

NEWTON RECTIFIERS



OXIDE CATHODE

MERCURY ARC



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INTRODUCTION

ANY method of converting alternating to direct current must fulfil three essential requirements. It must be reasonable in cost, dependable in service, and economical in operation.

Experience has conclusively proved that these vital requirements are most satisfactorily met by the use of Static Rectifiers. Such Rectifiers offer indisputable advantages over any other method, and unquestionably provide the natural solution to all converting problems.

The type of Rectifier which has been mainly used hitherto is the Mercury Arc Rectifier, and experience extending now for many years has proved its simplicity, dependability and economy.

During recent years, however, an alternative type of Rectifier has become available—the Oxide Cathode pattern. This has the advantage of extreme simplicity, since it dispenses with the necessity for special ignition and exciter circuits, offers the advantage of lower first cost and many other important advantages which are fully described in the following pages.

The complete range of both types of Rectifiers is described in this catalogue, making it possible to offer the most suitable type for a given application. Every Rectifier embodies the result of considerable research and experience, whilst several years of continuous satisfactory operation in a wide variety of applications has established their superior dependability and performance.

Nearly five thousand Newton Rectifiers are in service and their success is sufficient to justify implicit confidence in their economical and dependable operation. They offer unassailable advantages over any other method of converting A.C. to D.C. and sell on merit against Rectifiers of competitive manufacture.



The Fundamental Principles of Static Rectifiers

ELECTRON EMISSION

Two electrodes, one hot and one cold, contained in an evacuated glass vessel, will, under certain conditions, where a potential difference is applied to the electrodes, cause a current to flow from the cold electrode to the hot one. If a positive potential is applied to the cold electrode, called the anode, and a negative potential is applied to the hot electrode, called the cathode, electrons (negative particles of electricity) will be liberated at the cathode, and will be attracted by the positive field of the anode, the result being a flow of electrons inside the vessel from negative to positive. This flow of electrons is in effect a flow of current, although the flow judged externally is regarded as positive to negative. If the polarity is reversed, the electron flow ceases.

It will be seen, therefore, that if alternating current is applied to the electrodes, a current will flow in one direction only, becoming uni-directional, or direct current. Fig. 1 gives the essentials of such a Rectifier as described above. "A" is the anode, "K" is the cathode, "T" is the transformer which converts the applied A.C. current to a suitable value, depending upon the voltage required in the D.C. circuit. When anode "A" is positive, an electron flow is established. Current flows from "A" to "K," thence via the transformer "T" to the direct current load. When "A" is negative, the electron flow ceases and consequently no current flows.

Figure 2 indicates the extent of the rectification or conversion of current from A.C. to D.C., the resultant wave form being termed "half wave." Commercial Rectifiers as marketed by Rotax Ltd. give "full wave" rectification, the negative half-cycles indicated in fig. 2 being transformed to positive half-cycles.

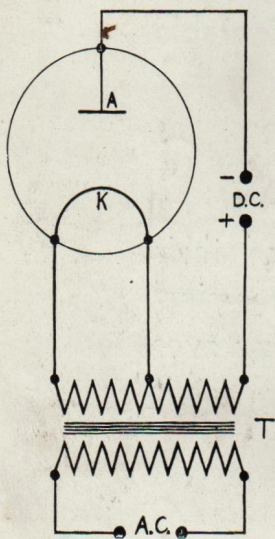


Fig. 1

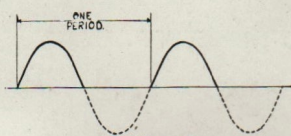


Fig. 2

THE KENETRON RECTIFIER

A simple Rectifier such as described is known as a Kenetron Rectifier. From a practical point of view, however, it suffers from the disadvantage that a very high internal voltage drop occurs in the valve.

Immediately the electron stream has been established between the anode and the cathode, a screening effect is imposed by a cloud of electrons which forms over the cathode. This electron cloud forms a true negative screen and makes it necessary to apply a high potential difference between the anode and cathode, or in other words, a very high positive charge is required on the anode, before sufficient attraction can be established to cause an adequate electron flow.

IONISATION

The difficulties of high internal voltage drop were finally overcome following research by the introduction of inert gas into the glass vessel. The gas can be considered as made up of particles comprising a positively charged nucleus surrounded by a number of orbital electrons. Collisions take place between the electrons emitted from the cathode and the gas particles, resulting in a loss of electrons from the particles which consequently become positive and are attracted to the negative cathode.

The screening effect of the negative electron cloud around the cathode is thus counteracted and a far lower anode positive charge is required to establish the desired electron flow. This principle is known as "Ionisation."

THERMIONIC GAS-FILLED VALVE.

Rectifying valves filled with inert gas are known as thermionic gas-filled valves. They are fitted with a special electron-emitting filament and one or more graphite anodes. Their rectification properties are both efficient and satisfactory, but in their original design they were comparatively expensive and suffered from the disadvantage of a short life. These difficulties have, however, been overcome with the introduction of Oxide Cathode Valves as described in detail overleaf, from which it will be seen that Rectifiers incorporating such valves are both low in first cost and have assured long life.



THE OXIDE CATHODE VALVE

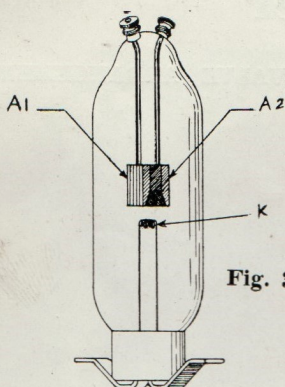


Fig. 3

The modern Oxide Cathode Valve consists of an airtight glass bulb filled with low pressure gas or vapour. Fig. 3 indicates the basic construction and shows a filament "K" and two graphite anodes "A1" and "A2."

The original thermionic gas-filled valve was provided with an expensive filament, one well-known type being of Ptiridium. This had the disadvantage of high cost and relatively short life. It was subsequently replaced by an oxide coated nickel filament, which was cheaper and had a longer life, but had the disadvantage of a comparatively low melting point.

In 1927 a great improvement was made in filament construction by the provision of a Tungsten core coated with nickel, the nickel being again coated with a very solid layer of oxide. The oxide forms an excellent emitter and the result has been the provision of the otherwise excellent nickel cathode on a Tungsten core, the melting point of which is much higher than the temperature at which the oxide emits.

The modern barium oxide filament has, therefore, the essential features of high efficiency following low voltage drop, low cost construction and long life. Practical experience has now extended for over six years and modern valves are constructed to give a guaranteed life of 2,500 hours, and the average life is as much as 10,000 hours.

It will be observed that a metal screen is provided between the anodes. This forms an obstacle in the path from anode to anode and prevents the arc discharging between the anodes, a phenomenon known as "back fire." For the same reason anodes are made of graphite which has a very low thermionic emission and consequently prevents any tendency for the glow discharge to develop into an arc even at high temperatures.

Efficient sealing is a most important factor, particularly with heavy currents. In the valves used with Newton Rectifiers the sealing construction takes the form of chromium and iron alloy and a special kind of glass. The inlet and outlet wires of the valve are, in practice, welded to small plates of the above-mentioned chromium/iron alloy, these plates being joined at the edges with glass both to each other and to the bulb. This gives freedom in selecting the number of lead-in wires, making it possible with ease to provide multiple anodes and deal with heavy currents.

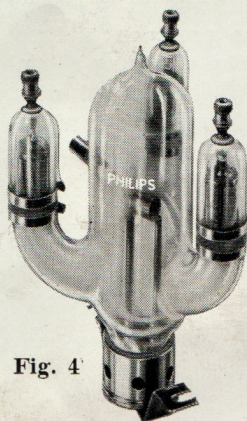


Fig. 4

The efficiency of the Oxide Cathode Valve is high, the only loss being power required to heat the filament and the small internal voltage drop. The filament loss averages from 2.5 to 3 watts per ampere output. The internal voltage drop is from 12 to 20 volts and is an approximate constant. Thus, the efficiency of the Oxide Cathode Rectifier is mainly dependent on the output voltage and ranges from 50% for low voltage Rectifiers of 12/20 volts output up to 85 to 90% for voltages from 200/250 volts.

THE MERCURY ARC BULB

The Mercury Arc Bulb consists of a highly exhausted quartz glass bulb containing a pool of mercury which forms the cathode and a number of graphite anodes. Fig. 5 shows the arrangement diagrammatically, "K" being the cathode and "A1" and "A2" the anodes.

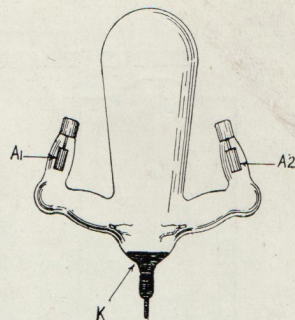


Fig. 5

If by artificial means a spot on the mercury is raised to a high temperature, making it incandescent, mercury vapour is produced and negative electrons are emitted from the cathode. If any anode has a positive potential with respect to the mercury cathode, an electron flow between cathode and anode will be established.

