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Bauer

OPERATING INSTRUCTIONS

HI 170
High-Current Lamp

with automatic arc-ignition

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Operating Instructions

EUGEN BAUER GMBH STUTTGART-UNTERTÜRKHEIM

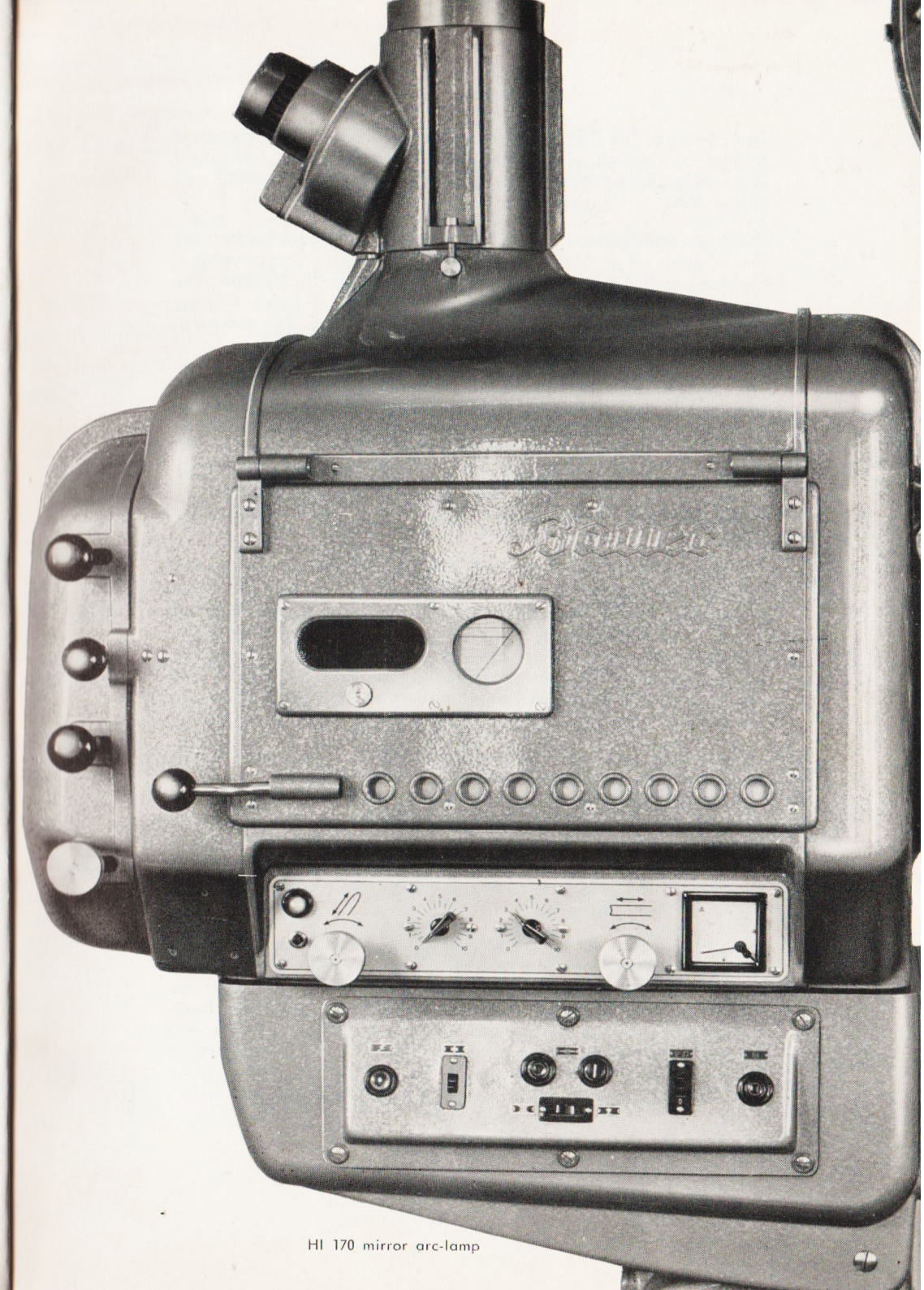
BAUER HI 170 High-Current Lamp

A. Field of Application

The BAUER HI 170 is a high-current arc-lamp, designed on the most modern lines, for burning HI carbons. Its working range lies between 160 and 180 amps on which it is capable of adequately lighting the largest of present-day screens. The lamp is particularly suitable for acommodating the giant screens of drive-in and open-air cinemas, and the large super cinemas. The specified load range of 160 to 180 amps can only be reduced by exchanging the positive carbon holder. The lamp can then be operated on 120 to 140 amps; but even so it still forms an exceptionally powerful source of light which can only be fully exploited on large-project work whereby the highest of light-currents are demanded for every size of film frame-picture. It is not possible to work below the last-mentioned load range. The BAUER HI 170 is a fully-automatic lighting unit. Arc-striking occurs automatically when the lamp switch is thrown, the carbons then returning to their correct burning position where their steady consumption is thereafter full-automatically compensated for with no further ado on the part of the projectionist. Hence the work of operating the lamp is confined to inserting the carbons and switching the DC supply on when taking the lamp into use and switching it off again afterwards. Convenient and highly reliable working coupled with the best conceivable standard of picture illumination is therewith guaranteed.

B. HI Carbons

The BAUER HI 170 is designed for the use of HI carbons (also called Beck carbons). The carbons burn in an angled position. The normal working range is 160 to 180 amps. The plus carbon rotates during operation in order to prevent sloped-crater burning at the high load currents employed. The rotation-mechanism, also, comes into play automatically when the lamp switch is thrown. The HI carbons (high-intensitiy carbons) possess certain characteristics rendering them the ideal source of light for illuminating the very largest of cinema screens.



HI 170 mirror arc-lamp

The colour of the light emitted by these carbons is nearly equal to that of daylight, i. e. pure white, and therefore suits itself in an outstanding manner for the projection of black-white and colour films.

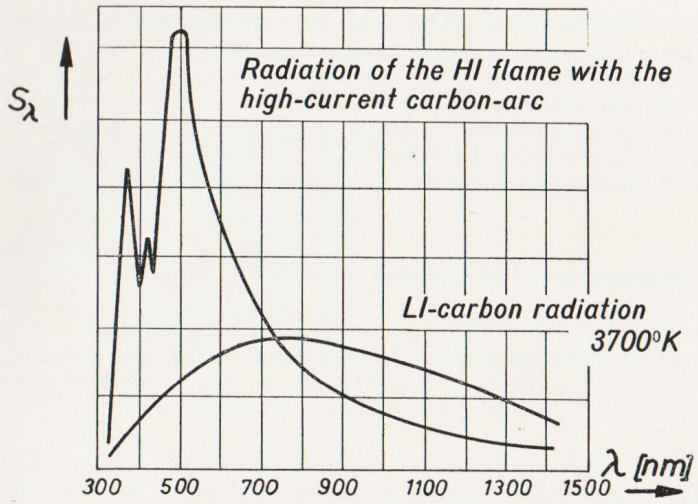
The high light-current of the HI carbon is achieved by burning the carbons at a high current-density: meaning by passing a high value of current through a small diameter of carbon. The tip of the negative carbon forms itself into a point thereby whilst a crater appears in the face of the positive. The temperature in this crater attains values up to 7000° C.

The cerium-fluoride salts in the HI carbon core volatilize at this high temperature to form a pure white sphere of incandescent gas in the crater of the positive carbon. This sphere of gas is the actual source of the light from HI carbons. Its diameter corresponds to about half that of the carbon although its density of illumination, i. e. its brightness, is a number of times (approx. 4-times) greater than that of the carbon crater itself.

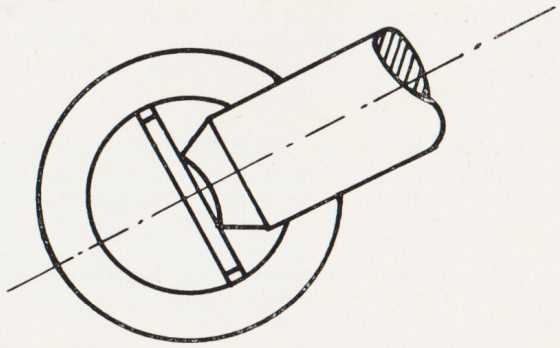
The high temperature in the crater of the HI carbon is achieved through employing a relatively high current-density. In itself this current would raise the carbon to red-heat along its entire length, and it is for this reason that the negative carbons are provided with a copper sheath forming a good conductor for the current. The positive carbons are not coppered. They rotate in the plus-carbon holder and are fed current over two silver jaws at the forward end of the carbon.

For working efficiently with HI carbons it is necessary to be aware of their operational characteristics. The carbon manufacturer prescribes a certain load range for each HI-carbon pairing. The pair of HI carbons prescribed for the HI 170: negative, 12 or 13 mm ⌀: positive, 13.6 mm ⌀, can take a load current of from 160 to 180 amps. In this case it is best to work with a current of 165 amps, whereby the light-arc voltage must lie between 75 and 80 volts.

With HI carbons it is just not possible to obtain the same rate of consumption for both positive and negative carbon, the former always burning away considerably faster than the latter. The HI 170 hence possesses a separate regulable feed-device for each carbon so that the crater always remains exactly the same distance from the mirror in spite of the difference in the individual burning-rates of the two carbons. This factor is of special importance for a constant and uniform light-cover-



Spectral-energy distribution in carbon-arcs



Position of slit-diphragm relative to plus-carbon image

age of the screen. A measure of the varying speeds of consumption of plus and minus carbons on HI-carbon working is the so-called burning-ratio, which is understood to mean the ratio of the speed of consumption of the negative carbon to that of the positive. For example: should the burning-ratio of an HI-carbon pairing be given as 1:3, it implies that the plus carbon burns away three times as quickly as the minus carbon.

C. Measurement of Illumination Intensity

It is considered a satisfactory standard of illumination in the cinema when the brightness of the screen, i. e. the light reflected back into the auditorium from the screen, has a value of over 9 foot lamberts (ft-lamb.) measured at screen centre.

The value of screen-brilliance depends firstly upon the intensity of the screen illumination (i. e. of the light projected onto the screen by the projector), and secondly upon the amount of light reflected back by the screen into the auditorium. The spectator sees only that part of the light which the screen reflects back. A simple relationship exists between screen illumination-intensity (light projected onto the screen, measured in ft-candles), screen brilliance (reflected light, measured in ft.-lamberts), and the screen reflection-factor. This relationship is

reflected light in ft. lamb.
= illumination intensity in ft. cand. × screen reflection-factor.

Now the arc-lamp must be so adjusted that the value of the light reflected from the screen centre to any seat in the hall is in excess of 9 ft. lamberts, with an edge fall-off of not more than 25%.

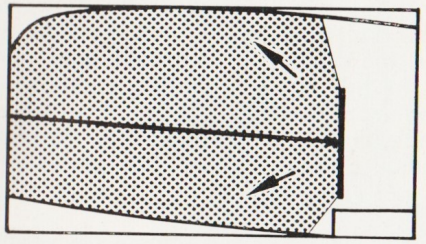
The numerical value of this reflected light is determined by measuring the illumination intensity in ft. candles with a photometer, and then multiplying the meter reading by the reflection-factor.

For new screens this reflection-factor approximates to the following:

Sonora-Supra	0.9
Sonora-Plastic	0.9
Schumann-Ideal	0.9
Sonora-Extra	2.5 (for centre rows of seats only!)

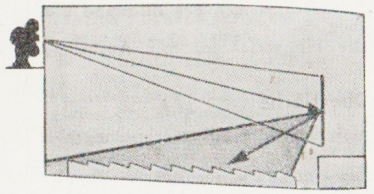
Diffusion-Angle of different types of screens

(Cross-sections through length of cinema)



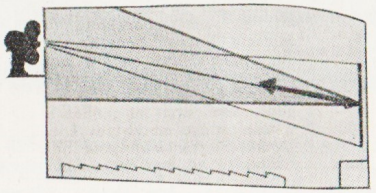
White plastic screen

diffuse reflection



Metallised screen

directed reflection:
Incident angle equals reflected angle



Beaded screen

preferential directed reflection in direction of incident beam

Sonora-Silver	1.6
Harkness-Perlux	1.4—2.5
Miracle-Mirror-Screen	1.7

The numerical values over 1 indicate that these screens have a very high reflection-factor but possess at the same time a small scatter-angle: that is, the amount of reflected light observed from the centre of the hall appears much greater than that apparent when viewed from the side. The most suitable type of screen for a cinema can only be decided after careful consideration of the individual characteristics of the particular cinema concerned.

Once the light reflection-factor has been established (its value will be appropriately smaller for older screens, owing to surface discoloration), the value of reflected light in ft. lamberts can be calculated from the measured value in ft. candles of the illumination intensity.

