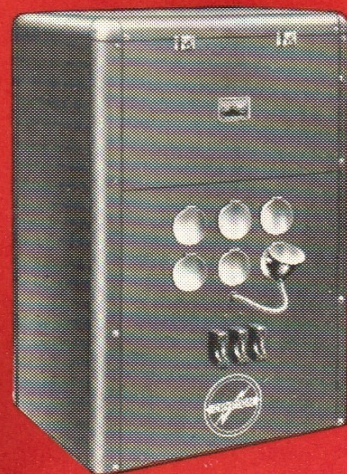


**'Choke Control'**  
**RECTIFIERS**  
**FOR**  
**CINEMA USE**

**Crypton**









# **VARIABLE CHOKE CONTROL RECTIFIERS FOR PROJECTOR ARCS**

**A New Method of Supplying Projector Arcs  
from A.C. Supply Mains, giving Easier Control,  
Better Lighting and Lower Running Costs**

**CRYPTON EQUIPMENT LIMITED  
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The new "Variable Choke Control" Rectifier designed by Crypton to provide Easier Control, Better Lighting and Lower Running Costs.



# INTRODUCTION

*POWER CONVERSION Equipment required for feeding Cinema Projection Arcs is of the utmost importance to every Cinema.*

*On the method employed depends the quality of projection, the attainment of lowest running costs, freedom from breakdown, ease of operation, amount of space required, capital invested in first cost of the equipment, the cost of maintenance and ease of installation.*

*All these considerations should be kept in mind when considering any method of Power Conversion for Projector Arcs either for the installation of new equipment or in reviewing existing methods.*

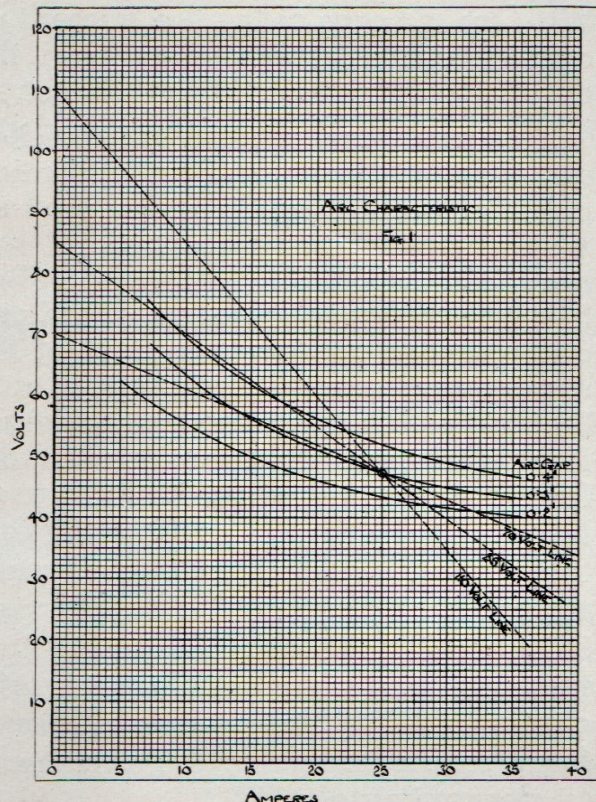
*Crypton Equipment Ltd. believe that the new Rectifiers described in the following pages meet every condition more satisfactorily than any other type of Projector Arc Power Conversion equipment yet developed.*

## WHAT THE EQUIPMENT MUST DO TO OPERATE PROJECTOR ARCS SATISFACTORILY

For satisfactory operation, Projector Arcs must be supplied with Direct Current. A.C. Arcs are not commercially satisfactory for many reasons, including the possibility of flickering, poor quality lighting, the necessity of continuous adjustment, possibility of arc noise or hum, the increased value of current required for a given load intensity, and the unadaptability of an A.C. arc for varying loads and burning conditions.

Since most supply systems are alternating current, means must be provided to convert the A.C. supply to Direct Current. The characteristics of the Direct Current supply must be suitable for the particular characteristics of carbon arcs.

To maintain an arc between two carbons it is necessary to apply between 35 and 55 volts. Fig. 1 illustrates the characteristic curve of a typical low intensity arc which would normally operate at 25 amps. 47.3 volts. The arc has a negative characteristic, i.e., the voltage across the arc increases as current decreases and vice versa. For small current a high voltage is required to maintain the arc. As the current increases the voltage falls. The arc volts will vary with the arc gap ; as





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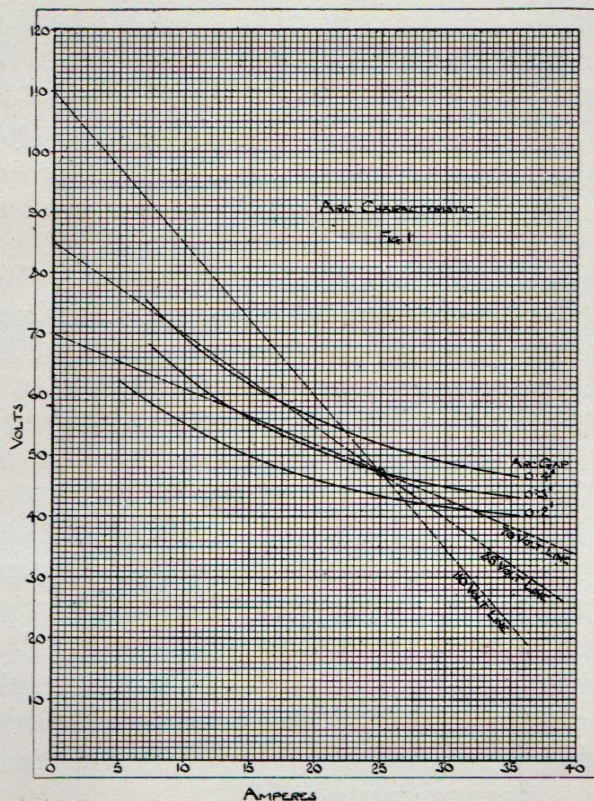
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# CONVERTING EQUIPMENT FOR PROJECTOR ARCS

Until recently all equipment for feeding projector arcs gave the necessary high voltage of from 90 to 110 volts with series regulating resistances for arc control. Two main types of power conversion equipment have been used, namely:—

## **Motor Generators ;**

## **Rectifiers.**

Motor Generators were formerly very popular, and are still in considerable use. The machines have the advantage of flexibility, provide easy control by a shunt regulator, give long life and general reliability and pure, ripple-free output. The disadvantages of the Motor Generator are, however, its low overall efficiency—particularly at medium and low loads—the large floor space occupied, special foundations which are necessary, the cost of installation, the necessity for auxiliary control gear, and noise.

Many of the disadvantages of a Motor Generator are overcome with Static Rectifiers which are available in the Oxide Cathode, Mercury Arc and Metal Rectifier types. The salient advantages of a Rectifier are:—

1. **High efficiency at all loads.** This ranges from 70% to over 80% and this efficiency is available over a range of loadings from 25% to full load.
2. **Silent in operation**—an important advantage.
3. **Small space requirements and light weight**—also an important advantage; easy transportation is equally important in many cases.
4. **No foundations necessary**—only a firm, level floor is required.
5. **No auxiliary control gear required**—everything is included in the Rectifier.
6. **Low maintenance costs**—resulting in extremely low upkeep over many years.
7. **No moving parts**, except in the case of Mercury Arc and Metal Rectifiers, which frequently require a cooling fan.

All Rectifiers as hitherto used are, however, subject to the general disadvantage of low overall operating efficiency due to the necessity of using ballast resistances. Crypton Equipment Ltd. have carried out considerable research with the object of providing a method of projection arc feeding which would eliminate the use of ballast resistances, yet still provide that essential requirement of flexibility in operation. Such a new method has now been perfected in the form of a **constant voltage and variable current control Rectifier.**



This new type of Rectifier offers the following advantages:—

1. Practically automatic in operation.
2. Provides complete variation for any required arc current and voltage characteristics.
3. Gives an overall efficiency of up to 70% as compared to the existing overall efficiency with ballast resistances of approximately 30%.

Before describing this new development in detail, it will, however, be beneficial firstly to consider recent developments on projector arc design.

## Types of Projector Arcs

The following table gives the essential details of the four main types of carbons which are in general use today:—

Type of Carbons.	Size of Carbons.	Current.	Arc Volts.
Low Intensity.	No. 24 Positive ... 12 mm.	25 amps.	50 volts.
	No. 25 Negative ... 9 mm.	30 amps.	52 volts.
High current density "Suprex" or "Hilo" type.	No. 90 Positive ... 7 mm.	40 amps.	36 volts.
	No. 90 Positive ... 8 mm.	60 amps.	38 volts.
	No. 91 Positive ... 7 mm.	40 amps.	38 volts.
	No. 91 Positive ... 8 mm.	60 amps.	40 volts.
Copper - coated High Intensity.	No. 90 Positive ... 11 mm.	90 amps.	45 volts.
	No. 91 Positive ... 11 mm.	80 amps.	45 volts.
Plain rotating High Intensity.	No. 91 Positive ... 9 mm.	75 amps.	55 volts.
	No. 90 Positive ... 13.6 mm.	135 amps.	65 volts.

It will be seen from the table that widely varying requirements exist with different carbon "trims" and that there is a considerable range both of current and arc voltage requirements to be met. It is necessary, therefore, to ensure that the design of any Rectifier which supplies the arcs direct without ballast resistances should be sufficiently flexible.

The data offered by the carbon manufacturers must be closely adhered to. This is particularly important when dealing with high intensity copper-coated and high intensity rotating carbons, as used for the Sperry or Hall and Conolly Projector. In these cases the light intensity depends essentially on the careful adjustment of the carbon "trim."

The maintenance of correct arc voltage is essential, since this voltage is generally an indication of the correct arc gap. An exception here is in the case of projectors employing rotating positive carbons, where arc voltage can be misleading in certain circumstances.

Carbon manufacturers stress the importance of fully loading medium and high intensity cerium cored carbons at all times, including change-over periods. This constant loading is essential to maintain the correct crater formation.



Overloading is most undesirable, as it causes craters to become too deep, with a resultant loss in light intensity.

These considerations all go to prove how essential it is that the arc feeding equipment should be so designed as to permit of easy adjustment in order to give correct output for particular type of carbon "trim" in use.

At the same time, the ability to adjust the output to suit a different "trim" or, for that matter, a different projector, is equally important.