The principle of ionization previously explained exists, since some of the electrons collide with the mercury vapour particles, positive ions being released which move at a high speed towards the cathode giving up their energy in the form of heat on striking the cathode, thus maintaining the necessary high temperature of the mercury pool.

An electron flow will be established only between the cathode and positively charged anodes, and consequently the bulb acts as a rectifier, allowing the current to flow in one direction only.

As explained above, it is essential to raise a portion of the mercury to incandescence before an electron flow can be established. In other words, a "Hot Spot" has to be formed. The formation of this "Hot Spot" constitutes starting up of the rectifier and is technically called ignition.

In normal circumstances, if the load were switched off the "Hot Spot" would disappear, and consequently means must be provided to maintain it under "no load" conditions. This is effected by the provision of auxiliary anodes arranged above the mercury pool. These anodes are supplied at a low voltage and immediately ignition is initiated by the formation of the "Hot Spot" the auxiliary anodes maintain the arc.

The Mercury Arc Bulbs as used in Newton Rectifiers are both highly efficient and absolutely dependable. They have a particularly high quartz content which enables them to withstand the temperature of the mercury arc with a high factor of safety.

One advantage of outstanding importance is the particularly dependable and efficient method of forming the necessary "Hot Spot." Whereas, in most bulbs, moving parts are fitted inside the bulb, in the case of Newton Rectifiers the operation is entirely electrical — there are no moving parts whatever. Many hundreds of bulbs are in service and have been operating without trouble of any kind for periods up to ten years.

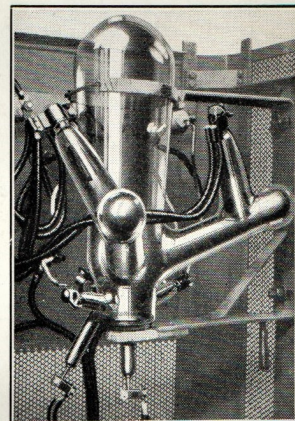


Fig. 6



STATIC RECTIFIERS

The Oxide Cathode Rectifier

SINGLE PHASE ARRANGEMENT

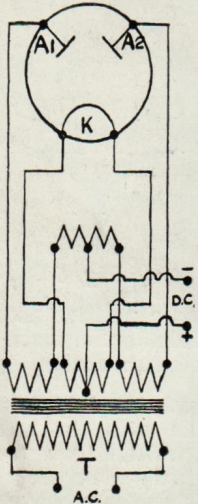


Fig. 7

Fig. 7 indicates the arrangement of an Oxide Cathode Rectifier for single phase. If it is considered that the left-hand side of the transformer winding "T" has a positive voltage at a given moment, anode A1 will be positive. Current will flow from A1 to the cathode "K," thence to the D.C. load and back through the neutral point of the transformer. In the second half period, the right half of the transformer winding will be positive and current will therefore flow from A2 to "K," thence to the D.C. load and back through the transformer neutral.

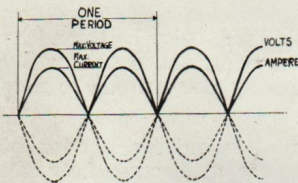


Fig. 8

The resultant wave form is indicated in fig. 8. The rectification is full wave, which constitutes an important advantage against many Rectifiers, which give half wave rectification only.

THREE PHASE SINGLE VALVE ARRANGEMENT

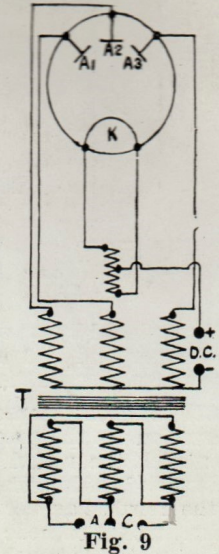


Fig. 9

A fundamental diagram of an Oxide Cathode Rectifier, fitted with a single three phase rectifying valve, is indicated in fig. 9. The theory of operation is identical to the single phase rectifier, three separate anodes being fitted with one common cathode. The resultant wave form is indicated in fig. 10.

For many requirements, such as Battery Charging, this wave form would be suitable, but there are other requirements which necessitate smoothing the rectified output. Smoothing arrangements, in the form of inductances or chokes, can without any difficulty, in these circumstances, be provided.

Alternatively, six phase Rectification can be provided as indicated below, in which case smoothing is unnecessary.

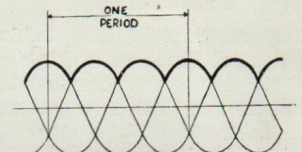


Fig. 10

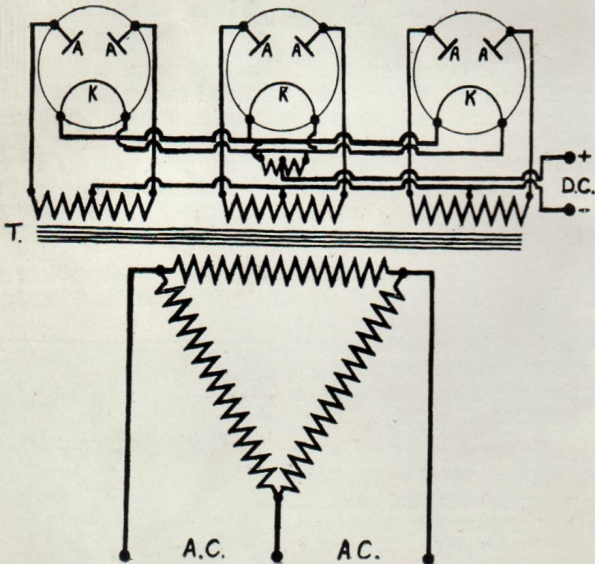


Fig. 11

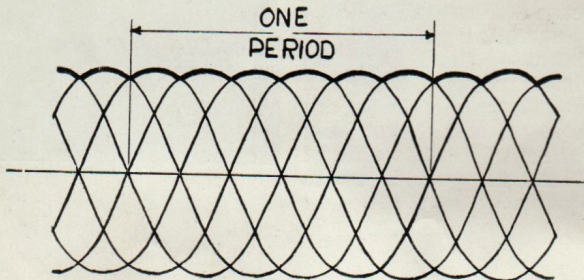


Fig. 12

SIX PHASE RECTIFICATION WITH THREE VALVES

The advantages of six phase rectification are obvious from a consideration of the wave form in fig. 12. As will be seen, a remarkably smooth output is obtained, which, in practice, gives a ripple variation of only about 4%. Six phase rectified current is suitable for practically all requirements, without the necessity of using any special smoothing arrangement.

In the case of Mercury Arc Rectifiers, the advantages of six phase rectification are in many cases sufficient to justify comparatively heavy increased cost, by the provision of a six anode bulb. In the case of Newton Oxide Cathode Rectifiers, however, all the advantages of six phase rectification can be obtained without increasing the cost. This is effected by the provision of three separate single phase two anode bulbs, providing a total of six anodes, which give six phase rectification. A fundamental diagram of a complete six phase three-valve Rectifier is given in fig. 11. This arrangement not only has the advantages of a remarkably smooth output, but in most cases the Rectifier is arranged so that if one valve fails, the remaining two will carry the load until a new one can be fitted. The wave form with one valve out of operation becomes, of course, temporarily less smooth.



The Mercury Arc Rectifier

SINGLE PHASE ARRANGEMENT

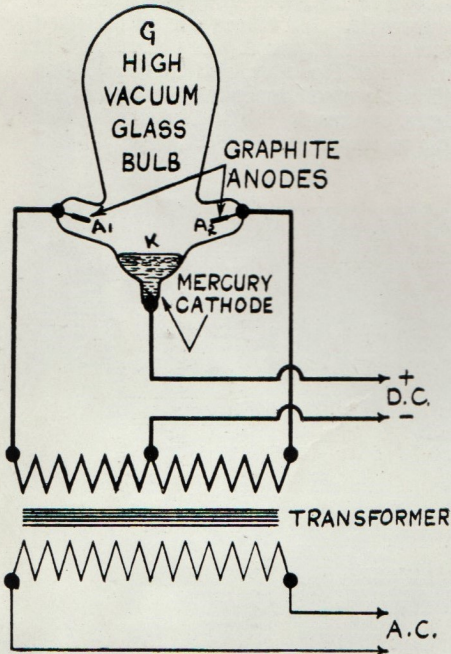


Fig. 13

The Rectifier therefore gives full wave rectification, as described on the preceding page for the Oxide Cathode Rectifier, the wave form being similar to fig. 8.

A typical diagram of a single phase Mercury Arc Rectifier is given in fig. 13. "G" is a high vacuum glass Bulb fitted with two electrodes, A1 and A2, and a mercury cathode "K." If by artificial means the temperature of a portion of the mercury is made incandescent, mercury vapour is produced and negative electrons are emitted, as previously described, these being attracted by either anode having a positive potential in respect to the cathode.