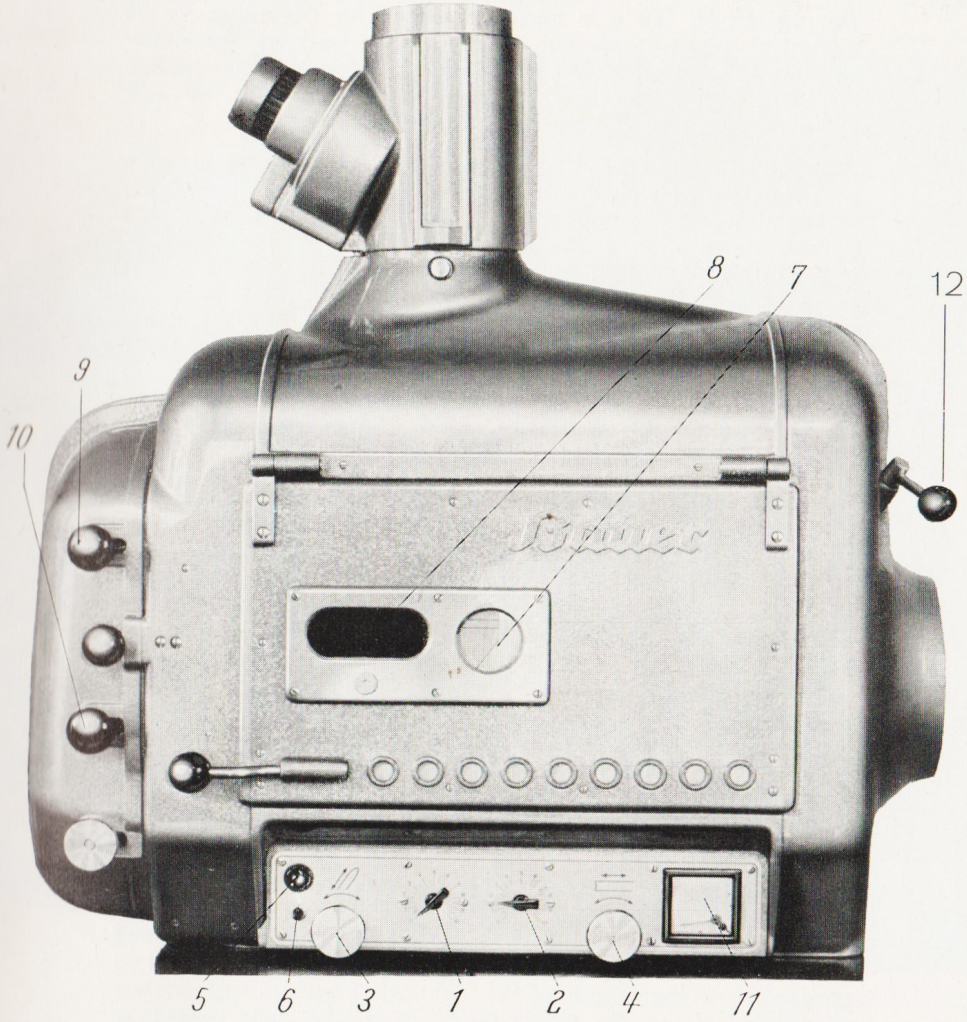
Example: Photometer reading in ft. candles = 13. Screen: Sonora-Plastic. Resulting light-reflection 13 × 0.9 = 11.7 ft. lamberts. The value of the light reflected lies, therefore, within the stipulated limits.

In addition to the centre-screen brightness the brightness of the screen borders must also receive consideration. This value must not be less than 75% of the centre-screen brightness. The particular value of the edge-brilliance can be calculated in the same way as before — by using a photometer to measure the illumination value in ft. candles at the borders of the screen, and then multiplying the reading by the reflection-factor.

Should the value of screen brightness be too low, the picture reproduction in the cinema will be unsatisfactory. The projected picture will appear flat and dull, and in the case of colour films the colour values will be reproduced out of correct proportion. Conversely, too high a screen brilliance will not necessarily result in better pictures as it may lead to noticeable flickering from the lighter elements in the screened picture.

Should it be required to go above a screen-brightness value of 13 ft-lamberts to compensate for a particularly dark print, the ultimate permissible limit can be taken to be that value of screen brightness attained without flicker becoming noticeable in the lighter parts of the picture (sky, snow etc.).

HI 170 Operating side



1. Potentiometer for minus carbon
2. Potentiometer for plus carbon
3. Manual control for minus carbon
4. Manual control for plus carbon
5. Indicator lamp for plus carbon feed
6. Switch for water pump and ventilator motor
7. Crater-image screen for checking carbon positioning
8. Observation glass
9. Knob for vertical mirror-adjustment
10. Knob for horizontal mirror-adjustment
11. Ammeter.
12. Handle for operating cut-off dowser

D. Technical Description of the BAUER HI 170

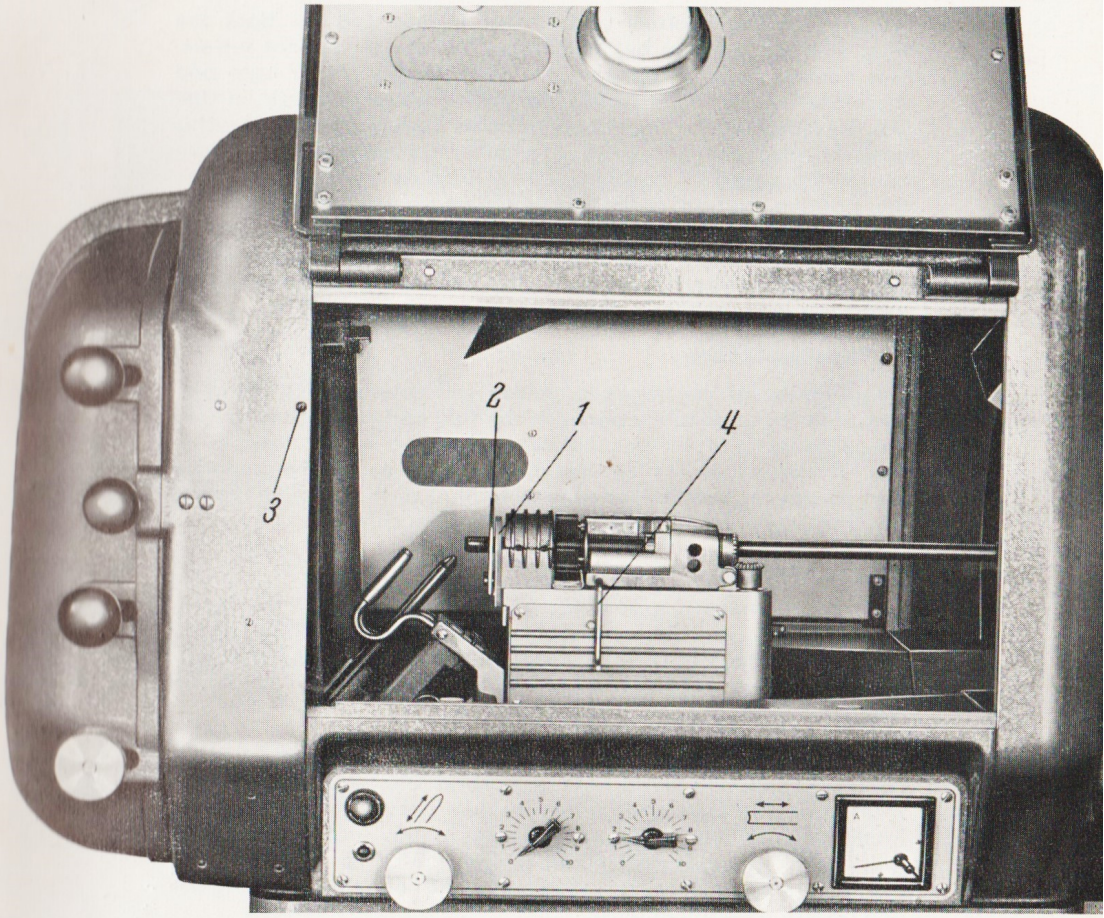
The BAUER HI 170 is a mirror arc-lamp for operating at the highest of load-currents with angled-carbon working. The mirror with an 18" diameter and the BAUER condenser-lenses endow the lamp with unusually high light-output and ensure optimum exploitation of the light-current from the HI carbon.

With the HI 170 the arc-striking process follows full-automatically with the throwing of the lamp switch. The direct-current flows through an electro-magnet which operates a rack-and-pinion device, the rotation of the pinion causing the negative carbon to slide upwards until it contacts the positive. As soon as current flows through the carbons a relay breaks the electric circuit of the striking-magnet. Its coil is thus deprived of current and the negative carbon allowed to return to its starting position once more. The light-arc is now burning and is maintained at an ever-constant lenght and in correct position by the automatic feed control. By this means any subsequent manual adjustment of the carbons is rendered superfluous.

Economic working, owing to high light-exploitation coupled with reasonable carbon consumption costs, is guaranteed by the HI 170 because of its facility of being able to take long carbons. Positive carbons up to a length of 500 mm and negatives up to a length of 230 mm can be inserted. The design of the positive carbon holder makes re-setting of the carbon unnecessary. From the time it is initially clamped in until the final stump has ceased to burn, the positive carbon can be fed, without interruption, over a free burning-length of 420 mm. Hence the need for re-carboning is eliminated even with the more lengthly reels of film. A stop-rest for the negative carbon automatically sets its correct working position when this carbon is being inserted, so that its correct distance from the positive carbon prescribed for automatic operation is obtained.

Two potentiometers on the control panel of the lamp serve to adjust the range of control of the feed mechanism. The right-hand potentiometer regulates the speed of feed of the positive carbon and the left-hand one the distance between the two carbons, i. e. the length of the light-arc. These potentiometers should be set to the approximate centre of their respective scales when the lamp is taken into use for the first time. If at the start one works at either extremity of the range of control one has no opportunity later on of re-regulating the controls to suit the operating characteristics of the particular carbons being employed.

HI 170 Operating-side opened



1. Magnetic plate
2. Heat insulating plate
3. Press-button switch for illuminating lamphouse interiour
4. Clamp lever

The fully-automatic feed control of both carbons operates on the following principle:

1. Positive Carbon

As soon as the positive carbon has burned too far back the light emitted laterally by the carbon falls on an optical system. This control optic only takes in a very narrow slit of light and therefore reacts immediately to the slightest change in the positive carbon. The light from the plus carbon taken in by this optic is then passed on to a photo-resistance which in turn causes the speed of carbon feed to increase until such time as the positive carbon crater has once more reached its correct position. The coming into effect of this regulating process is indicated by the glowing of a small green indicator lamp which will light up at regular intervals when the setting of the potentiometer has been properly adjusted.

2. Negative Carbon

Consumption of the negative carbon will automatically be compensated if the distance between the two carbons increases and hence causes the voltage between plus and minus carbons to rise. A special device ensures that regulation of the negative carbon can only come into play when that of the positive carbon is not taking place and the latter is standing still.

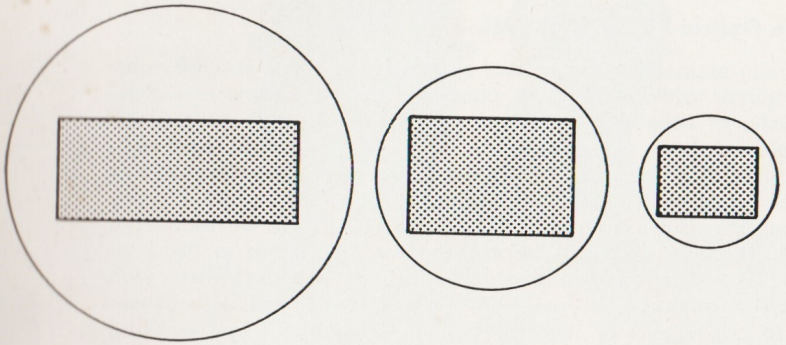
3. Lamphouse

An inspection lamp, providing good illumination of the lamphouse interior, switches on automatically whenever either of the lamphouse doors is opened. Press-button switches for this purpose have been mounted on either side of the rear lamphouse wall.

In its standard form as a model for the 35 mm film the BAUER HI 170 is supplied fitted with a positive condenser-lens in the front wall. The lens is mounted, insulated from heat, in ceramic holding blocks set firmly in position in this wall. Only when going over to a different width of film (55 or 70 mm) does the positive lens have to be exchanged for either a plane-glass one or else a negative lense.

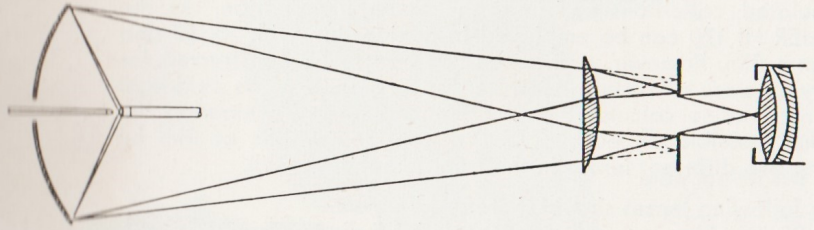
A turbo ventilator is built into the lamphouse chimney. It serves to draw off the hot air above the crater and behind the mirror, and to direct the arc-flame away from the mirror. This ventilator is not a substitute for the normal exhaust-fan arrangement mounted in the lamphouse flues. Provision must be made when the lamp is installed to ensure that, quite independent of the

Frame-areas of different widths of film



70 mm 55 mm 35 mm

Condenser-Lenses



Operating principle of a BAUER condenser-lens

– . – . – . – Path of light rays without lens. Crater image too large (Light loss).