For most satisfactory service the cinema engineer requires an arc feeding unit which has the following characteristics:—

1. It must be flexible, so that the exact requirements of carbons can be most efficiently dealt with.
2. It must be flexible so that films of varying density, colour films and cartoons can be handled without loss of light efficiency.
3. It must be flexible so that it is possible to make adjustments caused by foggy and smoke-laden atmosphere.
4. It must be flexible to permit of any economies being effected on occasions where a different carbon "trim" can be used.
5. It must have a high efficiency which it will maintain at all loads.
6. It must have a high power factor in order to reduce the maximum K.V.A. demand.
7. It must be as simple and fool-proof as possible, the operation being preferably as nearly automatic as possible, but without having to use expensive and elaborate control gear.
8. The space occupied should be as small as possible and there should be no special demands in the way of ventilation, special foundations, head-room.
9. The equipment should demand little or no attention and maintenance.
10. It should be accessible to permit of easy cleaning and servicing.
11. The first cost should be as low as possible.

As the following pages will show, the new **Automatic Choke Control Rectifier** developed by Crypton provides the most satisfactory answer to the whole of these requirements.



# A COMPARISON OF ALTERNATIVE METHODS OF SUPPLYING PROJECTOR ARCS

Until recently, Projector Arc feeding equipment was designed for D.C. outputs of 90 to 110 volts, and supplied the arcs through series regulating resistances. Several different types of equipment were in use, including:

## **Motor Generator**

These machines were formerly very popular and are still considerably used. They have the advantage of flexibility, ease of control, long life, are very reliable and give a pure ripple-free output. The disadvantages, however, are low overall efficiency, large floor space occupied, the necessity of foundations, cost of installation and need of auxiliary control gear.

## **Mercury Arc Rectifier**

This type of equipment has been considerably used, and has the advantages of higher efficiency, particularly at medium and low loads, less floor space occupied, no need of special foundations or auxiliary control gear, ease of installation and wiring, and low maintenance costs. Although, on the average, higher in price than the Motor Generator, this is offset by the savings in current consumption by reason of the higher average efficiency.

## **Oxide Cathode Rectifier**

This is a more simple form of Rectifier which consists of a Transformer and a number of Oxide Cathode Valves which convert A.C. into D.C. The advantages are high efficiency from 70% to 80% at all normal loads, silent in operation, small space requirements, light weight, no moving parts, and low maintenance costs. No foundations are necessary and no auxiliary control gear is required. The first cost is lower than a Mercury Arc Rectifier. The valves give a guaranteed long life, can be replaced at low cost, and the Rectifiers are designed so that in the event of a valve failing the remaining valves will carry the load until a new one can be fitted.

## **Metal Rectifier**

Quite recently Metal Rectifiers have been developed for Cinema use, mainly in the form of special "Constant Current" Rectifiers. These Rectifiers have the advantage of high efficiency and power factor, low running costs, silent operation, small size and light weight.

They have the advantage over Oxide Cathode Rectifiers that no renewals are normally required, but this is largely offset by the initial cost, which is considerably higher. Also Cinema type Metal Rectifiers are fitted with a cooling fan and the performance of the unit depends very materially on the dependability of this fan, as the metal unit is very critical as regards temperature, and unless kept cool will break down. A break down of a metal unit means considerable expense in renewals, whereas in the case of an Oxide Cathode Rectifier a spare valve can be fitted in a few seconds and at very low cost.



## Metal Rectifier Constant Current System

This is a special adaptation of the modern Metal Rectifier which eliminates the use of series resistances. It incorporates a semi-resonant circuit, having similar characteristics as for a Rectifier at an extremely high line voltage. The Rectifier gives a constant arc current, regardless of arc volts.

The main advantage of this type of Rectifier is the high efficiency and consequent low running costs, due to the elimination of resistances.

The main disadvantages usually experienced are, firstly, that there is no means of testing when and how many of the Rectifier discs are inoperative; secondly, that the three positions of "strike," "burn in" and "run" are obtained by using one phase, two phases and three phases, and this not only outbalances the system, but also are not adjustable in their ratio to one another. Thirdly, the Rectifier in itself is not very flexible. Adjustments for different values of arc current have to be made by changing the thicknesses of packing strips in the choke air-gaps, which is a lengthy job, since it necessitates the Rectifier being completely shut down and the chokes being partially dismantled. Further, there is no easy way of adjusting arc current values for films of varying intensity or for smoky or foggy atmospheres.

## CRYPTON "VARIABLE CHOKE CONTROL" METHOD

As a result of considerable research and realising that all existing arrangements left something to be desired, Crypton have succeeded in developing a Rectifier which entirely dispenses with ballast resistances, has a high power factor, an extremely high efficiency and provides the exact characteristics required for feeding any arc, at the same time providing complete flexibility.

The Rectifier is of the Oxide Cathode pattern, because for **practical** Cinema requirements this is the most suitable type of Rectifier to employ. It permits of wide adjustment in the arc current, it enables a given Rectifier to be utilised for any arc voltage from 35 to 55 volts, inclusive, and it is arranged to enable the operator automatically to provide for "striking," "burning in" and "running" by operating a single switch. All adjustments employ the 3 phases.

The Rectifier gives a selection of arc currents to suit actual operating conditions and the type of film being shown, this arc current being completely under the control of the operator. For each value of arc current the correct arc voltage is automatically applied. All this is achieved without the use of ballast resistances, there being, therefore, no loss of power.

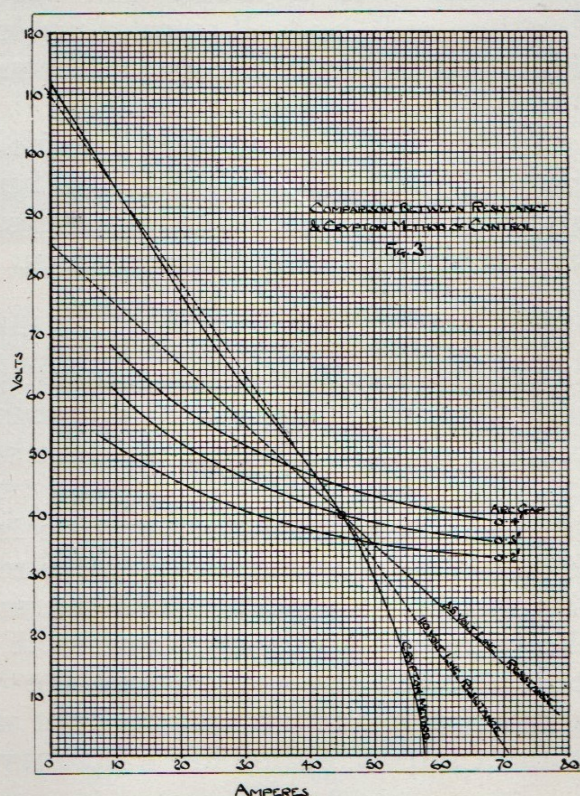




Fig. 3 illustrates the characteristics of the Crypton Rectifier as compared with the normal Rectifier or Motor Generator having a line voltage of 110 volts D.C. using ballast resistances.

## Comparison with Normal Rectifier

It will be of interest to compare the operation of the two methods with a variation in arc voltage of 5%.

Under these conditions and using a normal 110 volt line voltage, the current variation against an arc voltage variation of 38 to 42 volts will be 4%.

In the case of the Crypton "Automatic" Rectifier the corresponding variation will be 2%.

With modern motor-fed arc mechanisms the arc gap would be regulated much more accurately than within + or — 5%, so that stability provided by the Crypton method is even superior to a standard 110 volt Rectifier and a steadier arc will be provided under all conditions even if the arc is under-fed.

The great advantage of the Crypton method will, however, be apparent from a consideration of Fig. 8, page 22, which shows a complete series of curves provided by a typical Crypton Rectifier which has a maximum output of 75 amps. designed for any selected arc voltage between 35 and 55 volts. This Rectifier has current adjustments in 5 amp. steps from 50 to 75 amps. The operator can select any current he requires and the Rectifier will be self-regulating for each value of current selected, as indicated by the six curves shown in Fig. 8.

With the Crypton Rectifier the suitable values of current are automatically selected for "strike," "burn in" and "run." With the Rectifier in question these values are 20 amps., 42 amps. and 75 amps. respectively as per characteristic curves given in Fig. 8.

From the projectionist's point of view, the Crypton Automatic Choke-controlled Rectifier is the easiest of all types of rectifying equipment to use. Not only is the arc maintained stable, but any required value of current can be selected with the same stability.

Another important advantage is the fact that the short circuit current is automatically limited to be a maximum of approximately 25% above the maximum rating of arc current. This is well within the capacity of the valves. Accidental overload is, therefore, impossible. Should the operator for any reason lose the arc and jam the carbons together, the short circuit current will be kept within its normal value—a value which cannot impair either the efficiency or life of the valves.



## **High Efficiency**

Owing to the elimination of ballast resistances, the overall efficiency from the supply mains to the projector is approximately double the normal. Fig. 4, page 18, shows a typical efficiency curve for a Crypton Rectifier for varying voltages.

## **Suitable for High or Low Intensity Arcs**

Crypton Rectifiers are distinguished by the fact that it is not necessary to have entirely distinct Rectifiers for high intensity and low intensity arcs. Any standard Rectifier can be designed for any arc voltage between 35 and 55 volts, and each have characteristics at varying selected currents which have been described in the preceding pages.

## **High Power Factor**

The disadvantage of the low power factor which normally accompanies a Choke-controlled Rectifier has been overcome. This results in a high and maintained power factor which is shown by the typical curves illustrated in Fig. 5, page 18.

## **Big Savings in Running Costs**

High efficiency and high power factor combined, as is provided in the Crypton Rectifier, show remarkable savings not only in the units of electricity consumed, but also in the charge for maximum demand, which is the basis of charge which most Supply Companies now use.