IGNITION

To start up the Mercury Arc Bulb, it is necessary to make a portion of the Mercury Pool incandescent, or form a "Hot Spot." There are many methods of doing this, some of which necessitate the use of moving parts within the bulb, a method obviously subject to disadvantages.

With bulbs used in Newton Rectifiers, all such moving parts are avoided. This is graphically illustrated in fig. 14. An extra arm is fitted in the base of the bulb, and mercury fills this arm as well as the main mercury pool, leaving a small bridge between the two. A special ignition transformer giving a heavy current at about 3 volts is connected across the bridge. When the transformer is switched on, a heavy current flows, which sets up a mutual repulsion in the mercury, due to the electric field. The action is most intense at the bridge, where the current density is obviously greatest. This causes a rupture of the mercury, resulting in a heavy spark, which initiates the "Hot Spot." The action is instantaneous and it is possible to generate a succession of "Hot Spots," should the initial "Hot Spot" fail to ignite, without causing damage to the bulb.

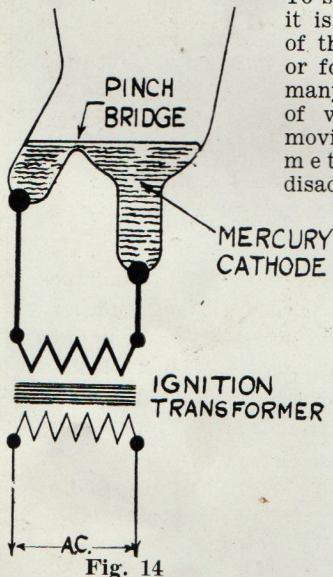


Fig. 14

THREE PHASE ARRANGEMENT

A fundamental diagram of a three phase Mercury Arc Rectifier is indicated in fig. 15. Three anodes are normally fitted, and the resultant wave form is as indicated in fig. 10. By increasing the transformer secondary phases to six, and by fitting the bulb with six anodes, it is possible to obtain six phase rectification, giving a wave form as fig. 12.

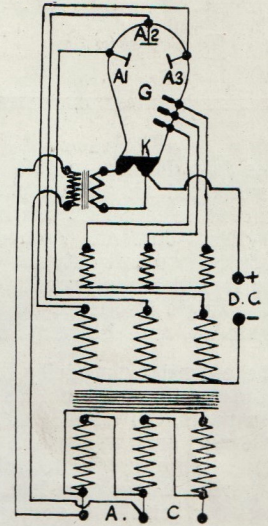


Fig. 15

AUXILIARY CIRCUITS

In ordinary circumstances, if the main Rectifier load is switched off, the "Hot Spot" will disappear. In practice, therefore, it is necessary to maintain the "Hot Spot" when the Rectifier is on no load.

For this purpose, auxiliary anodes are provided in addition to the main anodes. They are supplied with a low voltage from an exciter transformer, and immediately the "Hot Spot" is initiated at the bridge, an arc is struck between the auxiliary anodes and the cathode. Fig. 16 shows the arrangement for a three phase Rectifier.

The current in the auxiliary circuit is limited by exciter resistances, and a relay disconnects the auxiliary circuit immediately the main arc current flows.

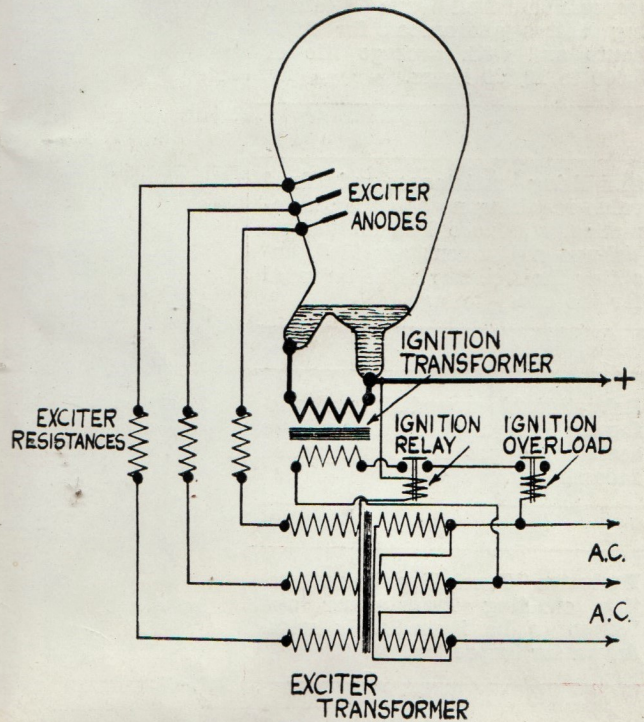


Fig. 16

OXIDE CATHODE RECTIFIERS

Design and Construction

The introduction in 1927 of the Oxide Cathode Rectifier constituted an almost phenomenal advance in simplified and more efficient methods of converting alternating to direct current. Although originally confined to comparatively small outputs, progress has been so rapid, and the Rectifier has proved to be so satisfactory in practice, that single Rectifiers up to 180 amperes output are now available, and the range is rapidly being extended.

The essential simplicity of the Rectifier will be apparent from the illustration. As will be seen, it consists of only two parts, the transformer and the valves. There are no moving parts whatever. Valves can be used singly for small outputs, or in parallel or hexaphase for larger outputs. Experience has proved the dependability of the Rectifier, and the average valve life is from 5,000 to 10,000 hours.

Steel Clad Cubicle with rounded corners and domed top. All metal parts chromium plated. Cubicle in black crystalline.

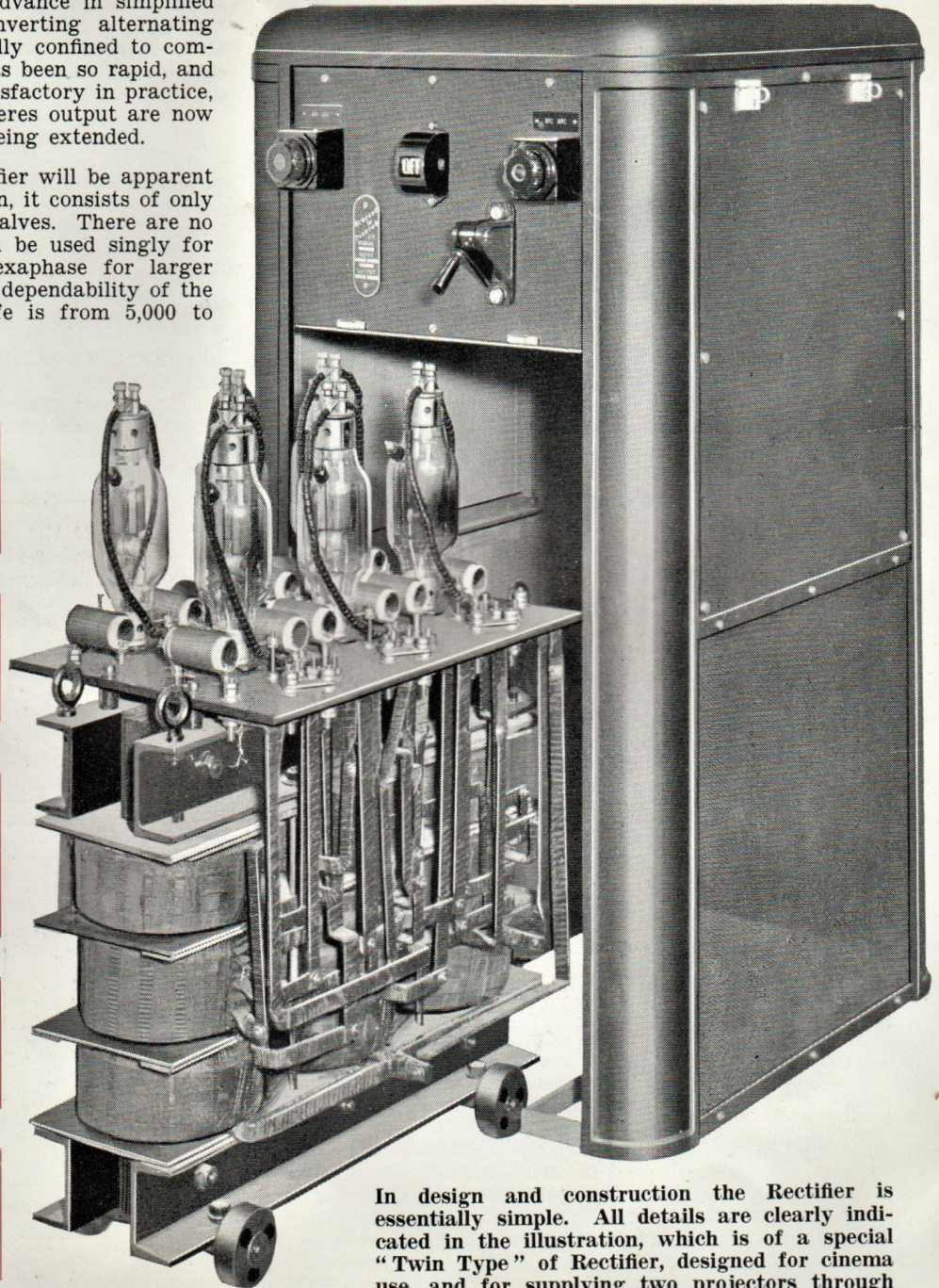
Dependable "Full Wave" Rectifying Valves guaranteed for 2,500 hours and with average life of 5,000 to 10,000 hours.