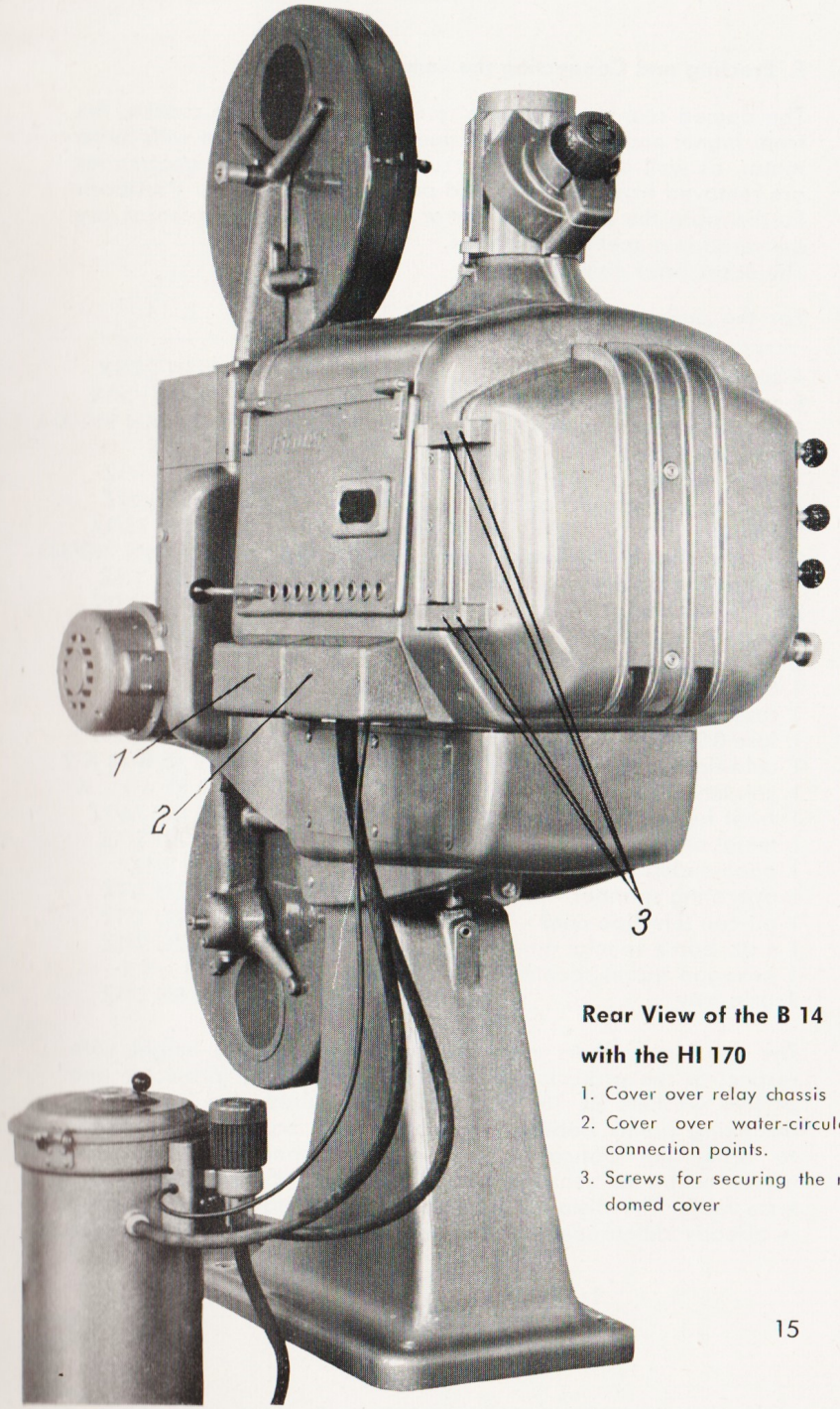
——— Path of light rays with condenser-lens. Correct size of image on rear of aperture plate.

turbo ventilator, particularly good up-draught conditions are present in the lamp chimney and flues.

E. The Optical System of the Mirror Arc-Lamp

The main element in the optical system is the large BAUER cold-light mirror with an 18"⌀. It possesses the very attractive characteristic of reflecting only that part of the energy emitted by the plus carbon exploitable as light for projection purposes, whilst allowing the remaining ray-components comprising above all the heat rays to pass unhindered through its manifold array of coatings. Thus, in spite of the high current load of the HI 170 in use, the film does not become excessively warm in the projector. The previously unavoidable use of a water-filter, with its accompanying light-loss, with high-current lamps is in consequence not necessary with this mirror arc-lamp. When working in conjunction with a modern BAUER cone-shutter projector one can even do without water cooling. The built-in air cooling system in the BAUER projectors, fed over the separate BAUER air blower, is fully adequate for providing sufficient cooling of the film even with the highest of light-currents. The fore-going gives an idea of the convincing effect of the cold-light mirror! The function of the cold-light mirror is to throw an enlarged image of the spherically-formed incandescent gases in the positive carbon crater — the actual source of light — onto the rear of the aperture plate. This image must be large enough to provide uniform illumination of the aperture. Too small a circle of light would lead to dark corners on the screen-picture, whilst too large an image would be accompanied by a reduction in light output. There is one, and only one, certain size of crater image which permits maximum utilisation of the light from the carbon-arc and which conforms at the same time to the stipulated conditions for uniform screen illumination. As the BAUER HI 170 can be employed in conjunction with 35, 55 and 70 mm film, however, and hence has had to be constructed for varying sizes of picture-aperture, the curvature of its cold-light mirror was so calculated that optimum screen illumination becomes possible on each of the present-day widths of film by using two different lenses in the front lamphouse wall.

The following lenses should therefore be used
for 35 mm film: a condenser-lens with 1.5 dioptre and 180 mm ⌀ (BL 10 RF 6/3 ×)
for 55 mm film: a plane-glass of 180 mm ⌀, and
for 70 mm film: a condenser-lens with —1.5 dioptre and 180 mm ⌀.



Rear View of the B 14 with the HI 170

1. Cover over relay chassis
2. Cover over water-circulator connection points.
3. Screws for securing the rear domed cover

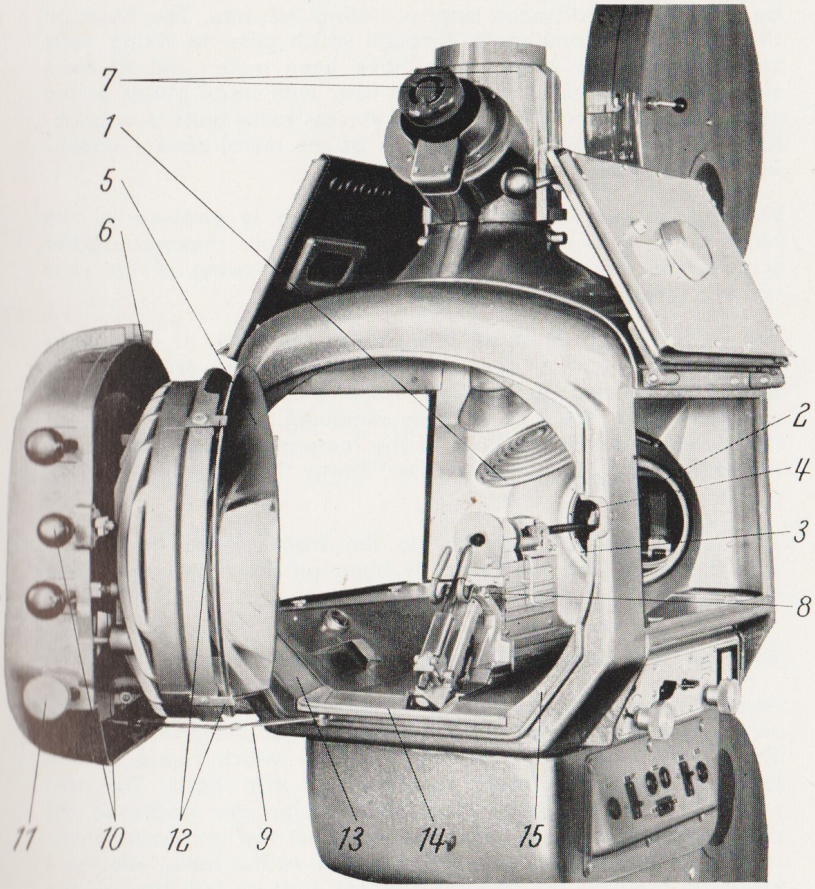
F. Erecting and Connecting the Lamp

The domed rear cover of the lamphouse, the relay chassis, the front funnel and drip-tray, the flue connecting section with turbo motor, as well as the water circulator and the usual accessories are removed from the lamp and packed separately for transport. Furthermore the projection mirror and the condenser-lenses are delivered in a special small box.
The accessories consist of:

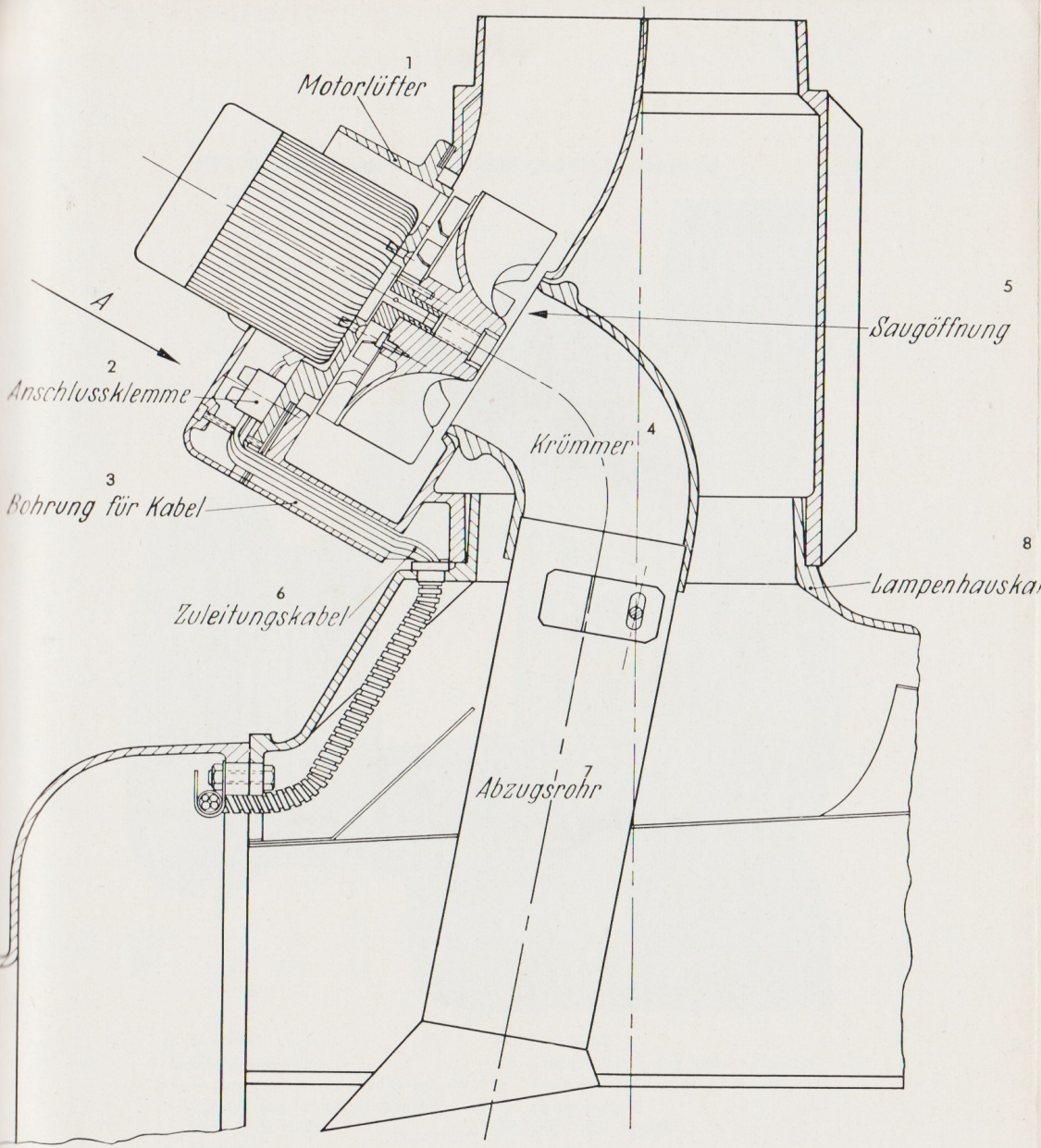
For the projectors	B 12	B 14
4 spacing plates	—	BL 10 PT 22/1X
8 spacing washers	BL 10 MS 11/IX	BL 10 MS 11/1X
4 hexagon-socket screws	M 8x20 DIN 912/314	M 8x20 DIN 912/314
4 spacing plates	LAPT 5/IX	LAPT 5/1X
1 relay chassis	BL 10 CH 1/1Z	BL 10 CH 1/1Z
1 flue connecting section	BL 10 GE 6/1Z	BL 10 GE 6/1Z
1 elbow	BL 10 MF 75/1X	BL 10 MF 75/1X
2 hexagon-socket screws	M 8x45 DIN 912/833	M 8x45 DIN 912/833
1 water circulator	BL 10 BH 1/1Z	BL 10 BH 1/1Z
2 arc-lamp cables	BL 10 KA 11/2Z	BL 10 KA 11/1Z
1 connecting cable	IBKA 12/1Z	IBKA 12/1Z
2 heat-insulating plates	BL 10 PT 21/1X	BL 10 PT 21/1X
1 fuse 6-A	S-W/19202/6	S-W/19202/6
1 fuse 2-A	S-W/19202/2	S-W/19202/2
1 fuse 0.02-A	S-W19200/0,02	S-W/19200/0,02
1 cold-light mirror 18" ϕ	HAW 45 B 14 K 2	HAW 45 B 14 K 2
1 condenser-lens	BL 10 RF 6/1 . . X	BL 10 RF 6/1 . . X
1 front funnel	BL 10 MF 73/1Z	BL 10 MF 74/1Z
1 metal brush	BL 10 ZU 3/1Z	BL 10 ZU 3/1Z
1 open-ended spanner	MAZU 2/1X	MAZU 2/1X
1 operating spanner	BL 10 ZU 4/1X	BL 10 ZU 4/1X
1 oil-can (ejection-can)	BL 10 ZU 1/1Z	BL 10 ZU 1/1Z
1 4 oz. bottle special oil	BL 10 ZU 2/1Z	BL 10 ZU 2/1Z
1 hexagon socket-spanner	MBZU 1/3 X	MBZU 1/3 X
1 drip-tray	BL 10 BH 3/1Z	BL 10 BH 3/1Z