## **Flexibility**

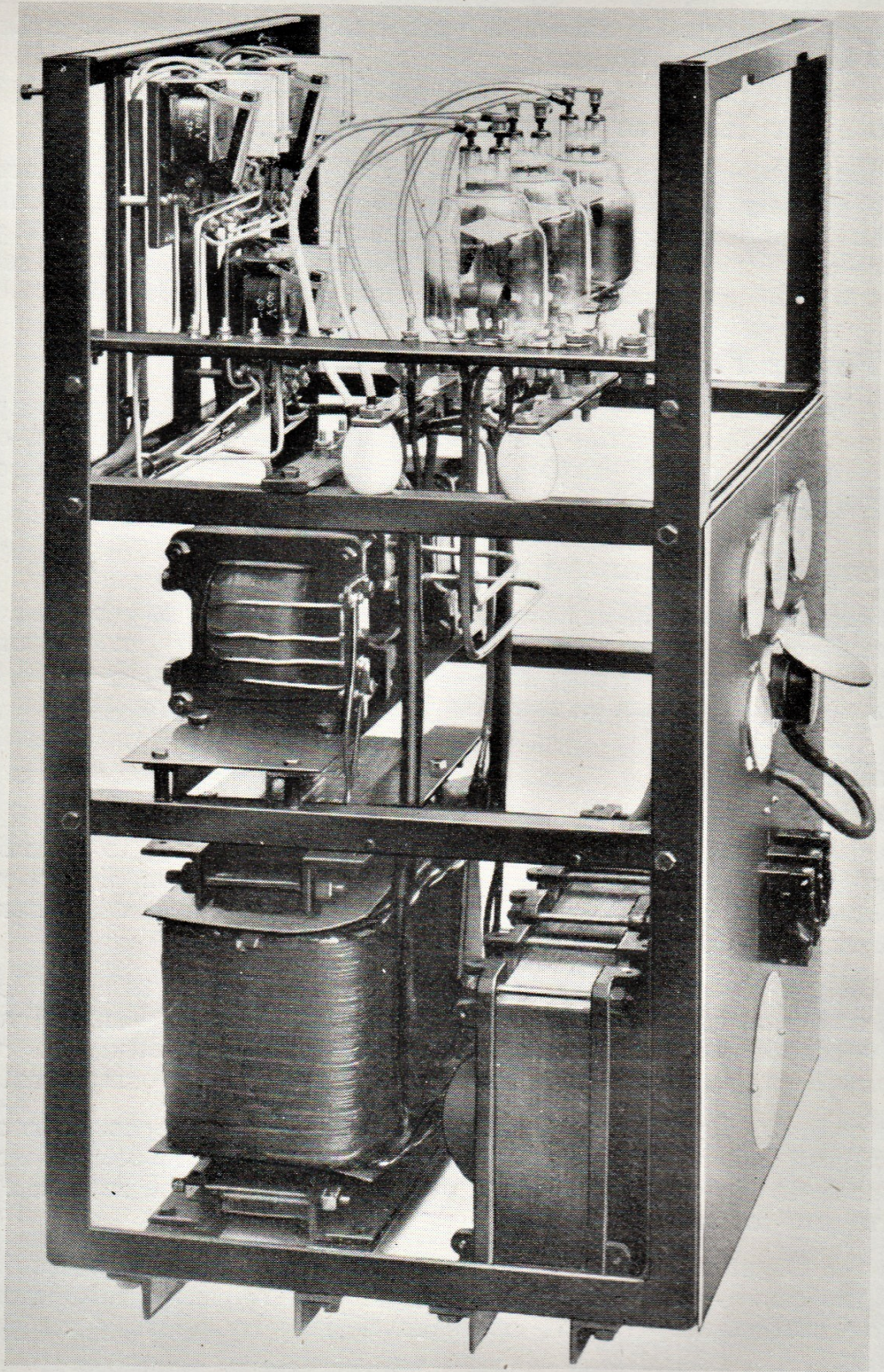
It has been explained in previous pages how essential it is that the Rectifier employed should be designed satisfactorily to handle the various types of carbons in use and the different types of carbon trim which have to be catered for. There are many occasions when considerable economy can be effected by making adjustments.

The ability to adjust the output to suit a different trim, or for that matter, a different projector, is a very desirable feature. Films of varying density—colour films and cartoons must be handled without loss of light efficiency. Foggy and smoke-laden atmosphere must be compensated for.

With ordinary Rectifiers, it is very difficult to make appropriate adjustment without loss of efficiency, and in many cases major alterations have to be made to the equipment, or it may even have to be returned to the manufacturer for modification.

With the Crypton Rectifier, however, complete flexibility is provided to suit all the above variable conditions, and the required adjustment can be made immediately by the operator, merely by altering the position of a plug.





Illustrating the accessibility of the Rectifier.



# GENERAL DESCRIPTION OF CRYPTON VARIABLE CHOKE CONTROL CINEMA RECTIFIER

## Mechanical

The Rectifier is provided in duplicate, each Rectifier comprising a well-ventilated robust cubicle, designed for floor mounting and requiring very little space. No foundations are necessary, and the weight is light, enabling the Rectifier to be easily transported.

## Electrical

Standard Rectifiers are designed for use on 3-Phase, 50 cycles supply, 380 to 440 volts. Special supplies are available when required. Each Rectifier includes long-life, full-wave Oxide Cathode Rectifying Valves, which carry a two years' proportionate guarantee, but which give an average life of considerably longer.

All Rectifiers give six-wave rectification and a remarkably smooth and ripple-free current output. As already explained, overloading is automatically confined within the normal overload rating of the valves and will not impair either their efficiency or life. Spare valves can at any time be fitted within a few seconds, and in the contingency of a valve failing, the remaining valves are sufficient to carry the load until the end of the film, giving ample time to fit a new valve before the next film is run.

## Transformers and Chokes

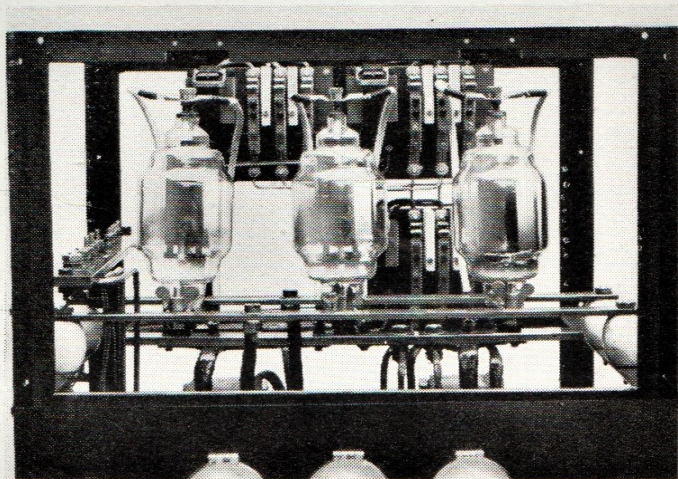
Both the Transformers and Chokes provided are of special design, specially wound and tested to 2,000 volts A.C. The arrangements of the transformers and chokes are illustrated on page 12.

## Valve Arrangement

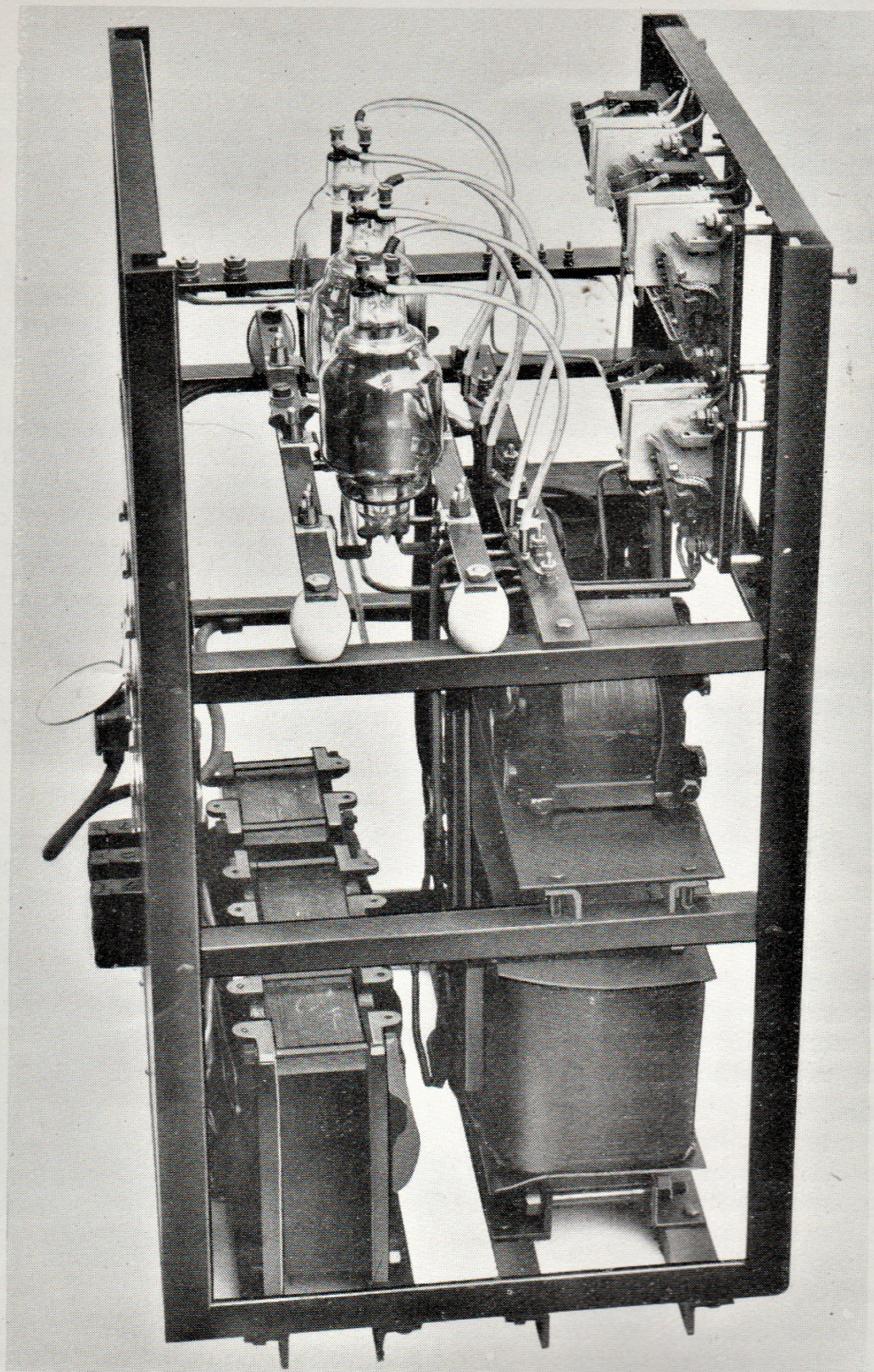
An exclusive arrangement of mounting valves is provided, each valve being securely mounted on copper bus-bars. This arrangement provides for ample ventilation and easy cleaning and maintenance.

Anode leads are designed with special heat-resisting cables. All valves carry a two years' proportionate guarantee and in the event of any valve failing to give two years' life under normal operating conditions it will be replaced at a reduced price.