Stabilising resistances of fixed value requiring no attention automatically balance load on Valves. Voltage adjustment provided, enabling the Rectifier to be adjusted for the exact voltage.

Robust double-wound Mains Transformer carrying complete Valve assembly — providing unequalled accessibility.

Exclusive "Truck Type" construction enabling Transformer and Valves to be immediately withdrawn for inspection.

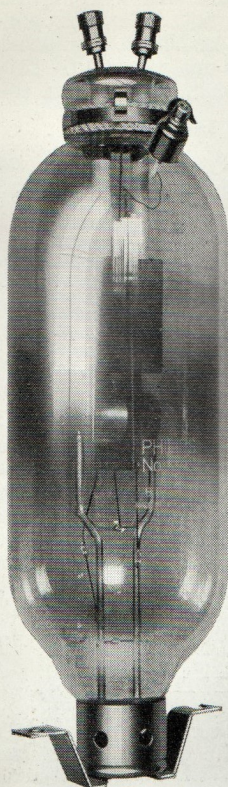
The cost of spare valves is low, and new valves can be fitted in a matter of seconds. All valves are self-excited and no auxiliary circuits are required. The first cost is lower than any other type of Rectifier, and this fact, plus its indisputable simplicity, proved dependability and other outstanding advantages, makes it the logical method of converting alternating to direct current.



In design and construction the Rectifier is essentially simple. All details are clearly indicated in the illustration, which is of a special "Twin Type" of Rectifier, designed for cinema use, and for supplying two projectors through separate banks of three-phase hexaphase connected valves.



THE VALVE



Consists of a simple gas-filled bulb with two graphite anodes and a Barium Oxide Filament excited from A.C. mains. No ignition or exciter circuits are necessary. The load can be applied immediately the filament is heated (about 30 seconds from switching on) and by leaving the filament excited, the load can be switched on and off as required. The voltage drop in the valve is low, 12 to 15 volts, and the filament loss negligible, thus ensuring high efficiency from no load to full load. The dependability of the valve has been proved by practical experience extending for over seven years. The actual valve life has been found to average from 5,000 to 10,000 hours. All valves are guaranteed for 2,500 hours. The first cost of the valve is low, resulting in low maintenance cost.

VALVE AND TRANSFORMER ASSEMBLY

The valve or valves are conveniently mounted on an insulated base, securely fixed to the top of the transformer. The valves are secured in "Goliath" lampholders and anode connections are made with heavy yet flexible beaded insulated connections.

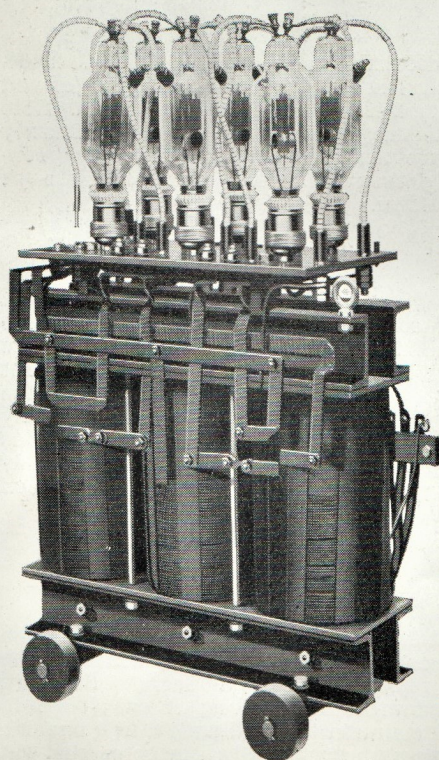
"TRUCK" TYPE CONSTRUCTION

This is an exclusive feature usually associated with high-grade switchgear. The transformer and valve assembly are mounted on wheels, and the complete unit, comprising all working parts, can immediately be withdrawn.

DOMED CUBICLE DESIGN

Distinctive and pleasing appearance with compact and convenient design are associated in the exclusive Newton Domed Cubicle construction. The cubicle is of black crystalline sheet steel with rounded corners and domed top. All fittings are in bright chromium. Internal wiring is run in the inside rounded corners of the Rectifier and enclosed in metal surrounds. Thus the Rectifier is free from all untidy internal connections and the arrangement is particularly neat, clean and tidy.

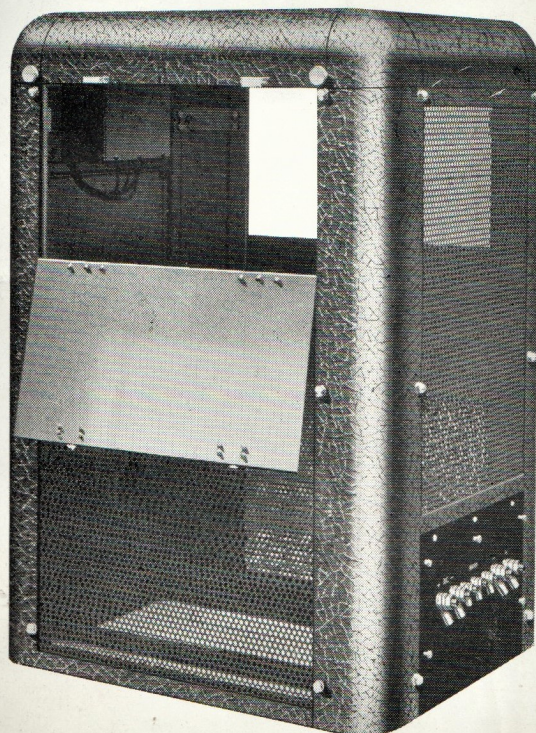
THE TRANSFORMER



Of the double-wound air-cooled type, the Transformer provides the required anode voltage for a given D.C. voltage output. The filament winding is also incorporated on the Transformer, making the whole unit entirely self-contained. Care has been taken to ensure the highest regulation and efficiency under all conditions.

Oil-immersed Transformers can be provided to meet special circumstances. In these cases, the

Transformer is usually mounted outside the cubicle, the valve assembly being specially mounted inside the cabinet.

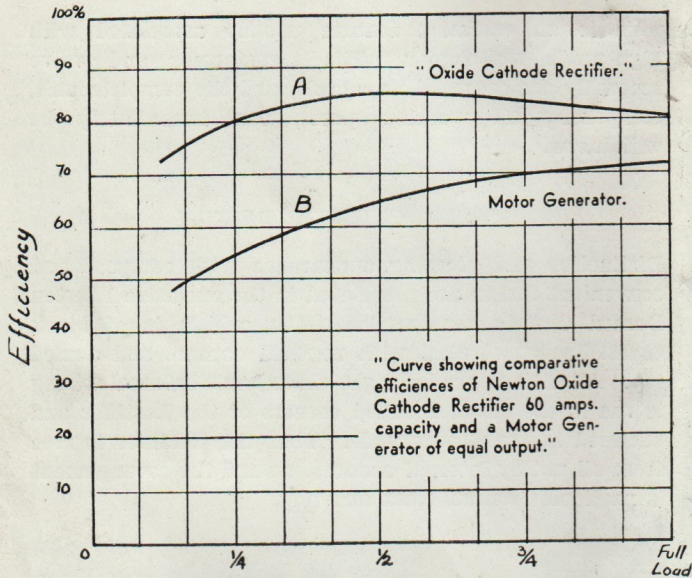


Note the accessibility of the cubicle and particularly the neat arrangement of the terminals, which are, in practice, enclosed in a cast-iron cover.



EFFICIENCY

The losses in the Oxide Cathode Rectifier are made up mainly of the voltage drop in the valves, about 12 to 15 volts. The additional losses, comprising filament consumption and transformer iron and copper losses, are all very low. The efficiency of the Rectifier, therefore, depends primarily on the D.C. output voltage, and it is remarkably constant from no load to full load. A typical efficiency curve of a standard Rectifier, as compared with a Motor Generator, is given below.



POWER FACTOR

The power factor of the Rectifier depends upon the number of phases and ranges, from about 0.85 for single-phase Rectifiers to 0.9 for three-phase Rectifiers.

VOLTAGE REGULATION

Low voltage regulation is a particularly important and valuable feature of the Rectifier. The voltage drop from no load to full load is within 5% and for such duties as cinema projection is within 2½% on change-over.