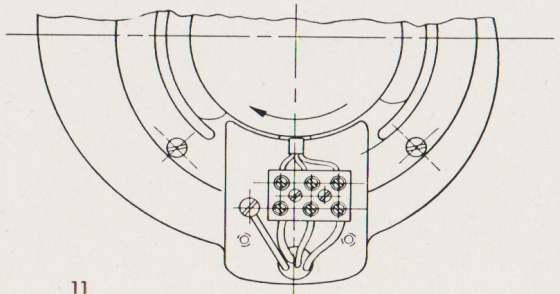
The spacing washers raise the lamp to the right height with respect to the projector. In the case of the B 12 projector one or two washers BL 10 MS 11/ X, as required, are inserted at the fixing points between lamphouse and base table in order to bring the optical axis i. e. the connecting line from mirror centre to centre of projection lens, 256 mm above the base table. The distance from mirror crown to picture aperture is already determined by the positions of the fixing-bolt holes

HI 170 Lamphouse – Rear-Wall and Doors opened

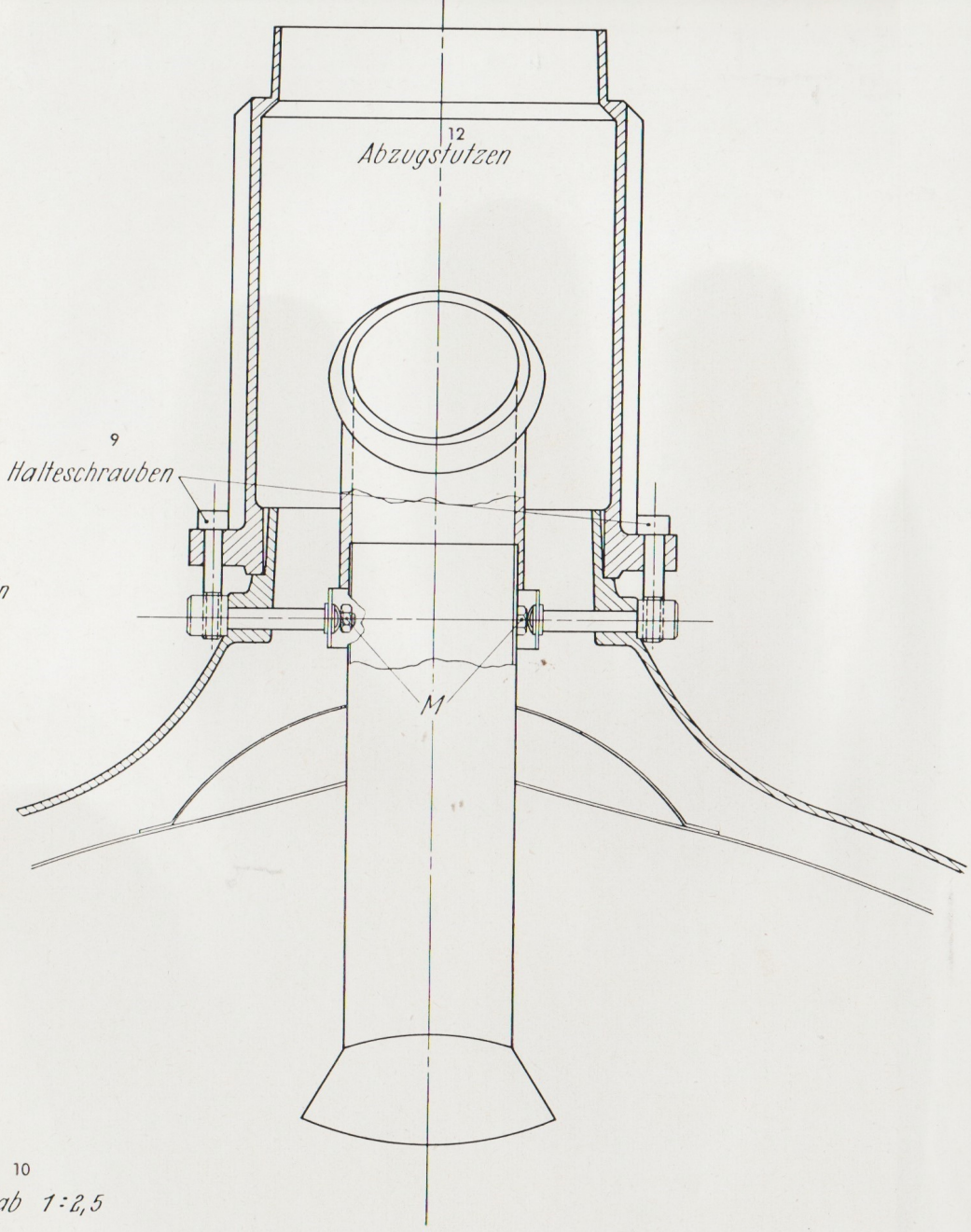


1. Dowser
2. Condenser-lens
3. Ceramic blocks for condenser-lens
4. Spring ring for condenser-lens
5. Projection mirror
6. Domed rear cover
7. Flue connecting section with vent. motor
8. Place for drip-tray
9. Hinge-rail
10. Catch for opening lamp rear-wall
11. Knob for moving mirror along axis of projection
12. Clips with springs
13. Cover plate
14. Base tray
15. Fixing screws for cover plate





Ansicht in Pfeilrichtung „A", ohne Kappe



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Maßstab 1:2,5

Diagram illustrating Assembly of Flue Connecting Section
with ventilator motor

1 Ventilator motor
2 Terminal block
3 Bore for leads
4 Elbow
5 Suction opening
6 Supply leads
7 Flue pipe
8 Lamphouse chimney
9 Securing bolts
10 Scale 1:2.5
11 View in direction ot arrow "A", without cap
12 Flue connection piece

in the lamphouse floor and in the base table. Should the lamp be used with a projector of a different make, attention must be paid to this distance approximating 960 mm. The holes in the base of the lamphouse, through which pass the fixing bolts securing it to the base table, have been milled out to form slots. These slots must be covered over with small plates at the same time as the bolts are inserted. Access to the bolts is only obtained after removing both halves of the metal covers screening the lamphouse floor (ill. on p .19).

The domed rear cover of the lamphouse is screwed to the hinge-parts provided (ill. p. 15), with four hexagon-socket screws. The hinge-rail limiting the outward swing of the rear cover is screwed on below (ill. p. 17).

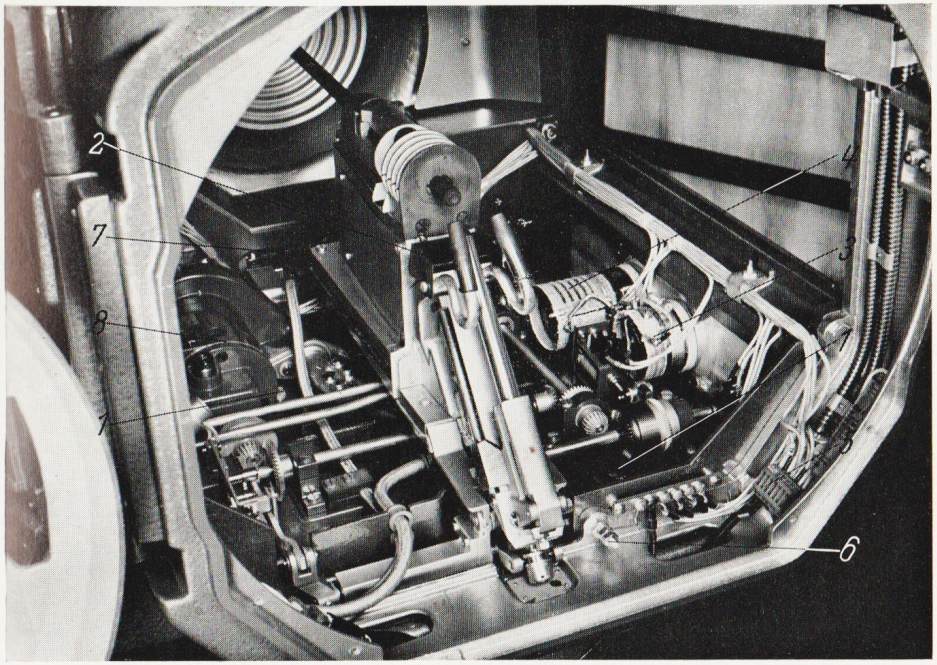
The relay chassis must be screwed to the back of the lamphouse with 3 screws. The electrical connections are made by means of block-contact plugs when the chassis is slid into position (ill. p. 27). This involves removing the cover plate at the forward end of the back of the lamphouse and then screwing it back in place again after fitting the relay chassis (ill. p. 27).

The funnel must be screwed to the front of the lamphouse with 3 screws, and the drip-tray hung on the negative carbon holder.

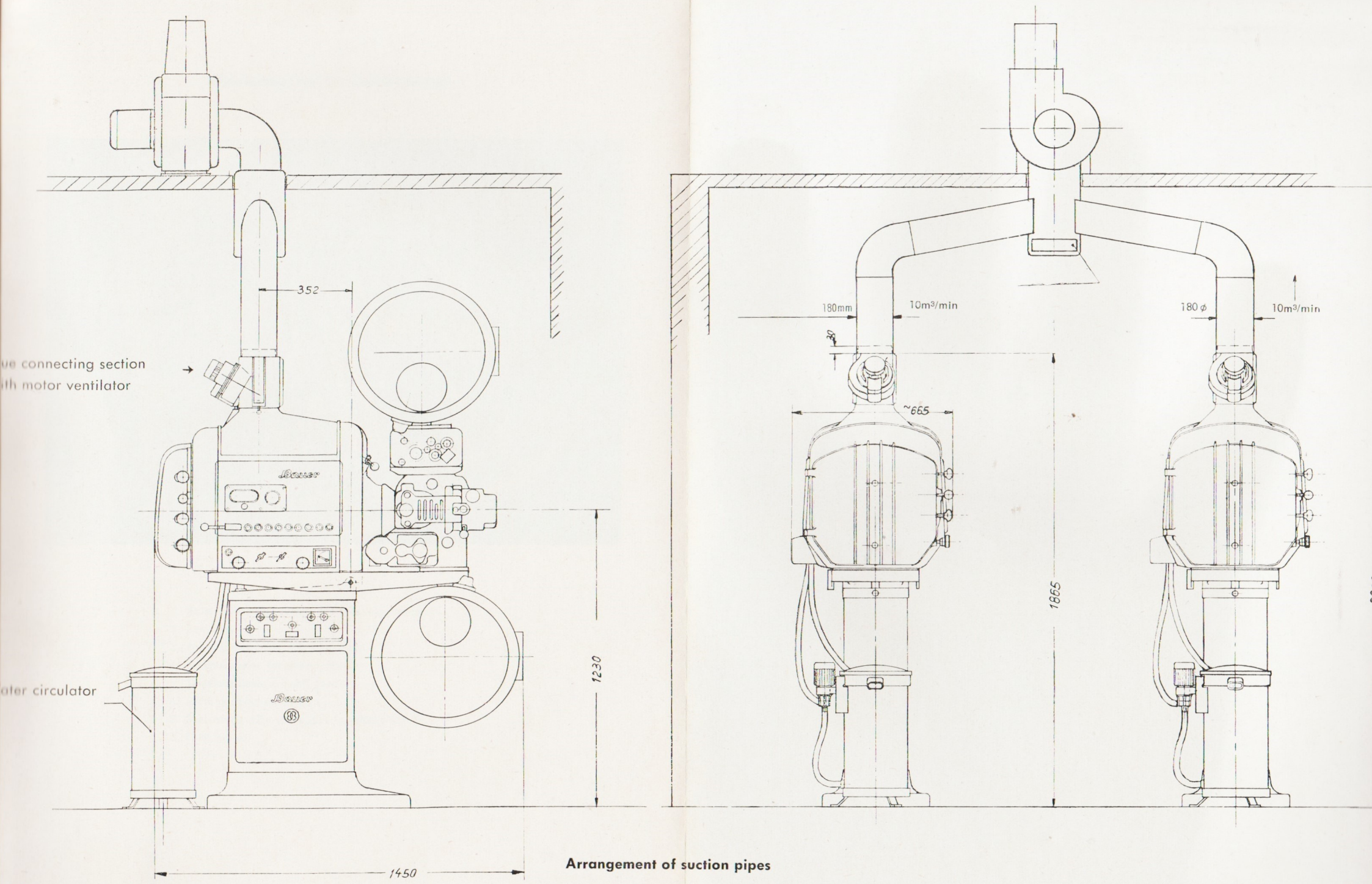
The Flue Connecting Section and the Ventilator Motor

Assembly should be carried out in accordance with the diagram on the facing-page and with the aid of the following instructions: The elbow is placed over the flue-pipe which hangs in the lamphouse roof chimney, supported by two bolts. The two nuts (M) in the angle brackets of this pipe are slackened off and the flue connecting section placed over the lamphouse chimney in the manner shown in the diagram. At the same time the 4 electrical leads to the ventilator motor must be led through the bore in the flue connecting section to the terminal block. Care must be taken to see that the upper part of the elbow comes to rest in the suction-opening of the motor. The flue connecting section is now secured in position with the two retaining bolts. Finally the flue pipe is pushed upwards from the interior of the lamp so that the attached elbow is right inside the suction-opening, the pipe taking up the direction shown in the diagram (over the crater). In conclusion the two nuts (M) are screwed tight and the ventilator motor connected to a 220 V≈ supply. The

Connections for the Current Supply I



1. Bolts with cover-plates for securing arc-lamp
2. Drip-tray
3. Potentiometer for minus carbon
4. Potentiometer for plus carbon
5. Terminal block for AC leads
6. Earth-connection screw
7. Resistance with moveable tapping-clips
8. Feed motor



Arrangement of suction pipes

ends of the cables led through, as well as their terminal-block connections are supplied with corresponding markings. The motor must revolve in the direction indicated in the plan.

