satisfy the above requirements, a

second test of the same extent must be mdae. If this is rejected too, the whole lot must be refused.

Code numbers:

Ethyl alcohol (denaturated, but not with wood-spirit, pyridine, or petroleum hydro-carbons)	02 752 75
Ethyl alcohol (denaturated with wood spirit, pyridine or petroleum hydro-carbons) as	02 752 76
Ethyl alcohol 02 752 75 tested/to electrical resistance	02 752 77.

Date: 8/2/38 R 16-10-18

TESTING SULPHURIC ACID.

SUPPLIERS:

Technical sulphuric acid:

Ketjen, Amsterdam
Dekker, Wormerveer and others.

Pure sulphuric acid:

Ketjen, Amsterdam.

REQUIREMENTS:

Technical sulphuric acid:

Content at least 96%.

Pure sulphuric acid:

1. Content at least 96%
2. After the volatilization of a few drops there may be no residue.
3. With quantities of:
   2 cc it may not react to heavy metals
   1 " " " " " " lead
   15 " " " " " " oxidizing materials
   1 " " " " " " nitric acid
   2 " " " " " " arsenic

TESTING THE MATERIALS RECEIVED:

A sample must be drawn from every shipment.

JUDGMENT:

If the random test does not satisfy the above requirements, a second test of the same size must be made.
If this second test is again rejected, the whole shipment must be rejected.

USE:

Sulphuric acid (technical) is used a.o. for acid-treatment of metal parts.
" " (pure) " " " " in silvering copper powder.

CODE NUMBERS:

Sulphuric acid (technical)	02 990 03
" " (pure)	02 990 01

Date: 25-7-38- R16-10-67

TESTING PHOSPHORIC ACID (REAGENT) H_3PO_4.

SUPPLIERS:

N.V.Kon.Pharmaceut.fabr. Amsterdam.
Schering Kahlbaum A.G. Belin.
E.Merck, Darmstadt.
Riedel en de Haën, Berlin-Britz.
The British drug Houses Ltd. London. a.o.

CHEMICAL COMPOSITION:

Specific gravity	min.	1,75
H_3PO_4	min.	85 %
Cl	max.	0,0005%
SO4	max.	0,003 %
Volatile constituents	max.	0,0015%
Alkali and other phosphates	max.	0,20 %
As	max.	0,0002%
Heavy metals	max.	0,001 %
Fe	max.	0,005 %

REQUIREMENTS:

Phosphoric acid (reagent) must satisfy the requirements stated under "Chemical composition"

TESTING MATERIAL RECEIVED:

An analysis must be made of every lot.

JUDGMENT:

If the sample does not come up to these requirements, a second sample must be tested. If this is condemned too, the whole lot must be rejected.

USE:

Phosphoric acid (reagent) is used a.o. in the preparation of gluten for fluorescent screens in cathode-ray tubes.

STORAGE:

Phosphoric acid (reagent) must be kept in a well-closed stoppered bottle.

CODE NUMBER:

Phosphoric acid (reagent) 02 900 28

Date: 5/4/38 R 16-10-69

TESTING AGAR-AGAR

SUPPLIER:

Brocapharm.

REQUIREMENTS:

Agar-agar is not specially tested.

USE:

Agar-agar is used in the preparation of graphite-suspension N.VII.

CODE NUMBER:

Agar-agar 02 753 05

Date: 21/2/38 R 16-10-72

EXAMINING / CETYLALCOHOL (PURISS.).

SUPPLIER:

Riedel en de Haën, Berlin - Britz.

REQUIREMENTS:

Cetylalcohol (puriss.) is not examined.

USE:

Cetylalcohol (puriss.) is used a.o. in the preparation of gluten for the application of fluorescent screens in cathode-ray tubes (R 2-14-11).

CODE NUMBER:

Cetylalcohol (puriss.) 02 752 79

Datum: 22-6-'37. R 16-11-13

TESTING SILVER NITRATE.

SUPPLIER:

Dryfhout, Amsterdam and others.

REQUIREMENTS:

Silver nitrate (purum):

Silver nitrate (purum) is not tested. If one wants to test it, however, look up some handbook, as e.g. "Standard and Tests for Reagent and C.P. Chemicals" by Benjam in L.Murray.

USE:

Silver nitrate is used a.o. in the preparation of silver marking paste.

CODE NUMBER:

Silver nitrate (purum) 02 991 55.