OVERLOAD CAPACITY

The overload capacity of the Rectifier can be economically adjusted to meet actual requirements. The elasticity of design is of great importance. Multiple valves are available to give any required factor of safety. It is also possible to use Rectifiers with twin banks of valves for special applications, such as Cinema projection, enabling prolonged overloads, up to 100%, to be offered without imposing any actual overload condition on the valves themselves, the overload affecting merely the transformer, which can conveniently be designed to meet the conditions imposed.

DEPENDABILITY

The very simplicity of the Rectifier is a measure of its dependability. It consists of only two parts, transformer and valves. Transformers are noted for their dependability, and can be considered almost indestructible. The

only part, therefore, which, in practice, can wear, is the valve. The valves are, however, guaranteed on a proportionate basis for 2500 hours, which, in normal operating conditions, amounts to approximately one year's life. This is the **guaranteed life**. Experience has proved that the average life is from 5,000 to 10,000 hours.

In the case of Newton "Twin Type" Rectifiers, as described in the following pages, the guaranteed life and average life is effectively doubled.

Further proof of the dependability of Oxide Cathode Rectifiers is found in the fact that over 15,000 are in successful use in Great Britain alone. The Rectifier is well tried and its dependability has been amply proved.

CONTROL GEAR

A double-pole switch gives complete control of the Rectifier, and this is really the only control gear necessary. Newton standard Rectifiers are, however, in most cases, fitted with a double-pole overload circuit breaker, which gives superior control and complete protection. D.P. fuses protect the D.C. output. Ammeters and voltmeters and any additional gear can be fitted to suit given conditions.

AUTOMATIC OVERLOAD PROTECTION

Almost any method of automatic protection can be easily and inexpensively arranged by the provision of an automatic contactor and push-buttons. Automatic control from one or a number of points is possible at exceptionally low cost.

ACCESSIBILITY

No Rectifier is as accessible as the Newton Oxide Cathode. A glance at the illustrations in the following pages will suffice to prove the extreme accessibility provided. Note that by moving the side panel the valves are immediately accessible. Observe the exclusive "Truck Type" construction, enabling the transformer and valves to be immediately withdrawn.

SIMPLICITY

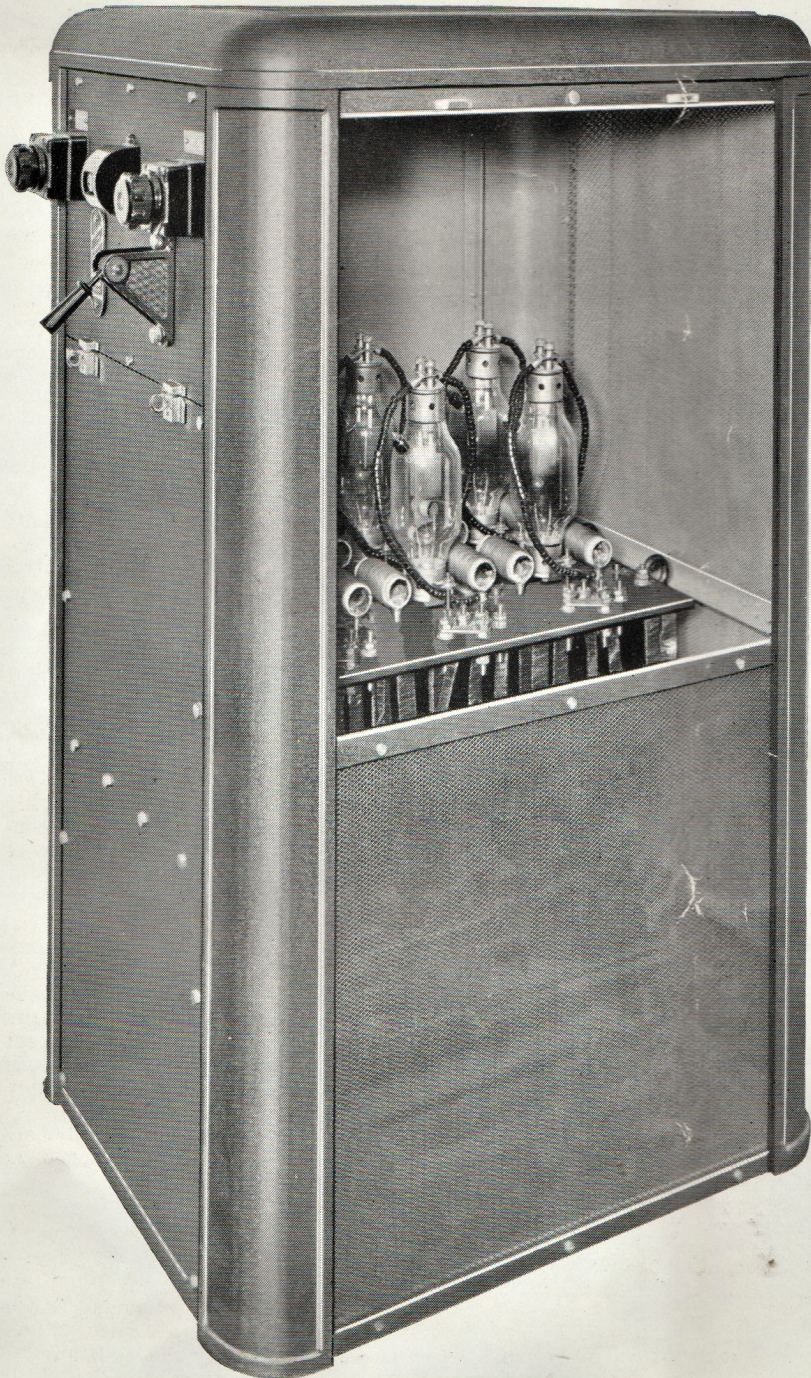
No other type of converting plant is so simple as the Oxide Cathode Rectifier. No starters or shunt regulators are required, there is no auxiliary gear; nothing except the transformer, valves, a few fixed resistances and the necessary external switchgear. Starting means merely closing a switch, and within 30 seconds the Rectifier is ready to take up load. The valves are continuously excited with negligible loss and load can be switched on and off at will.

MAINTENANCE

It will be apparent from the information previously given that the maintenance of the Rectifier is confined to the very occasional replacement of a valve. Standard Rectifiers are fitted with three valves; if one does fail, the other two will maintain the load until a new one can be fitted. The fitting of a new valve can be carried out in a matter of seconds. No adjustments are necessary. The Rectifier is self-exciting, self-regulating and needs merely to be switched on and switched off.



Nothing more simple than the Newton Oxide Cathode Rectifier can be imagined. Simplicity is associated with extreme accessibility, and careful design has assured smallest possible size and light weight.



SPECIFICATION

All standard Rectifiers comprise a floor mounting sheet steel cubicle of exclusive and attractive design, fitted with rounded corners and removable domed top. Adequate ventilation is provided in the design. The finish is black crystalline and all metal parts are bright chromium. The working parts comprise only a transformer and valves. The transformer is of the double-wound air-cooled pattern of liberal design and robust construction. The valve or valves are supported on suitable holders on a heavy insulated base, which is mounted direct on the transformer. Filament connections from the valves to the transformer filament windings are made through the valve holders. Anode connections are made by connecting beaded insulated connections direct to the valve anode terminals. Transformer connections are of heavy taped copper strip. The transformer and valve assembly are of "Truck Type" construction, enabling the complete assembly to be withdrawn by unlatching the front bottom panel. The side panel of the Rectifier is also removable as illustrated.

The exact number and arrangement of the valves depends upon the A.C. supply and the D.C. output. In the case of single-phase supplies, valves are of two anode pattern, giving full wave rectification. In the case of three-phase supplies, either a single valve giving three-phase rectification, or three two-anode valves, giving six-phase rectification, are used.

The latter arrangement is particularly advantageous since the rectified D.C. output is smooth within about 4% without the use of inductances or chokes. Where required for single-phase and single valve three-phase rectification, inductances can be fitted.

Starting gear is not required, since the Rectifier is self-excited by closing the A.C. main switch or circuit-breaker.

D.C. control gear is designed to suit actual requirements. Two single-pole porcelain handle fuses are fitted as standard. Ammeters and voltmeters can be fitted as required.

Automatic control is simple and inexpensive, and can be provided to meet almost every requirement.

Select a Newton Rectifier for Simpler Conversion at Lower Cost



**OXIDE CATHODE RECTIFIERS
FOR CINEMAS**

Proved by their simplicity, economy and dependability as the best and most economical method of converting A.C. to D.C. for all Cinema Requirements



**The First Cinema on a Railway Station
NEWS THEATRE - VICTORIA STATION - LONDON**

Fitted with Newton Oxide Cathode Rectifier



Study their Advantages

1.—SUPERIOR PROJECTION

Experience has proved that projectors supplied through an Oxide Cathode Rectifier give a whiter and steadier light, and better crater formation. This advantage is also coupled with superior voltage regulation, usually within 2½%, ensuring the same arc intensity being maintained during change-over.