The main flue pipe is placed over the circular top of the flue connecting section which is arranged to take 180 mm stove-piping (hitherto 120 mm ⌀). It has proved very practical to insert a length of flexible stove-piping directly above the flue connecting section: one then has the opportunity of shifting the position of the projector a little when lining it up to the screen. The main booth-flues should be so disposed that with the installation of two projectors the up-draught in each lamp is as balanced as possible.

Apart from the ventilator motor situated in the flue connecting section, further ventilators mounted inside the main flues are an absolute necessity when working on such heavy load-currents. These fans may be installed in the flues inside the projection room, although it is better to position them outside near the flue outlets. Care must be taken to ensure that neither condensation nor rain-water can penetrate into the lamp. In the case of a flue-pipe common to both lamps the ventilator-fan must have an exhaust capacity of 700 cub. ft./min., whilst with separate flues each fan must exhaust 350 cub. ft./min.

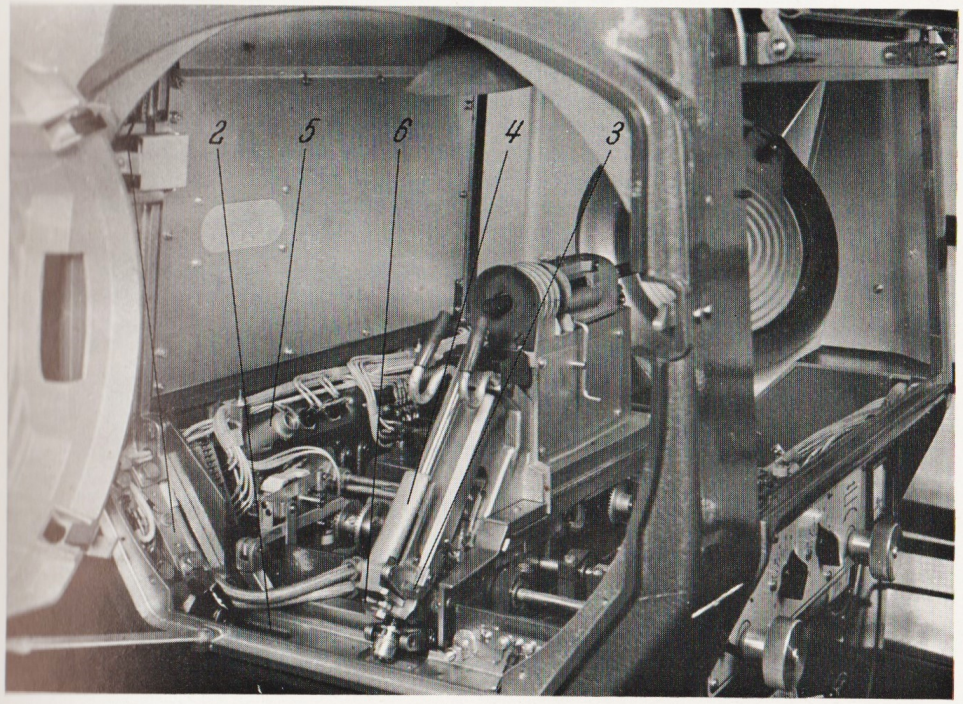
Under no circumstances may the HI 170 be operated with normal rear-silvered mirrors. Only with a cold-light mirror can it be guaranteed that the high load-current will exercise no damaging effects upon the film.

Inserting the Optical Components

1. Inserting the projection mirror: This entails opening the domed rear cover and swinging it to one side. The fitting is designed to take 18" ⌀ mirrors only, whereby American as well as German mirrors can be employed.

   The parts for securing the mirror in position, 4 clips with springs, are screwed on to the mirror fitting with retaining screws. The two lower fixing components are screwed tight from outside using normal-headed screws. The two upper fixing components are placed over the free threaded ends of the two screws screwed through from inside, and tightened up with knurled nuts.
   The parts for holding the mirror had hitherto to be screwed onto the threads lying more towards the rear of the mirror fitting when German mirros were used, in order that these mirrors would be held at the correct distance of 170 mm from

Connections for Current Supply II



1. DC connecting points
2. Slot for leading cables through
3. Clamp lever
4. Clamp jaw
5. Optic for controlling positive carbon
6. Stop-rest for negative carbon

the crater. The forward threads were employed for holding American mirrors because these have a 160 mm crater-distance as well as a different curvature radius. Today only one method of securing the mirror is available, and for American mirrors the 3 holding bolts upon which the mirror fitting moves should be set forward a matter of about 15 mm in the direction of projection. When inserting either make of mirror the lower cut-out in the perimeter must lie centrally between the two springs. For mirror-exchange the two lower screws and clips remain screwed tight, the two upper nuts being slackened off and the clips pivoted round to the rear so that the mirror can easily be lifted out (ill. p. 17).

2. The accompanying condenser-lens is placed in the three steatite retaining blocks accommodated in the funnelled part of the lamphouse front. The condenser-lens is held in position with the spring ring.

3. The mirror fitting should not be moved right back during operation otherwise the heavy concentration of the light-rays could seriously damage the condenser-lens.

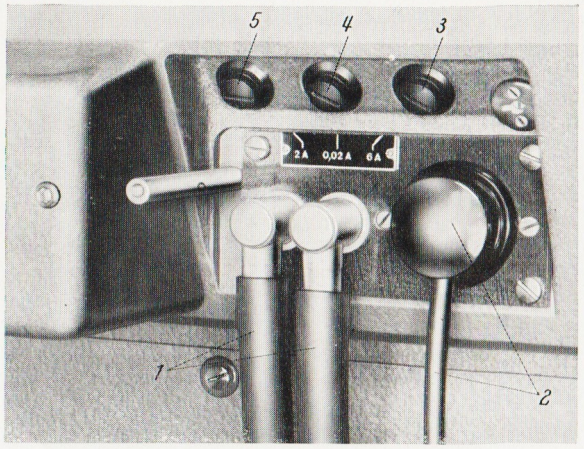
Connecting the Current Supplies

1. The DC cables from the rectifier are led through the slot in the base of the lamp and connected to the two DC terminals. Take care here! Positive lead must go to positive terminal and negative to negative terminal. Reversed connection can give rise to the danger of certain parts of the lamp being damaged.

   The terminal points for current connection are screened over with shaped metal covers. The domed rear door is opened by lifting the centre black knob and the middle cover, in the shape of the base tray for catching carbon and copper particles etc., is then removed. This is followed by the removal of the two sloped covers lying at each side, each of which is secured in place with one screw. These screws need only one turn to release them, after which the two plates can be lifted up and out (ill. p. 17). The DC connecting points lie beneath the left-hand plate, the AC connecting points beneath the right (ill. p. 21).

2. The AC leads are connected to the first two terminal points on the connecting block. The terminals for phase and neutral respectively are marked as such and must not be interchanged. The earth connection goes to the bolt lying at the

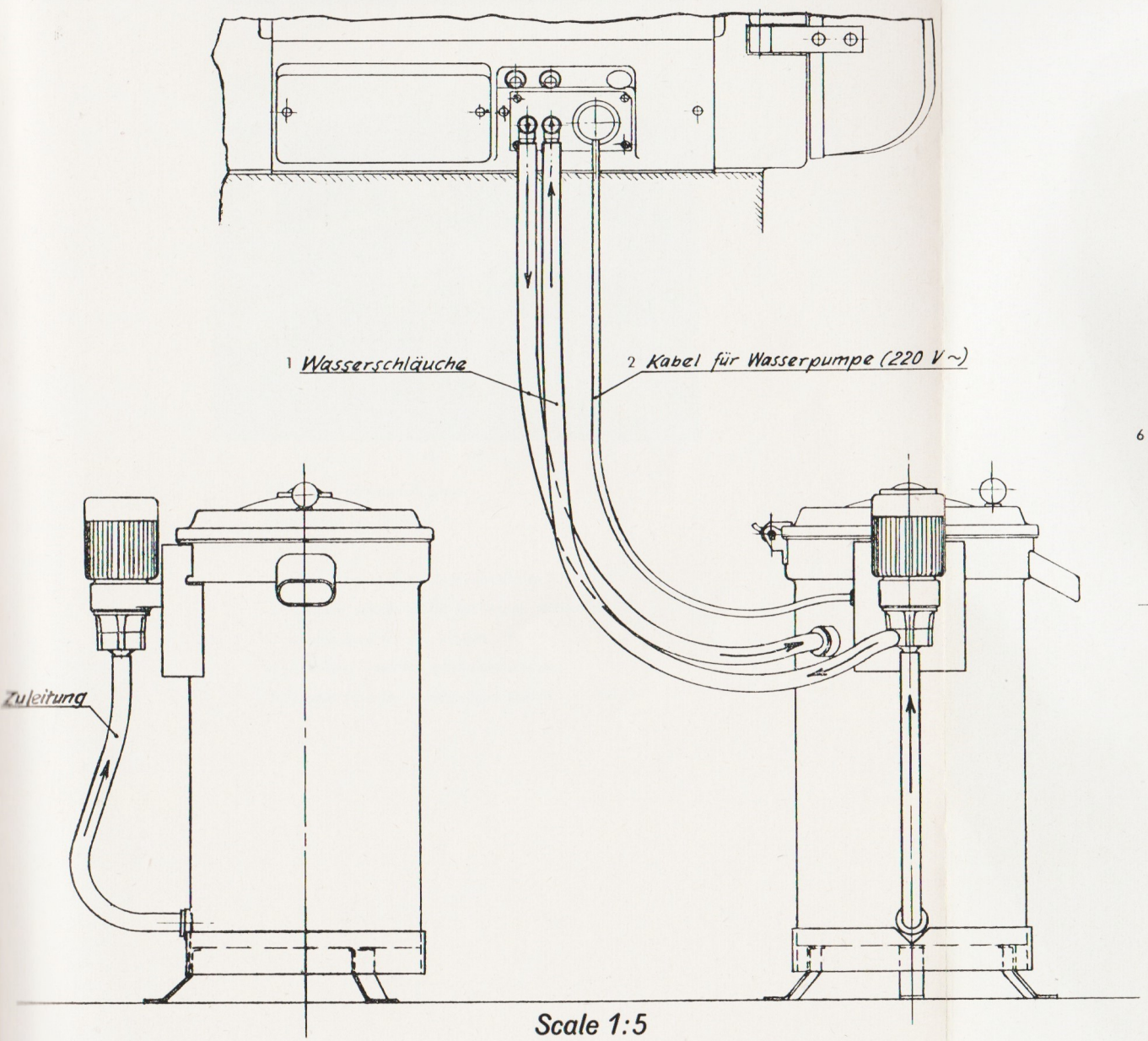
Connection of the Water Circulator to the Lamp



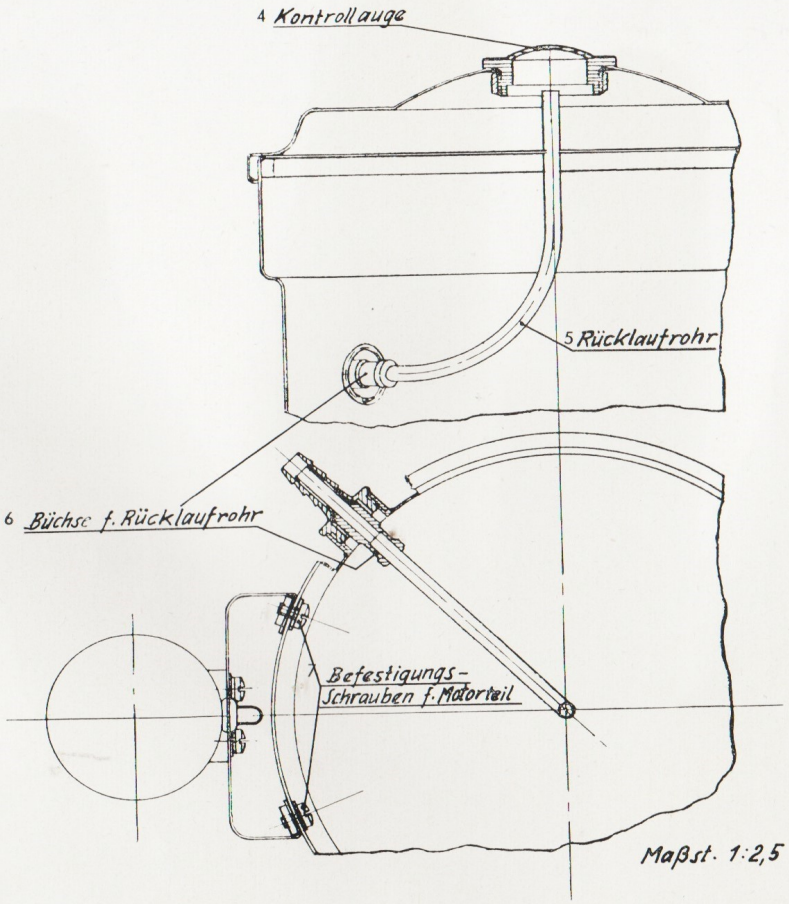
↓ ↑

Direction of flow of water
(indicated by arrows)

1. Water hoses for water circulator
2. Current supply-point for water circulator
3. 6-amp fuse for AC circuit
4. 0.02-amp fuse for photo-resistance
5. 2-amp fuse for carbon-feed motor



Scale 1:5



Maßst. 1:2,5

Connection of Water-Circulator

1 Water hoses
2 Cable for water pump
3 Water hose
4 Control eye
5 Return – flow pipe
6 Bushing for return – flow pipe
7 Bolts for motor part

left below the brass rail. After this the covers are screwed tight in position once more and the base tray replaced (ill. p. 19).