The dependability of the modern valve needs to be emphasised. Several hundreds of Crypton Oxide Cathode Rectifiers are giving successful operation in Cinemas, and there are tens of thousands of Crypton Oxide Cathode Rectifiers giving successful service in all parts of the world for such additional duties as battery charging, radio transmission, telephone and telegraph work, etc.

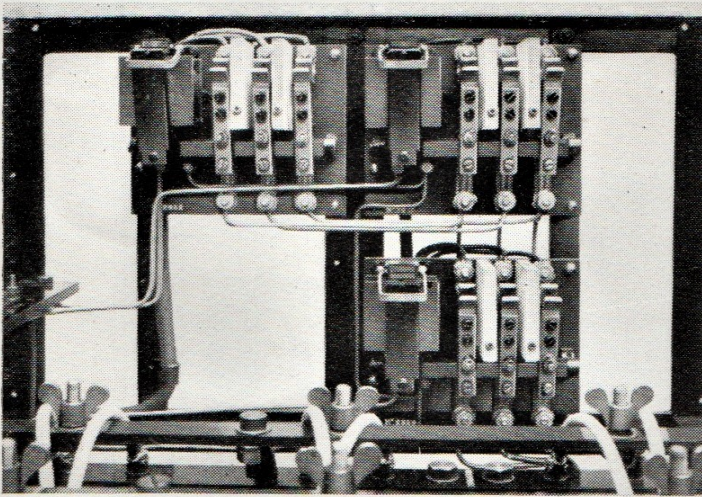






Interior view of the Rectifier





## Automatic Operation

In order to provide remote control of the Rectifier, a contactor panel, as illustrated, is provided in the Rectifier. This has an advantage over other types of Rectifiers where control gear is separately provided and has to be separately mounted and wired up. The contactor gear enables the operator to switch on the Rectifier for "striking," "burning in" and "running."

in" and "running" by the operation of a simple arc control provided in the operating box, and the "burning in" load can be adjusted when the Rectifier is installed to suit the particular make of arc to be operated.

## Control Equipment

Ironclad control switches are supplied with all installations which can be mounted in a convenient position in the projection box, and which serves to switch the Rectifiers in and out of operation and to provide automatically for "striking," "burning in" and "running."

This switch automatically gives reduced values of current for the "striking" and "burning in" position. The running current can be adjusted to well within the limits of the Rectifier, adjustment being in the form of plugs and sockets mounted on the front of the Rectifier, as illustrated on page 12.

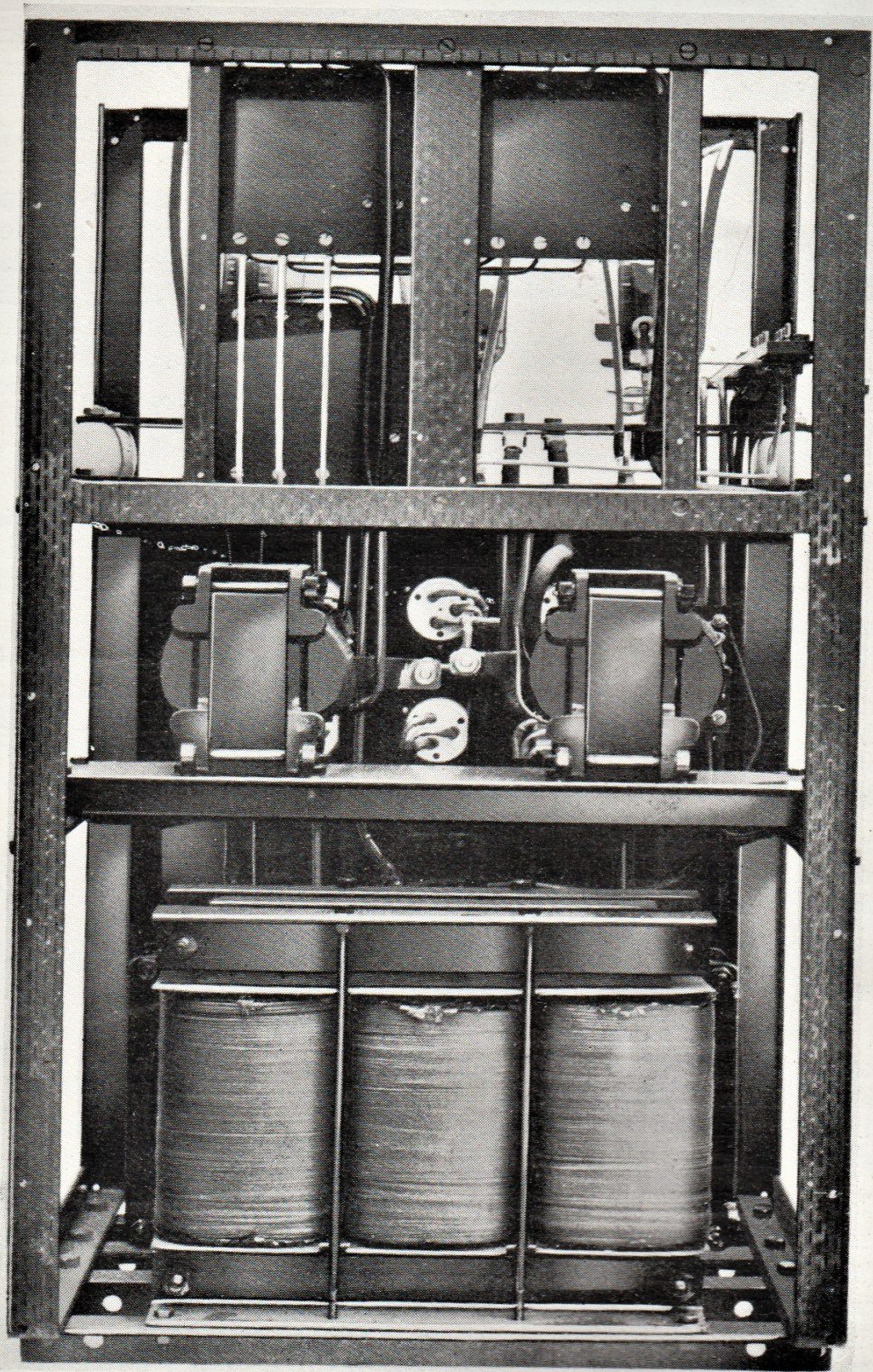
By inserting the plug into the appropriate position, any value of current required can be obtained by the operator to meet any actual operating conditions.

## Accessibility

The accessibility of the Rectifier is clearly shown in the accompanying illustrations. By removing the side panels, the complete interior of the Rectifier is immediately available for cleaning and any service which may, in the future, be required. The illustrations also show the arrangement of the interior construction, illustrating:—

1. The transformers mounted at the base of the Rectifier.
2. The chokes securely mounted on brackets.
3. The valves mounted on copper bus-bars carried on porcelain insulators.
4. Valve anode leads.
5. The contactor gear mounted at the back of the Rectifier.
6. The simplified interior wiring.
7. The exclusive plug and socket arrangement, each socket being fitted with a metal cover to protect against any possibility of shock.





Rear view of Rectifier, showing Transformers and Chokes.



The complete Rectifier is an outstanding example of modern, compact and well finished design.

## Operation

All Rectifiers are supplied for the appropriate mains voltage, but adjustments are provided to enable any fine adjustments of voltage to be made.

As already explained, adjustments for different values of arc current within the range specified for each Rectifier can be made by the operator without the necessity for any alterations to the choke air gaps by fitting strips of packing or similar complicated jobs. The adjustments provided on the Crypton Rectifier will meet **all** conditions on the lines already completely explained. Once the Rectifier is installed and connected up, it provides the operator with complete control of current values. No resistances whatever are used and it is necessary merely to install the Rectifier, wire up to the projector, adjust for the normal current required and then make whatever adjustments may be further required.

Operation is entirely automatic, and as previously explained, is carried out by means of arc control switches in the operating box which operate automatic contactor gear mounted within the Rectifier.

Normal practice is to provide duplicate Rectifiers, one connected to each projector. Three distinct sizes are available as follows:—

**"Twin 45" Rectifier,** each Rectifier having a maximum output of 45 amps., any voltage from 35 to 55 volts.

**"Twin 60" Rectifier,** each Rectifier having a maximum output of 60 amps., any voltage from 35 to 55 volts.

**"Twin 75" Rectifier,** each Rectifier having a maximum output of 75 amps., any voltage from 35 to 55 volts.

Each Rectifier is characterised by the same standard of simplicity and ease of adjustment, six alternative current values in 5 amp. steps being available.



# ADVANTAGES OF CRYPTON VARIABLE CHOKE CONTROL CINEMA RECTIFIERS

It is confidently claimed that the new Crypton Rectifier offers advantages which make it superior to any other type of Cinema Rectifier previously available.

## No Ballast Resistances

The equipment is complete in itself and operates the arc direct at any required arc current within the capacity of the Rectifier and without the use of ballast resistances or any further apparatus for current control.

The Rectifier does not use any resistances whatever and includes a special method for maintaining stability and adjustable control which eliminates any waste of power.

## High Efficiency

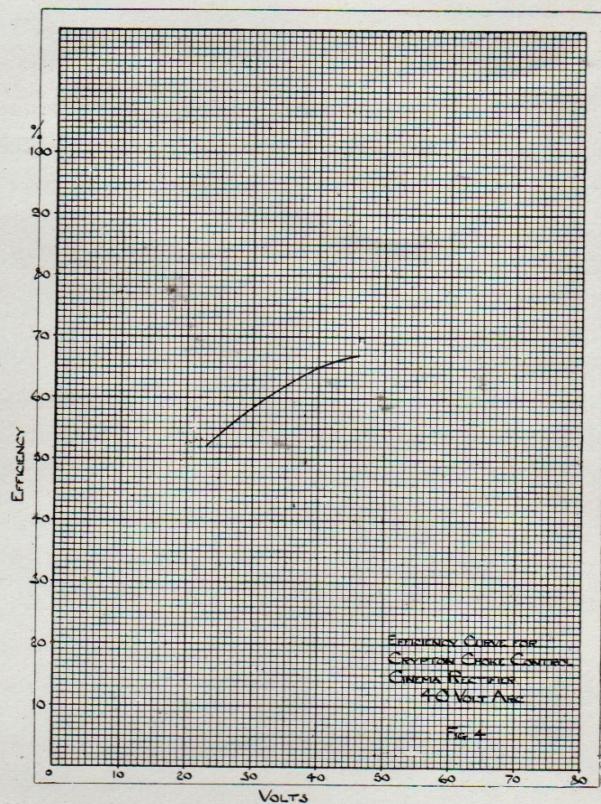
The efficiency from A.C. mains to projector arcs is uniformly high at all operating loads. There are no resistances to waste power.