2.—LOWEST IN COST

The most inexpensive of all Rectifiers, yet giving greater advantages than any other method. Low first cost is also coupled with the lowest cost of installation and the greatest economy in current consumption.

3.—RELIABILITY PROVED

Experience has proved the reliability of the Rectifier. Only one part ever needs replacement, namely, the valve, which is guaranteed for long periods. The failure of one valve after a long period of use does not interfere with operation. All Rectifiers are fitted with three valves—if one fails, the other two maintain the load until the end of the reel, when a new valve can be fitted in a few seconds.

4.—VALVE LIFE GUARANTEED

All valves are guaranteed for 2,500 hours, and the average life in practice is from 5,000 to 10,000 hours. The actual guarantee covers twelve months of normal service, which is extended to two years with "Twin Type" Rectifiers. The average life is considerably more than this—from two to five years. The cost of new valves is low.

5.—EASILY THE SIMPLEST TO OPERATE

Oxide Cathode Rectifiers are easily the simplest form of converting plant made. They have no moving parts and there are no relays, ignition or exciter devices, and no special starting or control gear is necessary. The Rectifier is started merely by closing a switch and within 30 seconds is ready to take up the load, which can be switched on and off at will. No attendance is required and the whole operation is effectively automatic.

6.—COSTS LESS TO INSTAL

The Rectifier needs merely to be placed in position on a firm floor, either in or adjacent to the operating box, depending upon the local regulations. No bed-plate or foundations are necessary. Wiring is reduced to a minimum. The A.C. supply is brought straight into the Rectifier and D.C. connections made from the Rectifier to the arc panel. Space requirements are less than in any other type of converting plant and the light weight of the Rectifier makes it easily transportable.

7.—NO MOVING PARTS

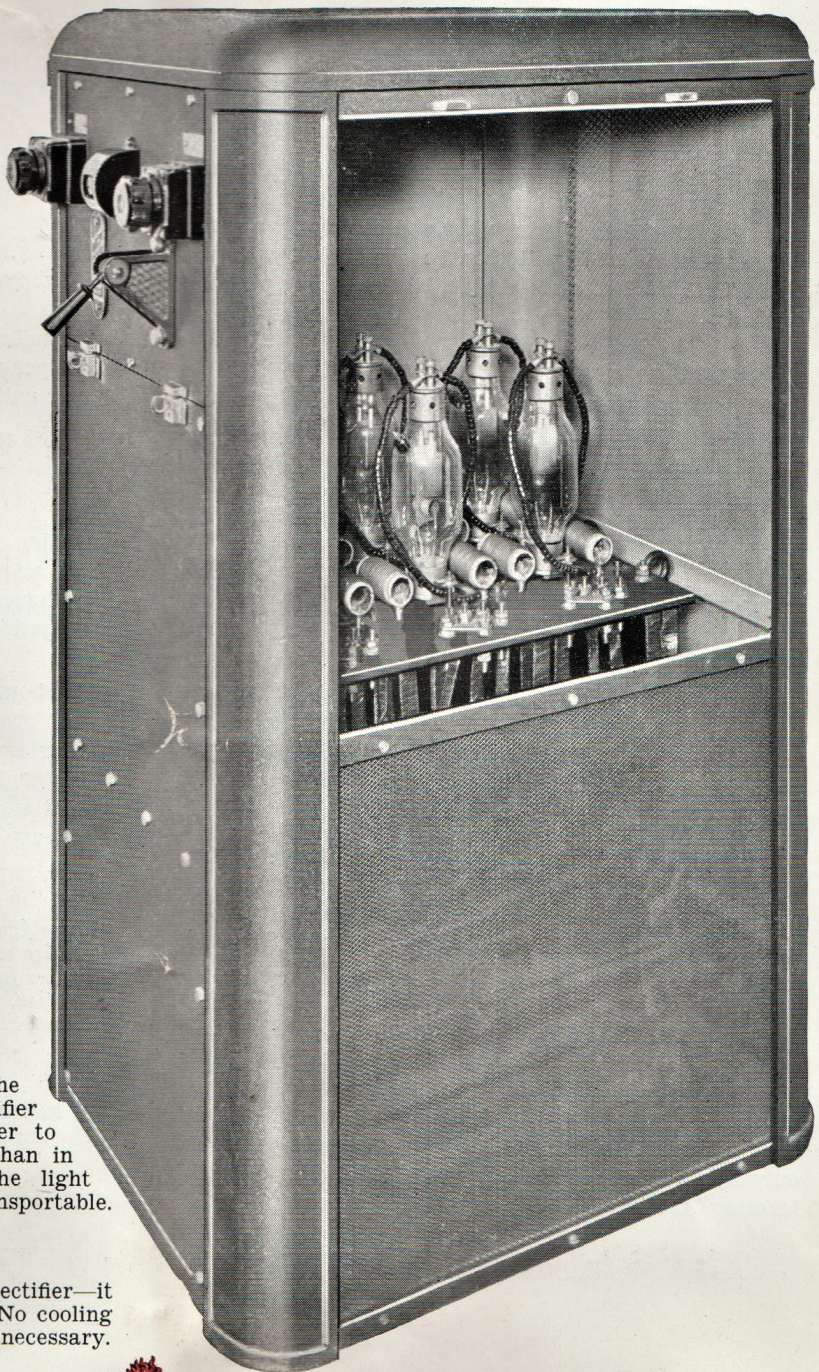
There is not a single moving part in the Rectifier—it consists merely of a transformer and valves. No cooling fans or special relays of any kind are necessary.

8.—PERFECT CHANGEOVER

An important consideration, making it possible to maintain perfect projection under all conditions without the need for any special adjustment.

9.—BIG SAVINGS IN ELECTRICITY BILL

A direct comparison between the Oxide Cathode Rectifier and a Motor Generator prove that when everything is considered, including the cost of replacement valves, the savings are sufficient to pay the complete cost of the Rectifier in a surprisingly short time. The details on the following page make this advantage conclusive.



A New Method of Cinema Conversion with unassailable Advantages over all other methods

OUTSTANDING ADVANTAGES OVER ALL OTHER METHODS

So outstanding are the advantages offered by Newton Oxide Cathode Rectifiers, so extremely simple are they to instal and operate, so reliable and low in cost of operating, that they have become accepted as easily the most satisfactory of all methods for converting A.C. to D.C. for Cinema use.

Imagine a simple, compact unit which can be installed anywhere, which has no moving parts, costs but little more than a Motor Generator but saves from 25% to 50% in current consumption. Consider the proved reliability, that there are merely two parts, only one of which (the valve) can wear. Remember that the valve has an average life of two to five years and costs only a pound or so to replace. It will then be obvious why Newton Oxide Cathode Rectifiers are rapidly replacing all other methods.

AS DEPENDABLE AS ANY OTHER METHOD

Dependability is vital for satisfactory Cinema operation and in this respect the Newton Oxide Cathode Rectifier has been proved by experience. The very simplicity of the Rectifier is a measure of its reliability—only one part (the valve) can wear, and this has a **guaranteed** long life.

All Newton Cinema Rectifiers are fitted with three valves, and if one fails the remaining two will carry the load until the end of the reel, when a new valve can be fitted in a matter of seconds.

The Newton Oxide Cathode Rectifiers can, without question, be accepted as equal in reliability to any other method, and has outstanding advantages over such methods in first cost, low cost of operation, size, weight, simplicity and quality of projection.

THE SIMPLEST OF ALL CONVERTERS

It is as simple to use a Newton Oxide Cathode Rectifier as to switch on an electric light. This is, in fact, all the operation necessary. The Rectifier, 30 seconds after being switched on, is ready to take up load; it is self-regulating and requires no adjustment. There is not a single complication or a single moving part. So light and small is the Rectifier that it can be fixed practically anywhere. Regulation during changeover is perfect—usually within 2½%. Standard Cinema Rectifiers give six-phase rectification with all its advantages of smooth output, but no extra cost is involved, as is the case with Mercury Arc Rectifiers.

COSTS LESS TO OPERATE AND SHOWS BIG SAVINGS IN ELECTRICITY BILL

The savings made in electricity consumption with Newton Rectifiers are definite and can be conclusively proved. As the following considerations show the savings are so appreciable as to make it certain that the Rectifier can be paid for out of savings in a remarkably short time. As an example, a comparison is taken between a Newton 45-amp. 100-volt. Motor Generator and a 45-amp. 100-volt. Oxide Cathode Rectifier:—

	Motor Generator	Oxide Cathode Rectifier
Output	45-amps. 100-v.	45-amps. 100-v.
Cost	£50 0 0	£55 0 0
Efficiency at full load	65%	80%
" " half load	50%	81%
*Normal consumption	407 units	267 units
Cost per week at 1d. per unit	£1 13 11	£1 2 3

Savings per week by use of Rectifier

11/8d. = £30 6s. 8d. per annum.