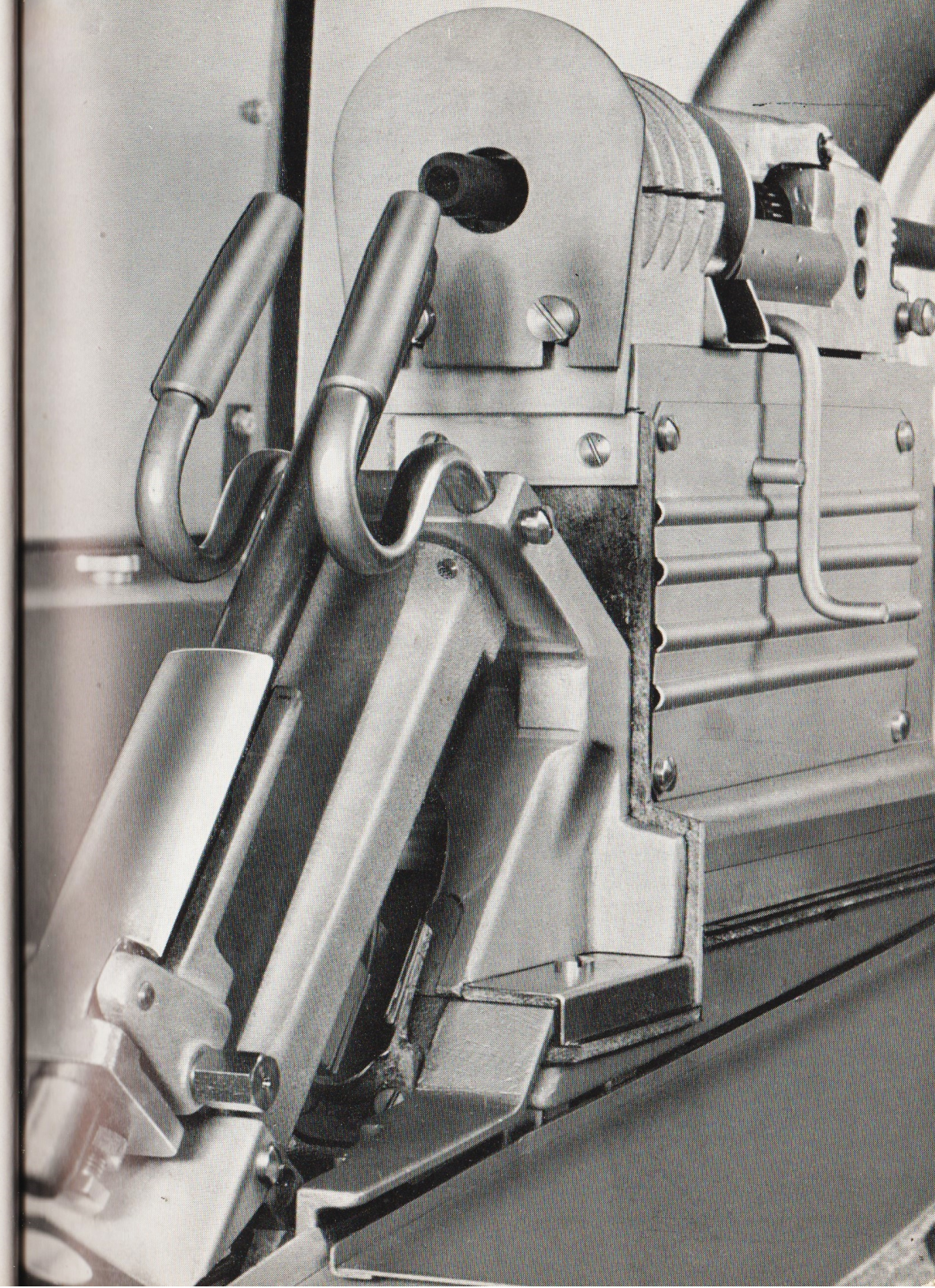
Connecting the Water Circulator

The water circulator is erected behind the projector in the manner shown in the accompanying sketch. The motor unit and the return-flow pipe must first be fixed on the circulator. This is done by removing the two fixing screws on the motor unit and screwing them right home through the two bores in the upper rim of the circulator. The lead-in hose for the water pump is pushed over the nipple lying below. The return-pipe is pushed into the socket as far as it will go, being inserted in such a way that its upper end lies in the centre of the control-eye mounted in the top cover. The two water hoses are slid over the two coupling nipples on the rear of the lamp. Furthermore the 3-point plug attached to the end of the supply cable leading to the water pump must be plugged into the earthed socket providing 220 V ≈. The water container should be filled to the level of the sloped shoulder below the overflow. The bag containing Microphos, an agent which prevents rust-formation as well as calcium deposit in the water pipes, is hung inside the water container on the branch-pipe for the return-flow hose. The contents of the bag (ca. 2 ozs.) lasts for more than a year if the water is changed daily.

The switch for the water pump, situated on the lamphouse control panel, can now be operated. If the water pump does not start working right away, the hose coming from the water pump should be removed at its lamphouse end and held downwards until it becomes filled with water, when it can be replaced over the coupling nipple on the lamphouse. The lid of the water container remains shut. The return-flow of the water and with it the functioning of the water pump can be kept under supervision through the control-eye in the lid. The level of the water must be checked daily.

G. The Source of D.C.

Sources of direct-current suitable for feeding the HI 170 are regulable rectifiers, of the continuous-working type, having an off-load voltage of at least 90 to 120 volts. Although it is possible to alter the off-load voltage and operating characteristic of no-loss regulable rectifiers, such adjustments demand fairly wide experience in this field and consequently it is best to allow a technician to carry them out.



The proper adjustment of a no-loss regulable rectifier is achieved when not only the value of the output load-current is corresponding to the values given in the carbon lists, but above all when the light-arc voltage (measured with a voltmeter across the main input terminals in the lamphouse) assumes the correct value.

H. Working with the HI 170

Inserting the Carbons

Wind the negative carbon holder right back and slide the carbon into the slanting carbon holder as far as it will go. The clamp lever, which can be tightened up with the open-ended spanner supplied, is then used to exert pressure on the upper clamp-jaw and thus clamp the negative carbon in position. The spanner has a bored-out shaft so that it can be placed over the positive-carbon clamp lever and used as a handle when clamping this carbon (ill. pp. 21 and 25).

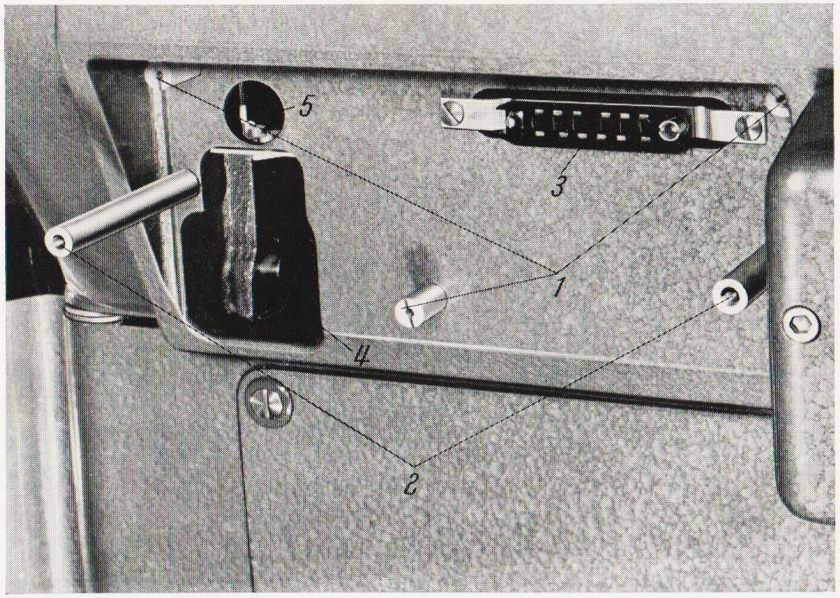
The positive carbon is slid into its holder from the rear. The clamp lever on the carbon holder must be set to its horizontal position in the direction of projection for this. The tip of the carbon should protrude 1" in front of the heat-shield plate. This plate is composed of non-magnetic, ignition-proof steel (Antitherm) and is enclosed with the accessories. It is inserted between the two special-pattern screws. The clamp lever for the positive carbon is then returned to its stop position. The tip of the minus carbon should evidence a separation of about 5/8" from the tip of the positive; both plus and minus carbons are then in the right position to enable the automatic arc-striking process to take place. The cut-off dowser in the front lamphouse wall is then closed with its operating lever and the negative carbon checked for free movement, i. e. the spindle is shifted by hand in the direction of striking. Whenever necessary the carbon holder should be freed of any particles of carbon or copper likely to cause jamming. A careful check here will ensure faultless automatic striking always obtained (ill. p. 11).

The lamphouse doors as well as the domed rear door should now be closed and **the exhaust-fan for the projection room set in motion** before the lamp is taken into operation.

Regulating the Feed-Automatic

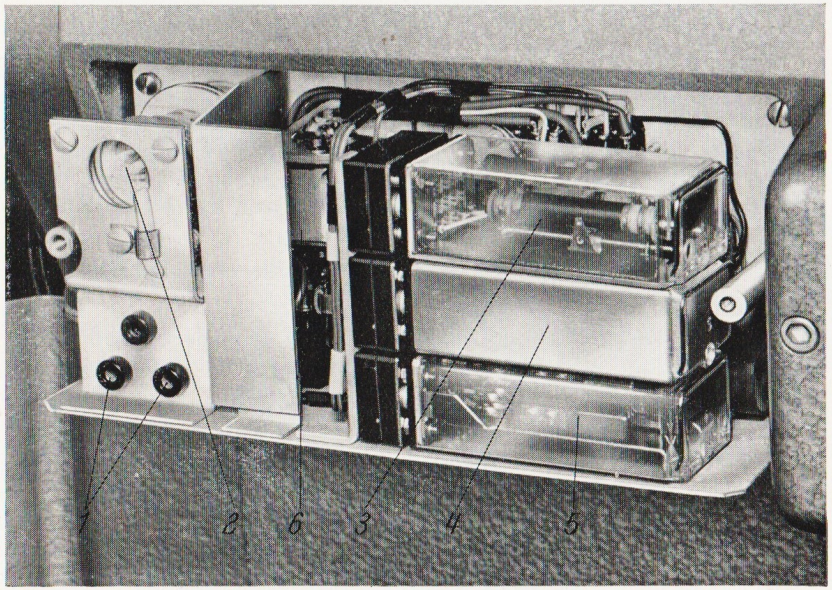
The regulation procedure takes place as follows: A reflector which picks up the light from the plus-carbon crater directs this

Rear of Lamphouse with Covers and Relay Chassis removed



1. Fixing points for mounting relay chassis
2. Fixing points for covers
3. Block-contact socket for relay chassis
4. Cut-away for measurement sockets
5. Cut-away for slit-diaphragm

Relay Chassis inserted



1. Socket for voltage-measurement
2. Photo-resistance (slit-diaphragm on opposite side)
3. Guard relay
4. Limiting relay
5. Auxiliary relay
6. Mercury switch-over relay

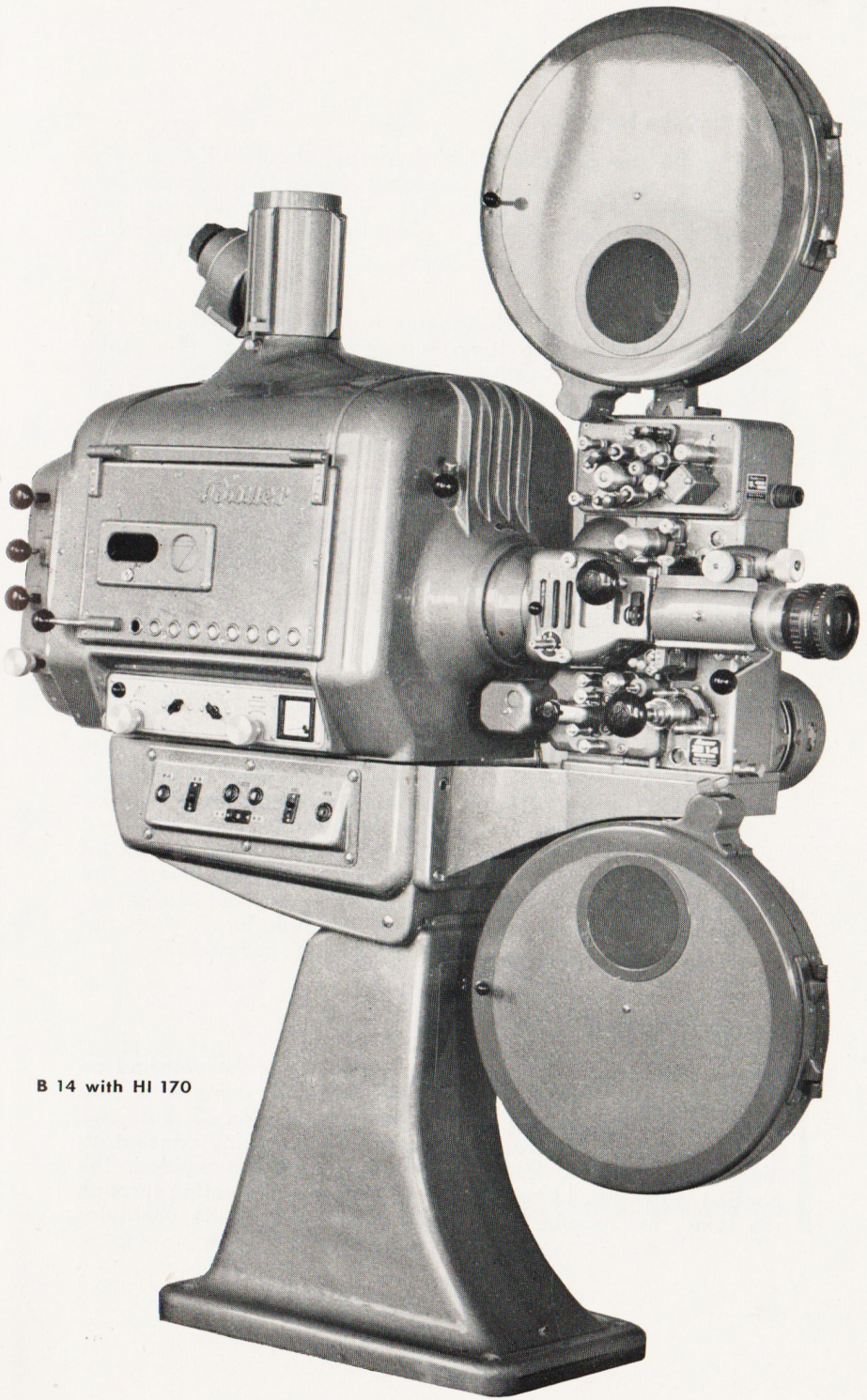
light via two plane deflecting mirrors onto the diaphragm of a photo-resistance mounted on the relay chassis (ill. p. 27). It is possible to make a check here to see if the image of the plus-carbon crater-edge appears vertical to the slit-diaphragm. This check involves lifting the rear cover-plate slightly, with the lamphouse door open, so that the image of the plus-carbon edge as well as the slit-diaphragm can be seen in the deflecting mirror. Caution, 220 volts! Should this not prove to be the case the slit-diaphragm can be rotated until the position shown in the lower illustration on Page 5 is reached. Just in case the image of the plus carbon does not appear on the slit-diaphragm, the deflecting mirrors can be readjusted. The distance of the edge of the plus carbon from the heat-shield amounts to about 13/16" during working (ill. p. 11).