## High Power Factor

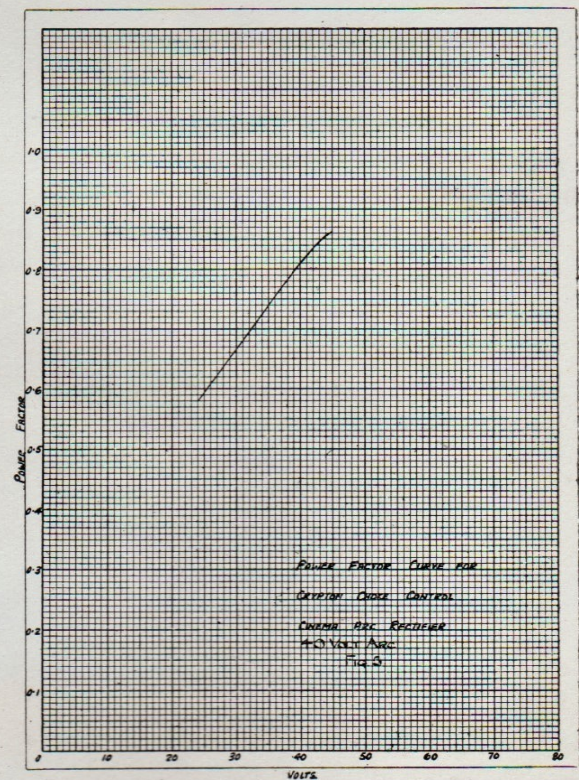
An ordinary Choke-controlled Rectifier gives a lower power factor. This disadvantage is overcome and the Crypton Rectifier gives an average power factor up to 0.85.

## Low Running Costs—Low Maximum Demand

The normal running costs are very low, because the efficiency is high and no power-wasting resistances are used. Average running costs are half the usual running costs of ordinary types of Rectifiers, and



Efficiency Curve.



Power Factor Curve.



show even greater advantage when compared with a Motor Generator. In the same way, by the avoidance of resistances and by reason of the high power factor, the maximum demand is reduced to approximately one half of the usual value with corresponding reduction in the charge for electrical power.

### **No Cooling Fans**

The temperature of the complete Rectifier will remain very low without the use of any cooling fans. This is an important advantage, because the operation of the Rectifier is not dependent upon a separate motor-driven fan, as is the case with many other types of Rectifiers in use.

### **Two Years' Guarantee**

All valves are of long-life pattern which carry two years, proportionate guarantee and give an average valve life considerably in excess of this.

### **Ease of Starting**

The Rectifier is fitted with automatic starting gear which is operated by a rotary switch in the operating box. This switch provides three different values of current for "striking," "burning in" and "running" the arc, and enables either Rectifier to be brought in or out of action as required.

### **Easily Adjustable**

Apart from the ease with which the required values of current for "striking," "burning in" and "running" are obtained, the operator has complete control of any value of arc current for varying operating conditions. Suitable values of arc current are selected by means of plugs and sockets provided on the front of the Rectifier.

### **Silent Operation**

The Rectifier is free from noise and vibration, there being no moving parts whatever. It gives smooth ripple-free output.

### **Fool-proof**

No special skill is required either in the operation or control of the Rectifier. It is the simplest of all methods of arc feeding available.

### **Reliability**

Reliability has been proved by practical experience. The valves give several years of trouble-free life, can be replaced in a few seconds, and in the event of one valve failing, the other valves will carry the load until the end of the reel.

### **Ease of Installation**

No special foundations are necessary. Nothing else is required, but a firm floor on which the Rectifier is placed.

### **Compact and Self-contained**

A minimum of floor space is required. Each Rectifier is self-contained with its own automatic control gear. There are no separate fixings of any kind.



# "TWIN 45" RECTIFIER

FOR ARCS UP TO 45 AMPERES, 35 TO 55 VOLTS

Output ... ..	45 amperes, 35 - 55 volts.
Normal arc voltage ... ..	40 volts.
Range of arc voltage ... ..	35 to 55 volts.
Range of current ... ..	20 - 25 - 30 - 35 - 40 - 45 amperes.
Normal "strike" current ... ..	15 amperes.
Normal "burn in" current ... ..	25 amperes
Maximum "run" current ... ..	45 amperes
adjustable for running conditions.	
Available for use on any supply mains 380 to 440 volts, 3-phase, 50 cycles.	
Input on maximum load ... ..	2.8 k.w.
Dimensions ... ..	3ft. 6¼in. high × 1ft. 9in. deep × 2ft. 3in. wide.

## SPECIFICATION

Two Rectifiers are supplied, each giving six phase rectification. Each Rectifier is in a floor-mounting, ventilated sheet-steel cubicle, supplied complete with:—

**Valves** of long-life, full-wave Oxide Cathode type.

**Transformers** of double-wound air-cooled pattern.

**Chokes** of exclusive and special design.

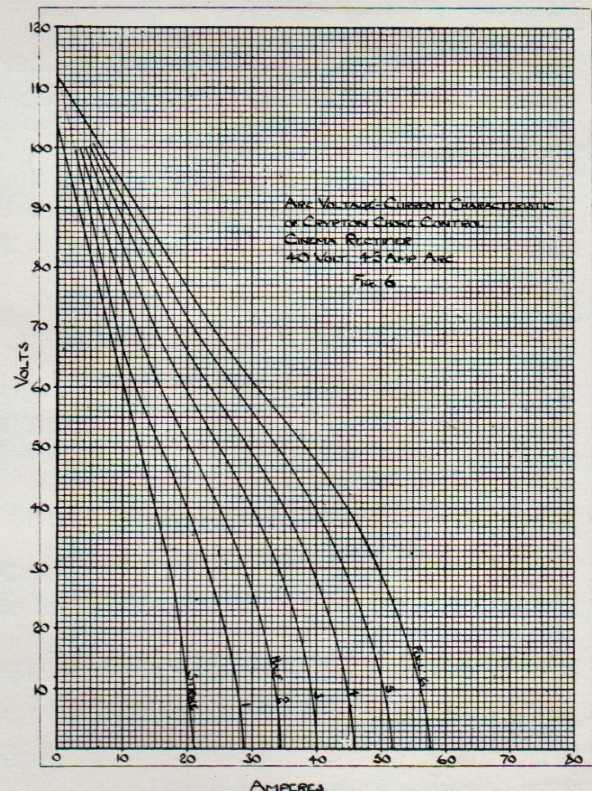
**Automatic Control Gear**, including Contactors designed for remote control.

**Plugs and Sockets** of enclosed type for adjustment of arc current.

**Fuses** of Home Office insulated pattern.

The Rectifier is supplied complete and ready for use in accordance with the illustrations given throughout this catalogue.

The normal output characteristics of the Rectifier are as illustrated in Fig. 3, which shows the "strike," "burn in" and "run" curves for average adjustments. The diagram also shows typical curves for each value of arc current available.





# "TWIN 60" RECTIFIER

FOR ARCS UP TO 60 AMPERES, 35 TO 55 VOLTS

Output ... ..	60 amperes, 35 - 55 volts.
Normal arc voltage ... ..	40 volts.
Range of arc voltage ... ..	35 to 55 volts.
Range of current ... ..	35 - 40 - 45 - 50 - 55 - 60 amperes.
Normal "strike" current ... ..	20 amperes.
Normal "burn in" current ... ..	30 amperes
Maximum "run" current ... ..	60 amperes
} adjustable for running conditions.	
Available for use on any supply mains 380 to 440 volts, 3-phase, 50 cycles.	
Input on maximum load ... ..	3.7 k.w.
Dimensions ... ..	3ft. 6¼in. high × 1ft. 9in. deep × 2ft. 3in. wide.

## SPECIFICATION

Two Rectifiers are supplied, each giving six phase rectification. Each Rectifier is in a floor-mounting, ventilated sheet-steel cubicle, supplied complete with:—

**Valves** of long-life, full-wave Oxide Cathode type.

**Transformers** of double-wound air-cooled pattern.

**Chokes** of exclusive and special design.

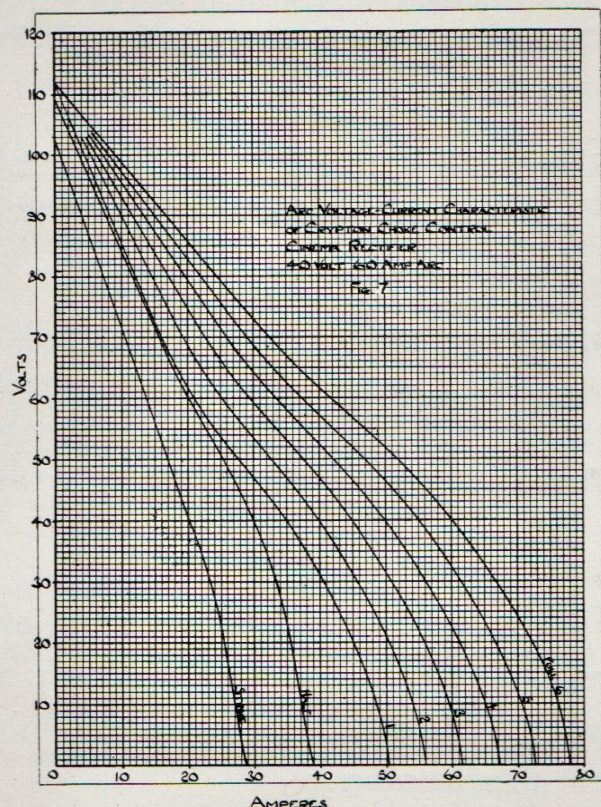
**Automatic Control Gear**, including Contactors designed for remote control.