Allowing a new set of valves for each successive two years at a cost of £15 per set, and debiting at £7 10s. a year for valve replacements, will reduce the above annual savings to £22 16s. 8d. after the first two years.

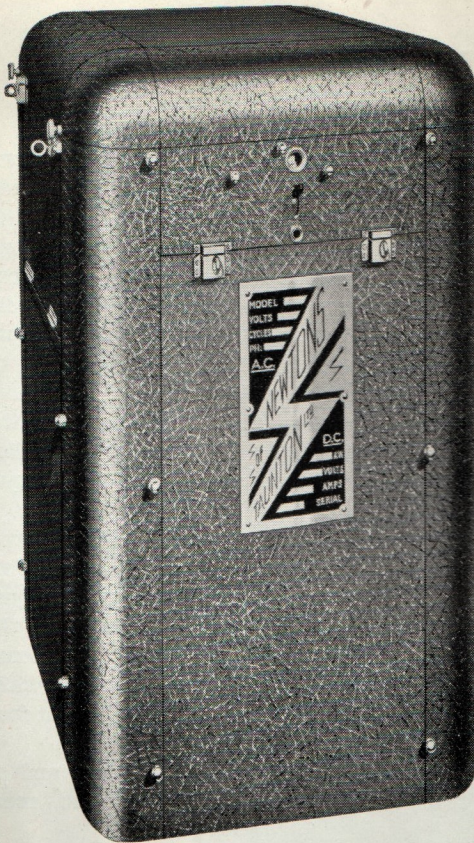
This shows, therefore, than on an assumption of only ten years' operation a Rectifier can be purchased and a total saving made (after paying all valve replacements) of **£234**; or, in other words, the total saving for the whole period amounts to **£289**—enough to pay for the Rectifier and leave **£234** balance.

**These figures have been computed on the assumption that the Rectifier will operate for 75% of this time on half load and 25% on full load, thus allowing for normal and change-over operation. A 48-hour week has also been taken and the consumption is therefore arrived at as follows:—*

	Motor Generator	Rectifier
36 hours at half load	324 units	200 units
12 hours at full load	83 units	67 units
Total	407 units	267 units

These facts explain the success of Newton Oxide Rectifiers for all Cinema requirements.





Study the extreme Simplicity!

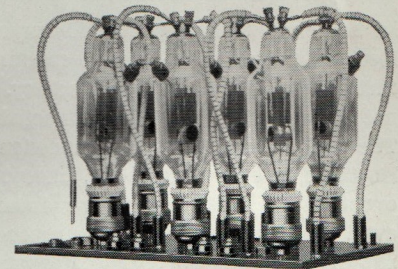
THE CUBICLE

Distinctive and attractive in design, yet compact and of robust construction. The cubicle is built of heavy crystallined sheet-steel with rounded corners and domed top. The front and side panels are immediately removable. All metal parts are in bright chromium. Internal wiring is run in the interior rounded corners and covered by neat metal surrounds.

The over-all dimensions are less than for any other Rectifier or Converter of equal capacity, and the light weight makes the unit easily transportable—a very important consideration in Cinemas, where access to the site selected for the Rectifier is sometimes difficult. An outstanding characteristic is the excellent finish, which is both impressive and durable. The finish can easily be maintained. There are no metal parts to tarnish, no awkward corners to hold dust—the Rectifier can be maintained in a spotless condition.

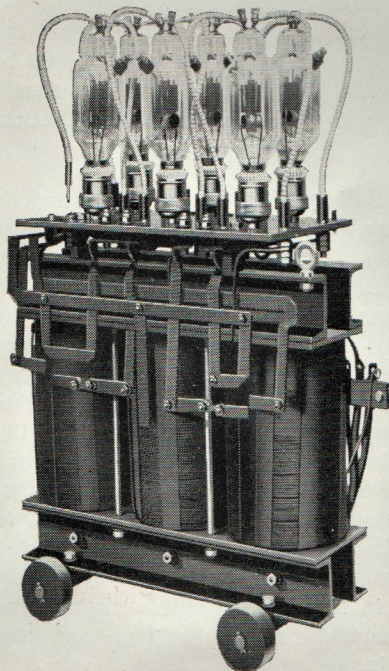
THE VALVES

All Newton Cinema Rectifiers are fitted with three dual-anode valves. This arrangement has two outstanding advantages. Firstly, in the event of one valve failing, the remaining two



Showing the Valve arrangement for a "Twin" Rectifier with two banks each of three valves. This allows two Projectors to be supplied from one Rectifier without imposing any overload on the valves.

maintain the load until the end of the reel, thus ensuring dependability. Secondly, the Rectifier gives six-phase rectification at no extra cost. This ensures smoother output and superior projection. The standard arrangement is as illustrated, the valves being supported on an insulated base which is mounted direct on the Transformer. Single Rectifiers have three valves and the special "Twin" Rectifier two banks each of three valves. Any valve can be removed and re-fitted in a matter of seconds.



THE TRANSFORMER

Of liberal rating and robust construction, the Transformer is of air-cooled double-wound design. It serves the dual purpose of transforming the incoming A.C. supply to a suitable value for the D.C. voltage output and also supplies excitation by a special filament winding.

The Transformer with its valve assembly is, as shown in the illustration, of special "Truck Type" construction, being mounted on wheels, enabling the complete equipment to be withdrawn.

The design of the Transformer is such as to ensure the highest efficiency and regulation, and unflinching dependability. Regulation is of vital importance in Cinema operation, and Newton Rectifiers are pre-eminent in this respect, the regulation in practice being within 2½% on change-over.

The extreme simplicity of Newton Oxide Cathode Rectifiers, coupled with their reliability and economy, explains why there are nearly 5,000 in use.



Selecting a suitable Oxide Cathode Rectifier

ARRANGEMENT OF VALVES

Instead of a single valve, as in the case of a Mercury Arc Rectifier, Newton Cinema Oxide Cathode Rectifiers are provided with banks of valves. In the case of a 45-ampere Rectifier, three valves, each 15 amperes, are provided; or in the case of a 75-ampere Rectifier, three valves, each 25 amperes. Each valve operates on one phase, the outputs being super-imposed. The rectification is six-phase, and the resultant D.C. output without smoothing is so satisfactory that the ripple is only 4%.

FOUR METHODS AVAILABLE

In selecting a suitable Rectifier, there is a choice of four methods. These methods are as follows:—

1.—ONE RECTIFIER FOR EACH ARC

In this case, to supply two 45-ampere arcs, two separate Rectifiers, each of 45-ampere capacity, are supplied. This method is simple and satisfactory. When either arc is not in use, the Rectifier connected to it is on no-load. The no-load loss under this condition is negligible. Neither Rectifier is ever overloaded, except in the very unlikely event of one of them breaking down, in which case, however, the other can, with proper control, temporarily supply both arcs during the change-over.

2.—ONE RECTIFIER FOR TWO ARCS — THE RECTIFIER GIVING TWICE THE ARC CURRENT

In the case of, say, two 75-ampere arcs, a 150-ampere single Rectifier can be installed. During normal operation, the Rectifier would be on half load, but there would be no loss of efficiency, since the half load efficiency of the Rectifier is even slightly higher than full load.

This method is to be recommended as an alternative to the "Twin Type." It offers generally similar advantages in that the valves are never overloaded, and this enables the guarantee to be extended from 2,500 to 4,000 hours. An important point is that only two cables are needed from the Rectifier to the Operating Box, whereas with the "Twin Unit" three cables are required.

3.—ONE RECTIFIER OF SPECIAL RATING FOR TWO ARCS

It is quite possible to take advantage of the normal overload capacity of the Rectifier and install a single unit slightly less than twice the full arc current. Thus a 54-ampere continuously rated Rectifier will, under these conditions, supply two 45-ampere arcs. Both the transformer and valves will carry the overload change-over for periods up to ten minutes.

This method is well tried and has the advantage of being the lowest in first cost, but methods (2) and (4) are always well worth considering as alternatives.

4.—SPECIAL "TWIN TYPE" RECTIFIER

This is the most popular unit, since it enables two projectors to be supplied from a single transformer, each Rectifier having its own bank of valves, the design being such that the valves themselves are never overloaded. In this case, if it is required to supply two projectors each at 75 amperes, the transformer is conservatively rated at 75 amperes continuously, but is designed to supply 150 amperes for intermittent periods. Two banks of valves are provided, each bank consisting of three 25 ampere valves. Each valve operates on one phase, the outputs being super-imposed. Without any further smoothing, the resultant ripple obtained in the D.C. output is only 4%.

As each bank of valves has a rated output of 75 amperes, it will be seen that they will never be overloaded. Furthermore, since each set is in operation for only just over half the working time of the Rectifier, the guaranteed life of the valve covers nearly 5,000 hours of Cinema performance, nearly two years' working, while the actual life obtained is, in practice, anything from four to six years.