The numbers on the scale of the left-hand potentiometer are a measure for the separation between the two carbons. Setting to a larger number results in the negative carbon increasing its distance from the positive, whilst moving back to a lower number causes the negative to approach closer to the positive. If it should happen, when using other carbons, that the correct distance of negative carbon from positive can only be obtained by turning the potentiometer right round to either end of its full travel – a state of affairs naturally resulting in no further range of regulation being available in the particular direction concerned – the desired centre-setting of the potentiometer can be procured once more by re-positioning one of the two tapping-clips on the resistance in the forward part of the lamphouse (ill. p. 19). As a check on this, the voltage across the two horizontal black sockets on the relay chassis should be measured with the potentiometer at its central setting. The voltage must be 20, and may not exceed 29 volts when the setting of the potentiometer is altered. If this voltage rises above 30 the overload relay (guard-relay) will respond and switch off the sensitive limiting relay. The guard relay can only be released again by switching the lamp off (ill. p. 27).

The points detailed below can serve as instructions should readjustment prove necessary:

Any alteration of the feed regulation may only be carried out after the lamp has been working for at least 5 minutes.

If the indicator lamp burns continuously or with only very short interruptions, the potentiometer regulating the speed of positive-carbon feed must be set to a higher value on its scale. If the indicator lamp does not come on at all, the positive potentiometer should be turned back to a lower value on its scale.



B 14 with HI 170

Operating the Lamp

Owing to the great consumption of energy, about 14 KW, a very large amount of heat is generated inside the lamphouse. The lamp should not be allowed to burn for lengthy periods with the cut-off dowser closed, in order that the energy converted into light and heat has no chance of building up inside the lamphouse.

1. After the fan in the exhaust flue has been set working, the 220-volt feed for the lamp is switched on from the main switchboard. The ventilator motor in the flue connecting section and the water pump should now be switched on by operating the toggle switch on the lamp control panel. Working without water cooling and ventilator motor can seriously damage the lamp.

2. Before switching on the DC supply the water pump must be checked at the water circulator for faultless operation. Arc-striking occurs automatically when the DC is switched on, the fan motor and water pump also being switched on automatically at the same time, as a security measure, although these two units should already have been set working by means of the toggle switch (ill. p. 9).

3. The initial coarse setting of the mirror should be such that a slot-length of about 1/4" lies free in front of the adjustment-bolts, in the direction of projection. The screen itself should be employed for determining the best standard of screen illumination. The mirror can be moved lengthwise by means of the aluminium knob set low on the lamp rear-door. The lowest of the three black knobs serves for horizontal mirror alignment, the uppermost for vertical alignment. The cut-off dowser must be open when carrying out mirror adjustment, and attention paid that the light-beam does not burn the lacquer finish of the front wall (ill. p. 9 and 17).

Conclusion of Operation

Provided the fan motor and water pump were not switched on by the toggle switch earlier on, they will also come to a stop when the DC is switched off. Protracted operation of these two units is a stringent necessity however, because any concentrating of heat around the carbon holders must be avoided. The cooling water should be allowed to continue circulating through the lamp, for together with the fan motor and the ventilator

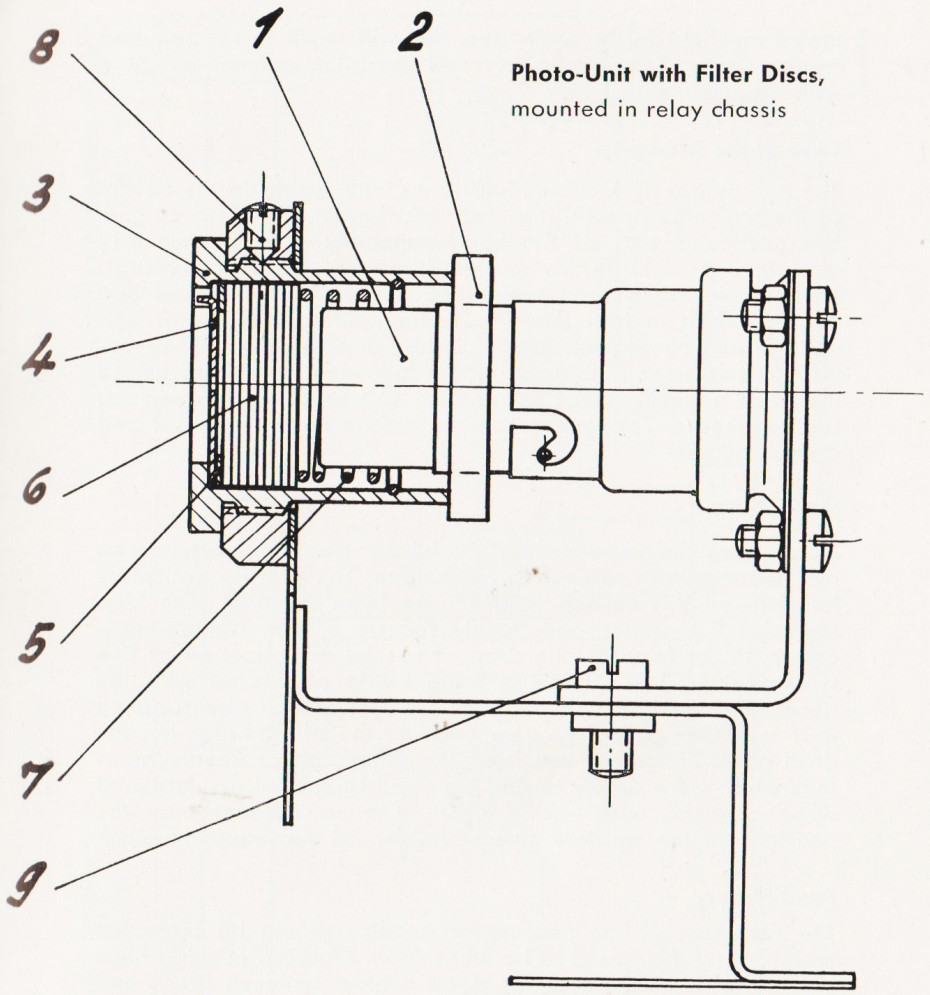


Photo-Unit with Filter Discs,
mounted in relay chassis

1. Photo unit
2. Felt ring
3. Fitting for slit-aperture and filter discs
4. Slit diaphragm
5. Masking ring
6. Set of filter discs
7. Spiral spring
8. 2 locking screws for fitting
9. 2 screws for photo-unit angle bracket mounting

motor mounted in the main flue, this will result in the required cooling-down of the lamp parts until operation commences again with the next reel of film.

Care of the Arc-Lamp

The arc-lamp is of decisive importance with regard to the quality of the projected picture. It is well worth-while, therefore, to give this particular part of the kine equipment regular care and attention. A dull, thickly-spattered mirror cannot produce a brilliant picture; burned and pitted carbon holders cause bad contact which in turn leads to further pitting, change of arc-voltage and consequent loss of light. For these reasons we advise conscientious adherence to the following instructions: Give the lamp a weekly cleaning, using a soft brush, and sweep out the lamphouse. Take good care to remove all carbon dust and carbon stumps.

Lubrication:

Apart from the negative carbon holder the lamp requires no maintenance with respect to lubrication. The spindle and plain bearings of this carbon holder have been supplied with high melting-point grease and merely require a little further lubrication, in the form of one drop of special oil, about every five working-days. We include a small bottle of this oil with the accessories, and by means of the ejection oil-can also supplied it is a simple matter to give each of the oiling-holes its one drop of oil. All other bearings are either ball or needle bearings which were simply dusted over with a special dry lubricant when assembly was taking place. On no account may the bearings of the positive carbon holder be subsequently oiled.

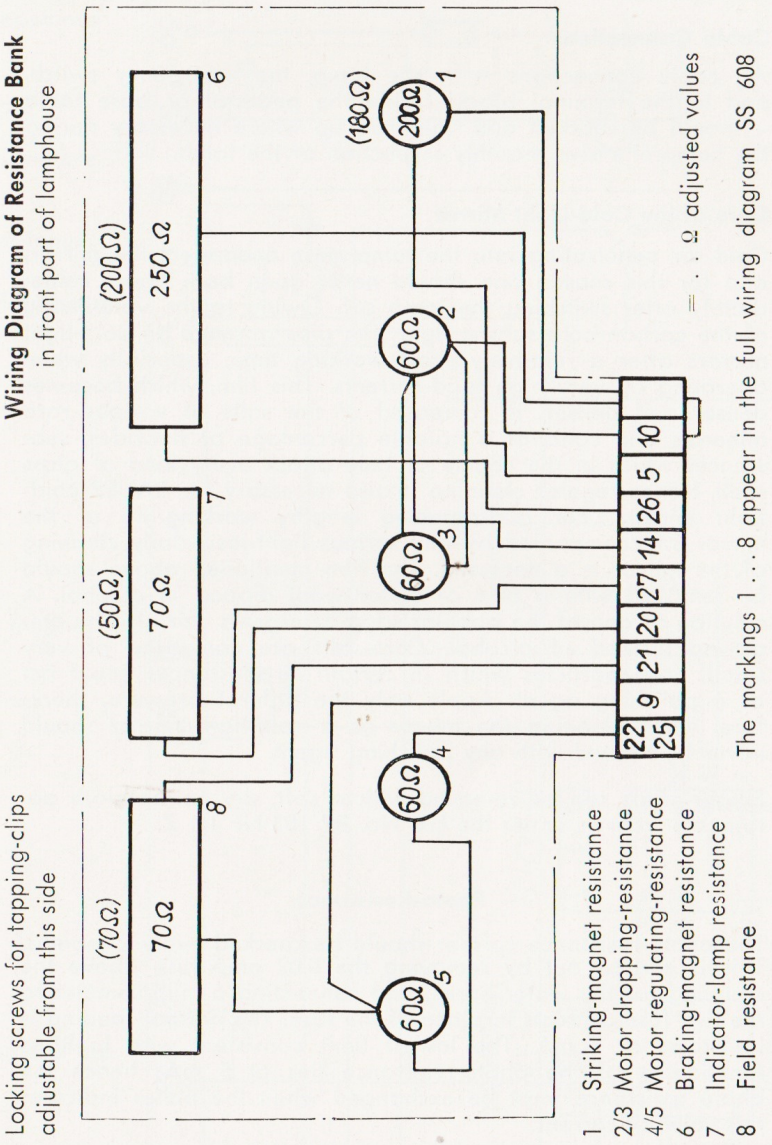
Feed Motor

The condition of the feed-motor brushes should be inspected monthly and any found to be worn down replaced in good time. List No. MO 4/1Z. Check for good contact between brush and holder (ill. p. 19).

Burning-in the Carbons

HI carbons certainly burn-in very quickly, but nevertheless it is advisable to switch on the lamp 1 or 2 minutes before the changeover so that the arc can settle down to steady, even burning. The carbons must be stored in a dry place – damp carbons burn unsteadily.

Wiring Diagram of Resistance Bank
in front part of lamphouse



The markings 1 . . . 8 appear in the full wiring diagram SS 608

Cable Connections

All cable connections – to the lamp, the emergency switch, and to the terminal blocks inside the pedestal or base table – should be checked and tightened up where necessary during the comprehensive monthly inspection of the lamp.