**Plugs and Sockets** of enclosed type for adjustment of arc current.

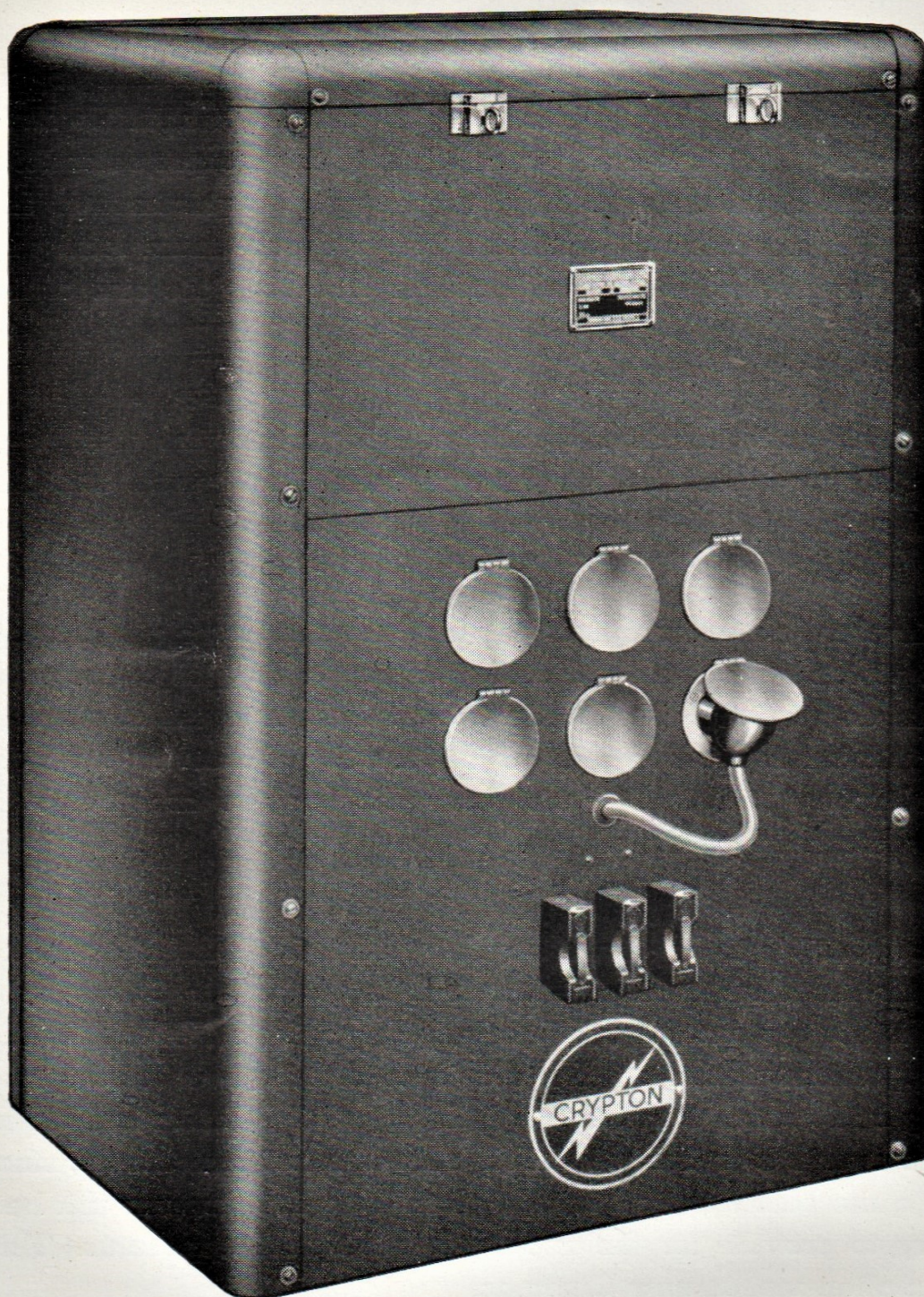
**Fuses** of Home Office insulated pattern.

The Rectifier is supplied complete and ready for use in accordance with the illustrations given throughout this catalogue.

The normal output characteristics of the Rectifier are as illustrated in Fig. 3, which shows the "strike," "burn in" and "run" curves for average adjustments. The diagram also shows typical curves for each value of arc current available.







Standard Variable Choke Control Rectifier.



## STANDARD CRYPTON CINEMA RECTIFIERS

*In addition to the "Variable" Choke Control Rectifiers illustrated in the preceding pages, Crypton also manufacture a complete range of both Air-Cooled and Oil-Immersed Type Rectifiers for feeding Projector Arcs through ballast resistances.*

*These rectifiers are described in the following pages and offer advantages which make them superior to any other type of converting plant of similar characteristics.*



# "TWIN 75" RECTIFIER

FOR ARCS UP TO 75 AMPERES, 35 TO 55 VOLTS

Output ... ..	75 amperes, 35 - 55 volts.
Normal arc voltage ... ..	40 volts.
Range of arc voltage ... ..	35 to 55 volts.
Range of current ... ..	50 - 55 - 60 - 65 - 70 - 76 amperes.
Normal "strike" current ... ..	20 amperes.
Normal "burn in" current ... ..	40 amperes.
Maximum "run" current ... ..	75 amperes
} adjustable for running conditions.	

Available for use on any supply mains 380 to 440 volts, 3-phase, 50 cycles.

Input on maximum load ... .. 4.6 k.w.

Dimensions ... .. 3ft. 6¼in. high × 1ft. 9in. deep × 2ft. 3in. wide.

## SPECIFICATION

Two Rectifiers are supplied, each giving six phase rectification. Each Rectifier is in a floor-mounting, ventilated sheet-steel cubicle, supplied complete with:—

**Valves** of long-life, full-wave Oxide Cathode type.

**Transformers** of double-wound air-cooled pattern.

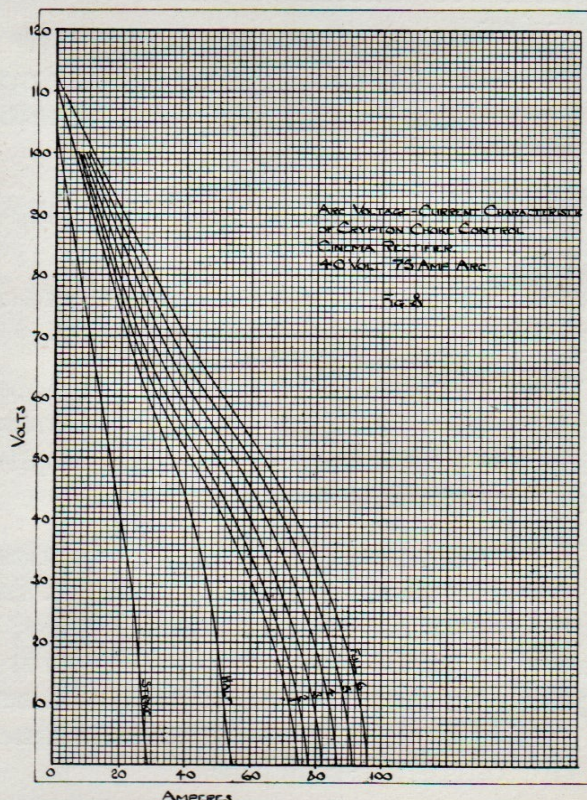
**Chokes** of exclusive and special design.

**Automatic Control Gear**, including Contactors designed for remote control.

**Plugs and Sockets** of enclosed type for adjustment of arc current.

**Fuses** of Home Office insulated pattern.

The Rectifier is supplied complete and ready for use in accordance with the illustrations given throughout this catalogue.





# OPERATION OF SPOTLIGHTS AND EFFECTS APPARATUS

In cases where spotlights, slide lantern or other effects apparatus is used in addition to the two projectors, it is not essential to provide additional Rectifiers. Arrangements can be made for suitable switching arrangements to be provided which enable the arc projector Rectifiers to be transferred where necessary, according to requirements. In these conditions it is necessary to estimate the total maximum load which is ever likely to be applied on the Rectifiers and base the size of the unit accordingly.

The exact arrangement depends entirely upon the nature of the auxiliary effects apparatus, the extent to which it is used and the type of control required.

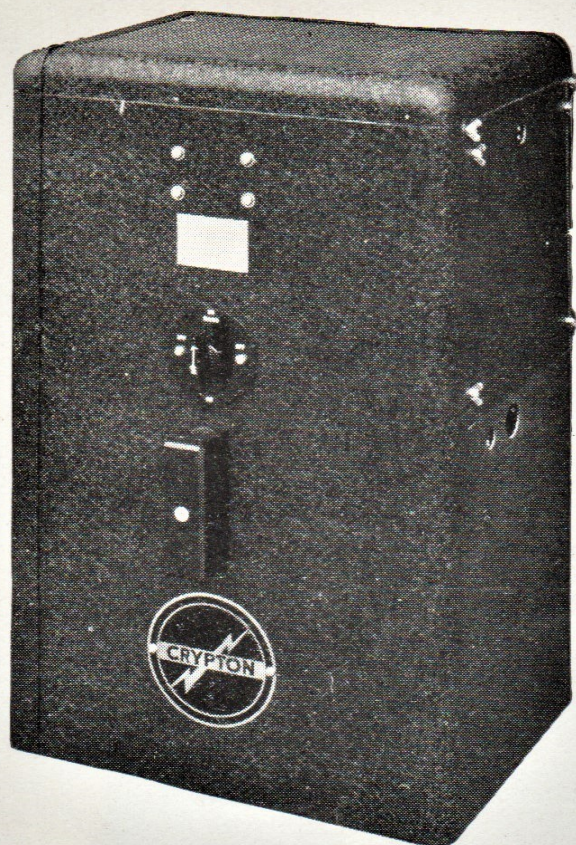
The simplest arrangement is to provide double-pole, double-throw switches which switch in the Rectifier either to the projectors or effects apparatus as required. An alternative method is to employ a series of special interlocking contactors which can be remotely controlled by means of rotary switches in the same way as the arc projectors are controlled from the operating box.

It is not possible to lay down any hard and fast rules, beyond a statement of the fact that the use of the Crypton Automatic Choke-controlled Rectifier is more practical and less expensive than the supply of additional apparatus, including the provision of whatever arrangement of switching and control is necessary. This type of Rectifier has an advantage here over the ordinary Rectifier using ballast resistances, since it is possible quite easily to add further plant from time to time if it becomes necessary to provide for the supply of additional apparatus. This is a condition often met in new Cinemas.

Crypton Equipment Ltd. invite applications for complete layouts and specifications, which will gladly be provided without obligation or cost, to meet any special Cinema conditions either as regards arc projectors only or the supply of additional effects apparatus.



# RECTIFIERS WITH AIR-COOLED TRANSFORMERS



## Ideally Suitable where Space is Limited

The development of the Crypton Air-cooled Cinema Rectifier is a noteworthy achievement in modern Rectifier design. Whilst built to the same mechanical and electrical specification as all other Crypton Rectifiers, exclusive and original features have been introduced to save space and weight and to provide the smallest, lightest and most compact Rectifier yet available.

The saving in size and weight has not been obtained at the expense of quality. The design of the Rectifier, its rating and temperature rise, overload capacity and dependability are in every way equal to any other Rectifier made.