Care of the Cold-Light Mirror

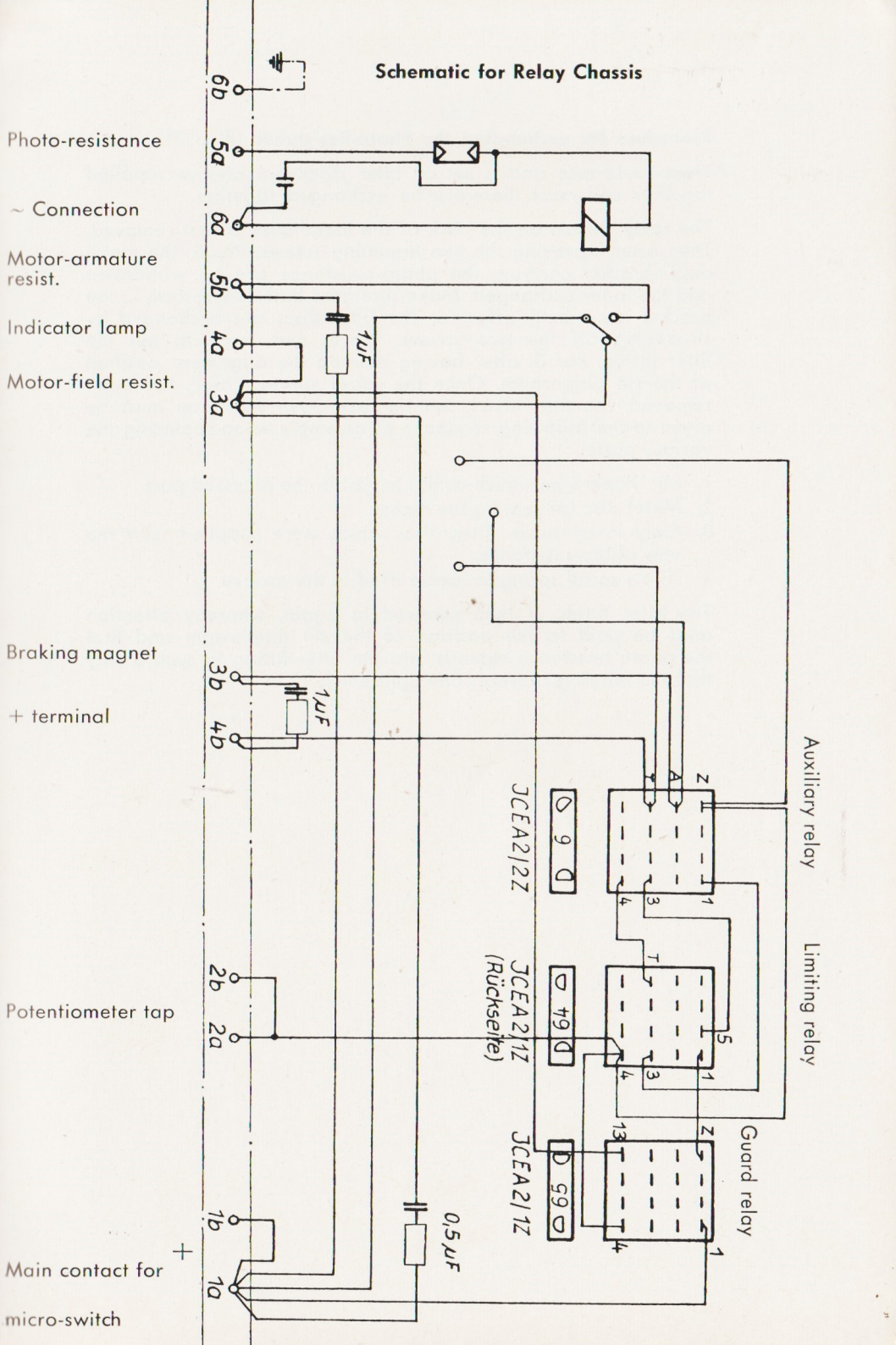
Cold air penetrating into the lamphouse endangers the mirror, and for this reason one should never open both doors immediately after switching the lamp off. Owing to the volatilizing of the carbon core-salts a light film also appears on cold-light mirrors after a relatively short working time, especially when operating on very high load-currents. This film, which becomes denser and denser, is composed of the salts of various rare minerals and contains a notable percentage of fluorides, substances which in the course of time attack every kind of glass shell. Hence regular cleaning is also necessary for BAUER cold-light mirrors. For guaranteeing lengthy working-life of the mirror unaccompanied by any serious light-loss, daily cleaning of the mirror is a necessity. The film mentioned above should be removed with a pad of cotton-wool dipped in alcohol. A solution of one of the popular soap-detergents can also be employed instead of alcohol. Core-salts are composed of very small, hard particles which in certain circumstances could act as a polishing agent. Apply only the lightest pressure, therefore, when cleaning the mirror as a cold-light mirror should never be treated with any polishing agent.

Finger-prints can be removed with a soft, dry cotton cloth obtainable from us under the List No. BZ 103 NF 1/1 Z.

Photo-Resistance

The photo-resistance current should be checked every 2 months. This is carried out by removing the 0.02 amp fuse above the coupling for the water hoses, and connecting a milliammeter to the two fuse contacts in place of the fuse. The normal reading is in excess of 7 mA. The lowest limit consistent with faultless functioning of the photo-resistance lies at 5 mA; hence the photo resistance must be exchanged when the meter indicates this value of current.

For arriving at a correct reading, the plus carbon is rotated back until the meter needle attains its widest deflection.



Procedure for exchanging the Photo-Resistance (ill. p. 31)

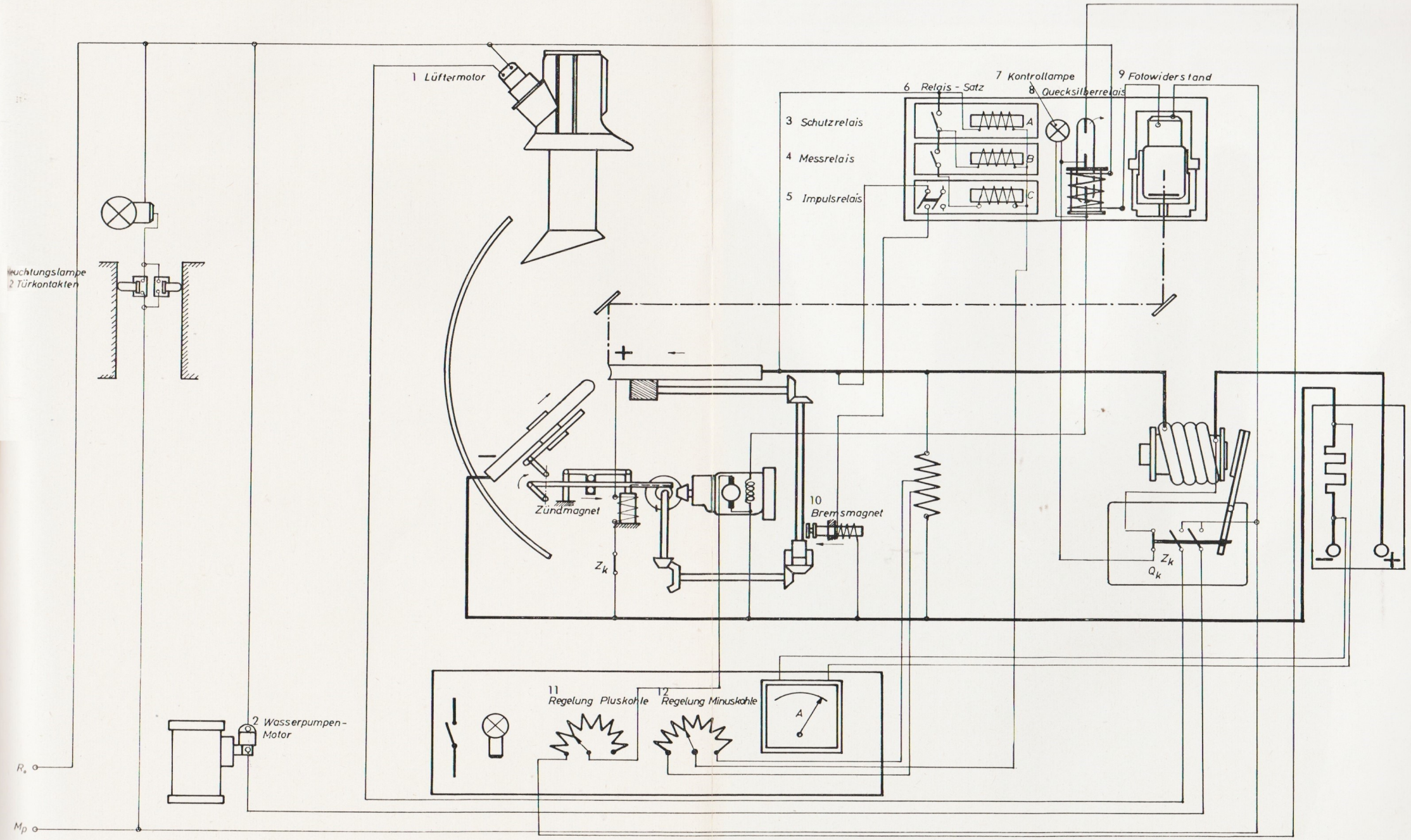
Photo-resistance and a set of filter discs are always supplied together and must therefore be exchanged together.

The relay chassis on the back of the lamphouse is first removed. Then after loosening the two mounting screws, Pos. 9, the metal angle-bracket carrying the photo-resistance can be withdrawn and the latter exchanged. Make sure here that its insertion in the bracket is correctly effected. The filter discs are exchanged by slackening off the two screws, Pos. 8, and screwing out the filter fitting, Pos. 3, after having marked the alignment position of the slit diaphragm. Once the spiral spring, Pos. 7, has been removed, the filter discs can be taken out. Attention must be given to the following sequence of assembly when replacing the various parts:

1. Slit diaphragm, which comes to rest in the recessed part.
2. Metal disc for sealing the recess.
3. Only insert those filter discs which were supplied with the new photo-resistance.
4. Allow spiral spring to locate itself in the groove.

The filter fitting is then screwed in again, whereby attention must be paid to the position of the slit diaphragm and that the photo-resistance extends into the filter fitting in such a way that the felt ring prevents any light-entry.

Schematic of current flow in the HI 170

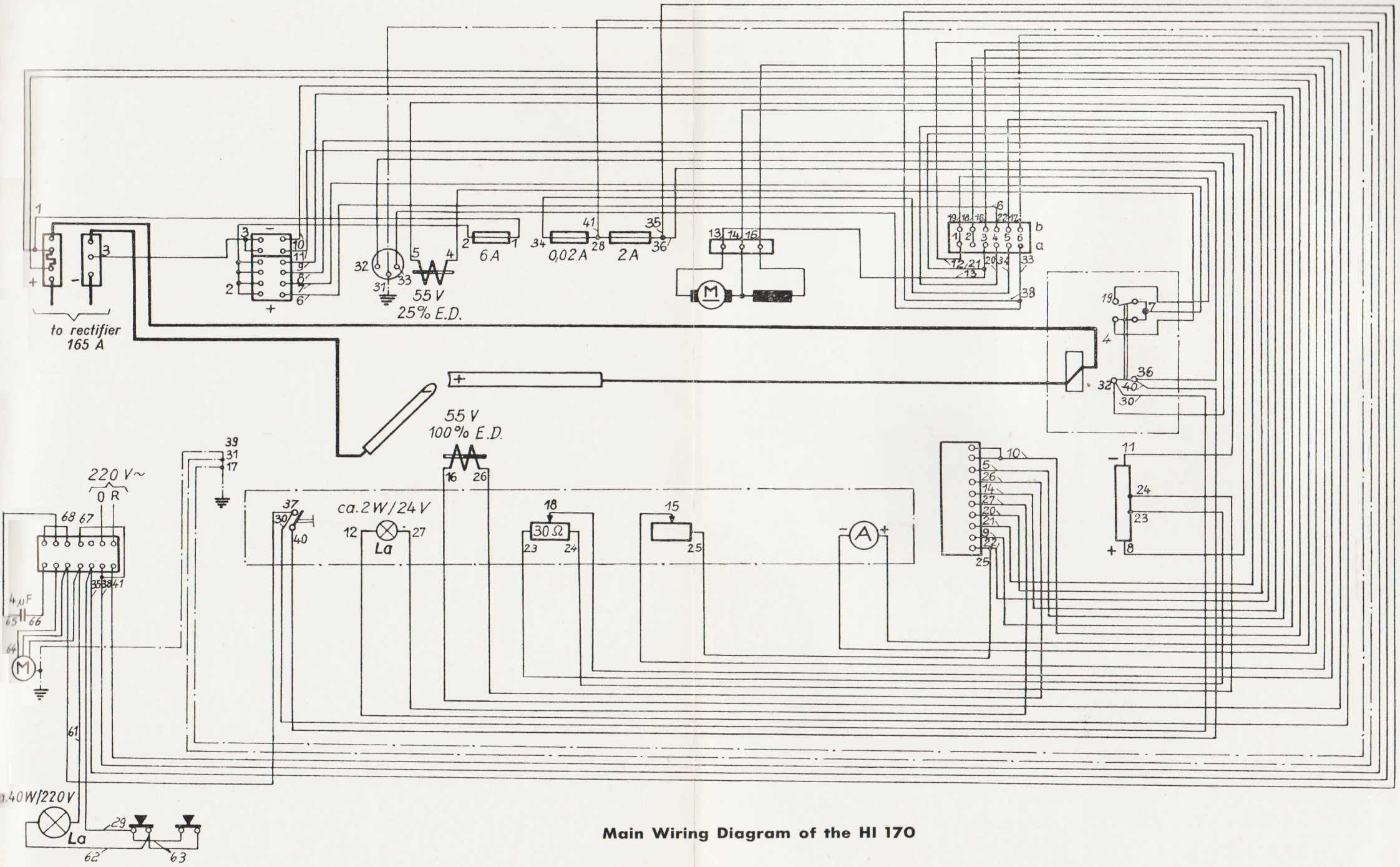


HI 170 – Schematic Representation of Method of Working

Main Wiring Diagram of the HI 170

to rectifier

1 Ventilator motor
2 Water-pump motor
3 Guard relay
4 Test relay
5 Impulse relay
6 Croup of relays
7 Indicator lamp
8 Mercury relay
9 Photo-resistance
10 Braking magnet
11 Plus-carbon regulation
12 Minus-carbon regulation
13 Manual switch for water-pump and ventilator motor
14 Control lamp
15 Lamp with 2 door contacts



Main Wiring Diagram of the HI 170