Saving in space comes mainly from the transformer, which is built up of selected materials and of special mechanical and space-saving design. Further space is saved by mounting the valves and gear directly on the transformer, providing a complete and self-contained chassis. Easy accessibility is provided by arranging for the two sides and the top of the cubicle to be easily removable.

The Crypton air-cooled Rectifier, as with all other Cinema Rectifiers, is guaranteed for one year, and all valves carry a full two years' proportionate guarantee.

A complete range of Rectifiers is available in capacities from two 25 amp. arcs to two 150 amp. arcs, and Rectifiers of any special rating can be quoted for on application.

No other Rectifier is so simple to install as this new design. The Rectifier is so small that it can, without difficulty, be easily transported. Space requirements are so small that the Rectifier can literally be installed anywhere. Wiring is extremely easy, and everything has been done to make the installation, wiring, connecting up and operation of the Rectifier more simple than anything previously available.

The complete Rectifier has no moving parts, requires no foundations or special control gear and is supplied complete with valves, mains switch and fuse, being ready for immediate connecting up and service.



## SPECIFICATION

### Rectifying Valves

The rectifying valves are of the full-wave gas-filled type, proportionately guaranteed for two years, and with an average life, as proved in practice, of at least four years. With Crypton design, valves are not overloaded. Spare valves are low in first cost and easily obtained. Experience has proved conclusively that the modern rectifying valve—as fitted to Crypton Rectifiers—is a thoroughly sound and practical engineering proposition, and there need be no fear whatever of undue breakdown or lack of dependability. Many hundreds of Crypton Cinema Rectifiers have been in successful service for years and conclusively prove their dependability.

### Air-cooled Transformers

Transformers are double wound air-cooled built to current B.E.S.A. requirement, are of liberal rating and the highest quality of design and construction throughout.

### Valve Assembly

Another exclusive feature is the elimination of slate or insulated panels and their replacement by solid copper bus-bar supports for valves. The heavy copper bus-bars are carried on porcelain insulators securely mounted above the cubicle. The interior wiring is of asbestos-covered cable throughout. Hinged doors provide immediate accessibility to valves and all other parts.

### Cubicle

The cubicle is of solid steel, well ventilated, designed for floor-mounting and of durable black crystalline finish with all metal parts bright chromium-plated.

### Interconnections

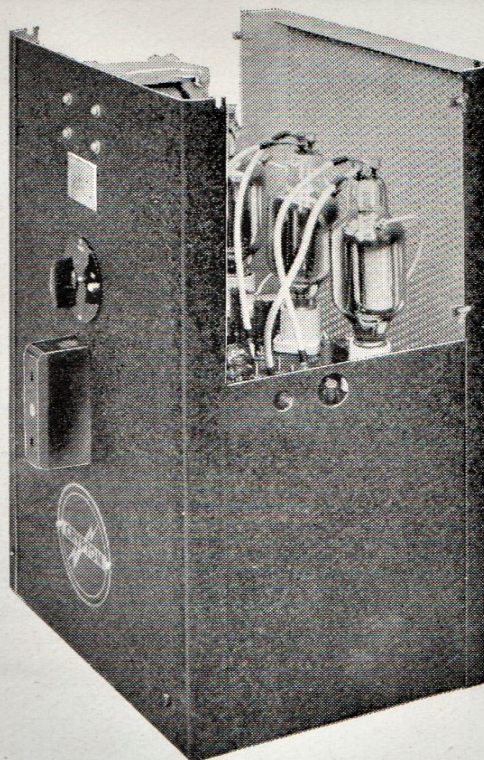
All necessary interconnections are made in asbestos-covered cable, neatly arranged with full accessibility to all connections. Wiring terminals are conveniently situated and so designed as to make the connecting up of the Rectifier as simple as it is possible.

### "Twin" Rectifiers

Twin-type Rectifiers are of special design for supplying two projectors. The valves are not overloaded during changeover, the overload being restricted to the transformer only. These Rectifiers are the lowest in first cost and by far the most popular type. Rectifiers of this design are available in capacities up to 2—150 amp. arcs.

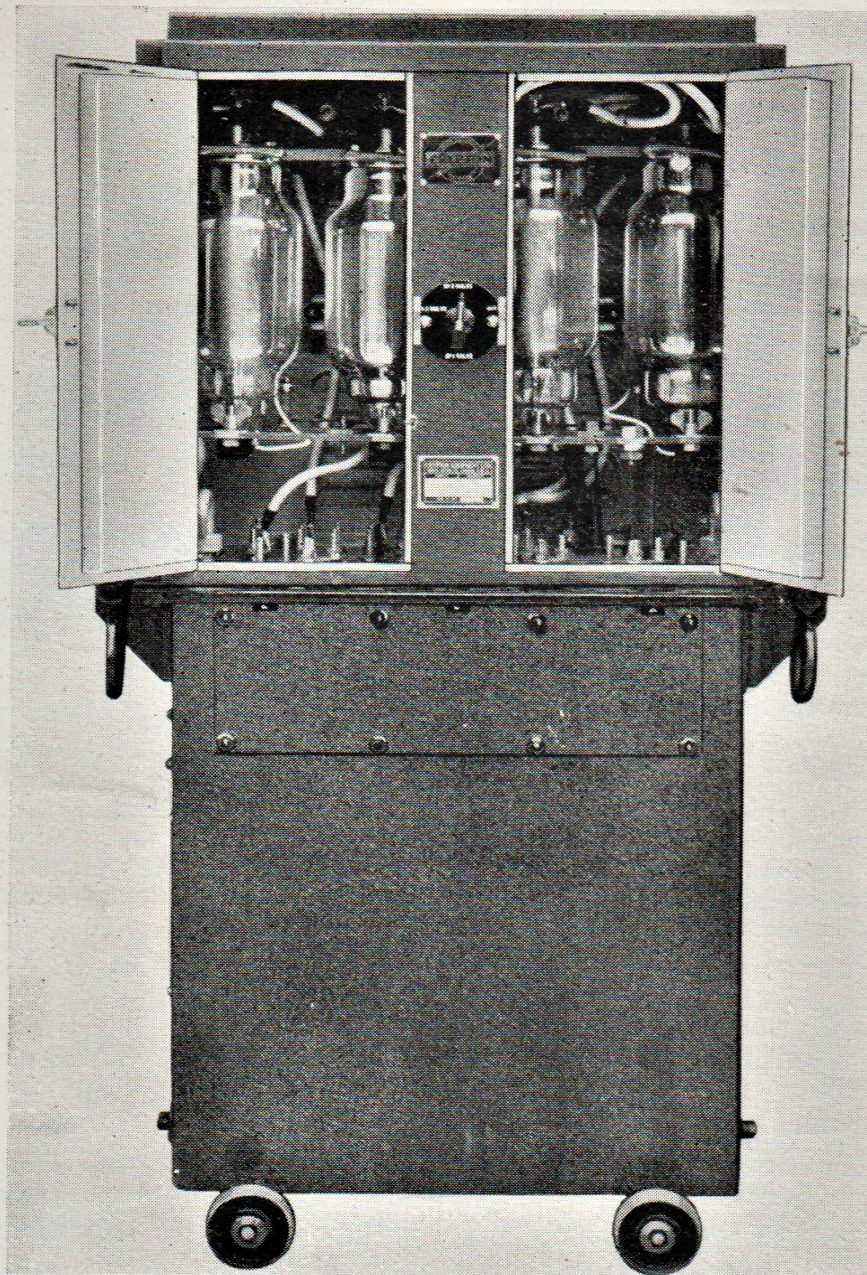
### Auxiliary Valve Circuit

The arrangement permits of a spare valve being permanently fitted in the Rectifier and an exclusive quick make-and-break rotary switch enables the spare valve to be automatically switched in position to replace any valve which may have failed. With the multiple valve arrangement provided in the Crypton Rectifier there is no danger of a complete breakdown, since in the event of a valve failure it is both easy and inexpensive to replace one small single valve. The auxiliary valve circuit design enables this to be done immediately without the necessity of opening up the cubicle and replacing the valve forthwith.





## RECTIFIERS WITH OIL-COOLED TRANSFORMERS



**Oil-cooled Transformer with Cubicle  
mounted direct on Transformer**

This type of Rectifier is quite unique and gives all the advantages of an oil-cooled transformer without undue space requirements. The transformer, as illustrated, is mounted on wheels and is completely enclosed and oil-cooled. Above the transformer is mounted a cubicle which holds the valves, valve bus-bars and ballast resistance and inter-connections. Easy accessibility is provided and transportation is extremely simple. Where the advantage of an oil-cooled transformer is required and space is restricted or transportation difficult, this type will be found an ideal selection.



## SPECIFICATION

### Rectifying Valves

The rectifying valves are of the full-wave gas-filled type, proportionately guaranteed for two years, and with an average life, as proved in practice, of at least four years. With Crypton design, valves are not over-loaded. Spare valves are low in first cost and easily obtained. Experience has proved conclusively that the modern rectifying valve—as fitted to Crypton Rectifiers—is a thoroughly sound and practical engineering proposition, and there need be no fear whatever of undue breakdown or lack of dependability. Many hundreds of Crypton Cinema Rectifiers have been in successful service for years and conclusively prove their dependability.

### Oil-cooled Transformers

Transformers are totally enclosed oil-immersed, built to current B.E.S.A. requirements, are of liberal rating and of the highest quality of design and construction throughout. They are of truck-type construction, mounted on wheels, and supplied complete with oil, the necessary oil level indicators being fitted.

### Valve Assembly

Another exclusive feature is the elimination of slate or insulated panels and their replacement by solid copper bus-bar supports for valves. The heavy copper bus-bars are carried on porcelain insulators securely mounted above the cubicle. The interior wiring is of asbestos-covered cable throughout. Hinged doors provide immediate accessibility to valves and all other parts.

### Cubicle

The cubicle is of solid steel, well ventilated, designed for floor-mounting and of durable black crystalline finish with all metal parts bright chromium-plated.

### Interconnections

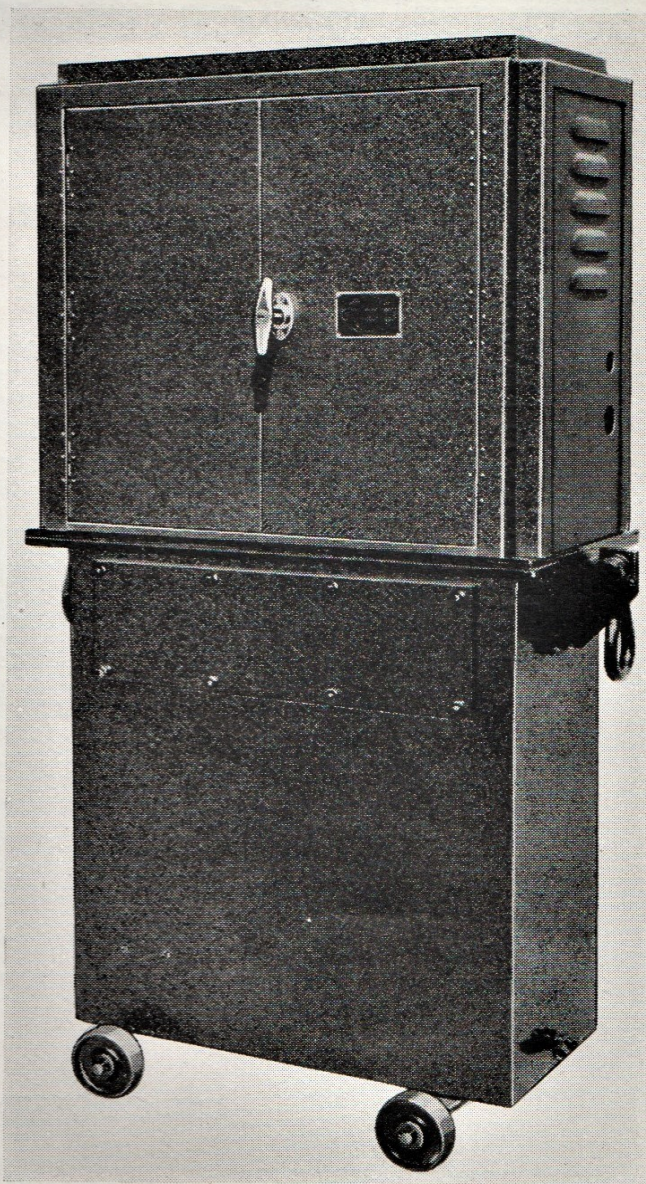
All necessary interconnections are made in asbestos-covered cable, neatly arranged with full accessibility to all connections. Wiring terminals are conveniently situated and so designed as to make the connecting up of the Rectifier as simple as it is possible.

### "Twin" Rectifiers

Twin-type Rectifiers are of special design for supplying two projectors. The valves are not overloaded during changeover, the overload being restricted to the transformer only. These Rectifiers are the lowest in first cost and by far the most popular type. Rectifiers of this design are available in capacities up to 2—150 amp. arcs.

### Auxiliary Valve Circuit

The arrangement permits of a spare valve being permanently fitted in the Rectifier and an exclusive quick make-and-break rotary switch enables the spare valve to be automatically switched in position to replace any valve which may have failed. With the multiple valve arrangement provided in the Crypton Rectifier there is no danger of a complete breakdown, since in the event of a valve failure it is both easy and inexpensive to replace one small single valve. The auxiliary valve circuit design enables this to be done immediately without the necessity of opening up the cubicle and replacing the valve forthwith.





# OUTPUTS OF CRYPTON STANDARD CINEMA RECTIFIERS

## AIR-COOLED TYPE A

Type	Output at 70/80/90 Volts		Dimensions L. × H. × D.
	For Two Arcs each	No. of Valves	
TC 325A	25 amps.	3 × 1738	1ft. 9in. × 2ft. 10in. × 1ft. 6in.
TC 345A	45 amps.	3 × 1749	1ft. 9in. × 2ft. 10in. × 1ft. 6in.
TC 360A	60 amps.	3 × 1759	1ft. 9in. × 2ft. 10in. × 1ft. 6in.
TC 375A	75 amps.	3 × 1759	1ft. 9in. × 2ft. 10in. × 1ft. 6in.
TC6100A	100 amps.	6 × 1759	3ft. 6in. × 4ft. 0in. × 2ft. 3in.
TC6120A	120 amps.	6 × 1759	3ft. 6in. × 4ft. 0in. × 2ft. 3in.
TC6150A	150 amps.	6 × 1759	3ft. 6in. × 4ft. 0in. × 2ft. 3in.
<b>Output at 100/110 Volts</b>			
TD 325A	25 amps.	3 × 1738	1ft. 9in. × 2ft. 10in. × 1ft. 6in.
TD 345A	45 amps.	3 × 1749	1ft. 9in. × 2ft. 10in. × 1ft. 6in.
TD 360A	60 amps.	3 × 1759	1ft. 9in. × 2ft. 10in. × 1ft. 6in.
TD 375A	75 amps.	3 × 1759	1ft. 9in. × 2ft. 10in. × 1ft. 6in.
TD6100A	100 amps.	6 × 1759	3ft. 6in. × 4ft. 0in. × 2ft. 3in.
TD6120A	120 amps.	6 × 1759	3ft. 6in. × 4ft. 0in. × 2ft. 3in.
TD6150A	150 amps.	6 × 1759	3ft. 6in. × 4ft. 0in. × 2ft. 3in.

## OIL-COOLED TYPE B

Type	Output at 70/80/90 Volts		Dimensions L. × H. × D.
	For Two Arcs each	No. of Valves	
TC 325B	25 amps.	3 × 1738	2ft. 6in. × 5ft. 0in. × 1ft. 3in.
TC 345B	45 amps.	3 × 1749	2ft. 6in. × 5ft. 0in. × 1ft. 3in.
TC 360B	60 amps.	3 × 1759	2ft. 6in. × 5ft. 6in. × 1ft. 3in.
TC 375B	75 amps.	3 × 1759	2ft. 6in. × 5ft. 6in. × 1ft. 3in.
TC6100B	100 amps.	6 × 1759	2ft. 6in. × 7ft. 6in. × 1ft. 3in.
TC6120B	120 amps.	6 × 1759	2ft. 6in. × 7ft. 6in. × 1ft. 3in.
TC6150B	150 amps.	6 × 1759	2ft. 6in. × 7ft. 6in. × 1ft. 3in.
<b>Output at 100/110 Volts</b>			
TD 325B	25 amps.	3 × 1738	2ft. 6in. × 5ft. 0in. × 1ft. 3in.
TD 345B	45 amps.	3 × 1749	2ft. 6in. × 5ft. 0in. × 1ft. 3in.
TD 360B	60 amps.	3 × 1759	2ft. 6in. × 5ft. 6in. × 1ft. 3in.
TD 375B	75 amps.	3 × 1759	2ft. 6in. × 7ft. 6in. × 1ft. 3in.
TD6100B	100 amps.	6 × 1759	2ft. 6in. × 7ft. 6in. × 1ft. 3in.
TD6120B	120 amps.	6 × 1759	2ft. 6in. × 7ft. 6in. × 1ft. 3in.
TD6150B	150 amps.	6 × 1759	2ft. 6in. × 7ft. 6in. × 1ft. 3in.



# SOME OF THE CINEMAS EQUIPPED WITH CRYPTON RECTIFIERS

Crypton Rectifiers have been installed in many hundreds of Cinemas, of which the following are typical examples:

Broadway, Bristol.	Paramount, London.	News State, London.
Herga, Wealdstone.	Odeon, Leicester.	Cameo, London.
Odeon, York.	Pavilion, Glasgow.	Royal, London.
Premier, Woolwich.	Grosvenor, Glasgow.	Odeon, Falmouth.
Odeon, Aylesbury.	Odeon, Forest Gate.	Rex, Coventry.
Savoy, Southampton.	Plaza, Dundee.	Astoria, Bournemouth.
Pavilion, Scunthorpe.	Odeon, Dalston.	Curzon, Brighton.
Odeon, Reading.	Ambassador, Bristol.	Odeon, Dudley.
New Rex, Romford.	Odeon, Chester.	Paramount, Birmingham.
Odeon, Peterborough.	Olympia, Blackburn.	Odeon, Balham.
Ritz, Norwich.	Odeon, Bridgewater.	Ritz, Bournemouth.
Rex, Nottingham.	Metropole, Bristol.	Odeon, Bristol.
Odeon, Morecambe.	Odeon, Bournemouth.	Regal, Atherstone.
Empire, Leicester.	New, Brislington.	Central, Braintree.
Odeon, Newport.	Odeon, Bury.	Tatler, Birmingham.
New Regal, Kennington.	Broadway, Belfast.	Empire, Biggleswade.
Odeon, Ipswich.	Odeon, Boston.	Odeon, Burnley.
Queens, Enfield.	Odeon, Epsom.	Regal, Cirencester.
Odeon, Exeter.	Palace, Bexley Heath.	New Regal, Dursley.
Ambassador, Cosham.	Odeon, Bolton.	Plaza, Dorchester.
Odeon, Hanley.	Plaza, Dublin.	Forum, Gosport.
Regent, Dundee.	Palace, Farnham.	Odeon, Lowestoft.
Palace, Huddersfield.	Odeon, Lancaster.	La Boheme, London.
Odeon, Norwich.	Palace, Kirkcaldy.	New Classic, London.
Toynbee Hall, London.	Odeon, Portsmouth.	Odeon, Penge.
Clifton, Leominster.	Odeon, Rhyl.	Regal, Nairn.
Odeon, Loughborough.	St. James, Northampton.	Odeon, Stafford.
New Court, Norbury.	Odeon, Herne Bay.	New, Portsmouth.
Playhouse, Oxford.	Carlton, Okehampton.	Odeon, St. Austell.
Odeon, Horsham.	Palace, Shoeburyness.	Picturedrome, Stamford.
Rivoli, Ruislip.	Odeon, Swiss Cottage.	Odeon, Southsea.
Empire, Sandy.	News, Southampton.	



All goods manufactured by the Company are guaranteed for a period of one year from date of supply against any fault or defect arising out of or occasioned by defective material or workmanship. This guarantee does not cover faults occasioned by wear and tear, neglect, accident, misuse or overload, and is limited to repair or replacement of the defective part, free of charge, providing same be returned to the Company's works properly packed and carriage paid. No responsibility is accepted for indirect or consequential loss or damage arising out of faulty material or workmanship. No guarantee is given by the Company in respect of other manufacturers' products, but the benefit of any guarantee given by such manufacturers will be applied. This guarantee does not include the loan of equipment during repair of faulty equipment.

## Other Crypton Products include

Metal Rectifiers for all purposes.

Mercury Cathode Rectifiers up to 200 k.w.

Battery Charging Equipment.

Emergency Lighting Equipment.

"Home" Battery Chargers for the private motorist.

Crypton "Tuning Service" Equipment for improving motor-car performance.

Specialised equipment for Automobile Engine and Electrical Service.

Details of any of the above available on application.