This type of Rectifier is so simple, so efficient and so dependable, that it is recommended as the most satisfactory.

SELECTING THE SITE

Whenever possible, the Rectifier should be placed next to the Projection Room, with the cubicle backing against the dividing wall. The D.C. cables will then be as short as possible, eliminating voltage drop and thereby improving regulation. Not less than a foot should be allowed between the back of the cubicle and the wall, in order that the terminal box may be easily accessible.

If it is not possible to place the Rectifier near the Operating Box, a site as near to it as possible should be chosen. The site should be a firm level floor, and should be free from damp and with reasonable ventilation.

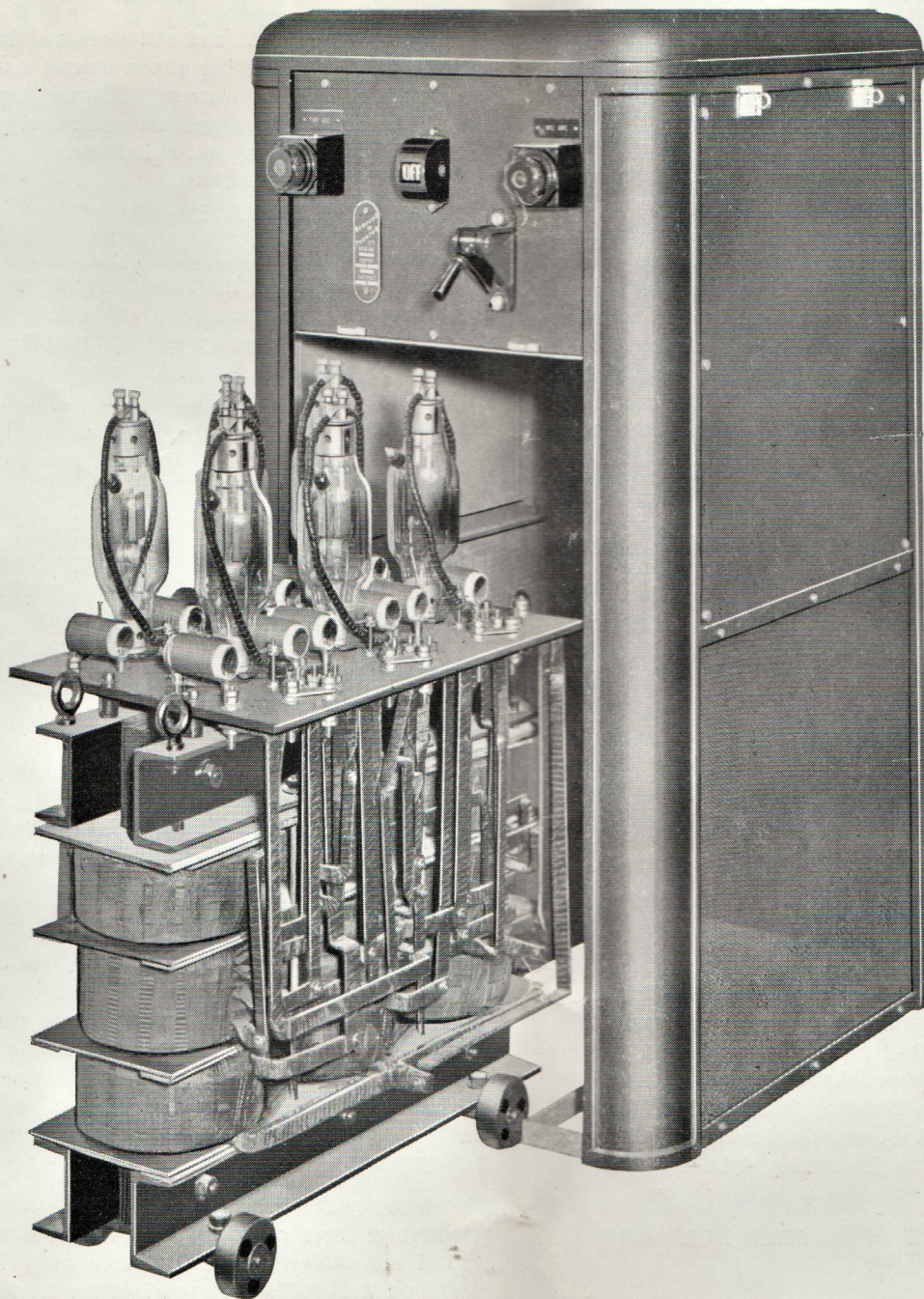
INSTALLATION

This is particularly simple. First the cubicle, which is comparatively light, is placed into position and the three incoming A.C. mains are coupled to their appropriate terminals. If the Rectifier is of the single type, two D.C. mains are taken from the output terminals to the Operating Box. In the case of a twin equipment, there are two pairs of output terminals, for it is virtually two Rectifiers in one. Since, however, the negative lead is common, it is necessary only to take three leads to the Box, two positives and one common negative of increased section, for it carries twice normal current on change-over. When the external leads have been connected to the terminal panel, the Transformer should be wheeled into position and the internal connections made by placing the connecting plugs in their appropriate sockets. The valves are then mounted in the holders and the anode leads plugged in.



STATIC
RECTIFIERS

Newton "Twin Type" Oxide Cathode Rectifier



The most popular type of Newton Cinema Rectifier. One Rectifier supplies two Projectors through one transformer and two separate banks of valves. With this design the valves are never overloaded and each bank is only in use when the Projector to which they are connected is in operation. The valve guarantee with this type of Rectifier is 5,000 Cinema Hours. Average life 10,000 to 15,000 hours, equivalent to four to six years.



Installation, Operation and Maintenance

SUPPLYING PROJECTORS AND SPOTLIGHTS

In this case, it is possible to supply either a separate Rectifier for the projectors and a further Rectifier for the spotlight, or, alternatively, a "Twin" Rectifier can be designed for both purposes.

Assuming two 75-ampere arcs and one 75/80-ampere spot-light, a "Twin" Rectifier at 75 amperes normal capacity can be utilised. On the last reel one bank of valves is out of use and this bank can, therefore, be switched on to the spot-light. A change-over switch and indicating label are provided with the Rectifier, enabling either bank of valves not in use to be connected to the spot-light circuit, the indicating label being provided to indicate which bank has been connected. This method is particularly economical since no extra expense other than the small cost of the change-over switch and indicating label is incurred.

The supply of two projectors and two spot-lights is another very satisfactory application of a Newton "Twin" Rectifier. In this case, a change-over switch can be incorporated in each output circuit, that is, in the circuit from each bank of valves. The two banks can, therefore, be independently connected, either to the projectors or to the spot-lights. Indicating labels are again provided, denoting whether a connection has been made to the projectors on the spot-light circuit. Special quotations are gladly submitted to meet special requirements.

CHARGING EMERGENCY LIGHTING BATTERIES

There is no more suitable method of battery charging than by the use of an Oxide Cathode Rectifier. Such a Rectifier can be designed of any capacity up to 180 amperes for charging from 1 to 120 cells. Full details of standard outputs will be found in the following pages, from which it will be noted that Rectifiers are available for use on both single-phase and three-phase A.C. mains in a wide range of outputs for charging both lead and nickel batteries. Make a point of consulting the Battery Charging Section of this catalogue for further details.

SUPPLYING DIRECT CURRENT FOR CINEMA VENTILATING FANS

Owing to difficulties of noise, Cinema ventilating fans are in many instances designed to operate on direct current. Where the supply is alternating current, an Oxide Cathode Rectifier provides a very simple and dependable means of converting A.C. to D.C. for this purpose. Rectifiers of any capacity up to 150 amperes, 100/110 volts, or up to 50 amperes, 200/230 volts, are available at small cost. The fact that no foundations are necessary makes it possible to install the Rectifier in any suitable position, and the high efficiency makes operating costs very low.

INSTALLING THE RECTIFIER

Small size, light weight and self-contained design makes installation of the Rectifier of the utmost simplicity. No foundation or bed-plates are required, nothing but a firm floor being needed. Wiring is reduced merely to bringing in A.C. leads and taking out D.C. leads.

OPERATING THE RECTIFIER

Close the switch on the Rectifier, wait 30 seconds, switch on the arcs and leave the Rectifier until the end of the performance. This summarises the full operation. No adjustments are necessary and no attention is needed. Voltage regulation is perfect, superior to any other method available, and resulting in superior projection during change-over.

QUALITY OF PROJECTION

Definitely superior projection is assured, experience having proved that the arc crater is superior and that the light is clear and white. It is well worth inspecting a Newton Oxide Cathode Rectifier in service: the remarkable improvement in lighting has to be seen to be appreciated.

CHANGE-OVER

An important practical advantage which means less maintenance and better projection; this is due to the low voltage drop of the Rectifier which, in practice, is usually within 2½%. This is a further fact which explains the superior projection always obtained with a Newton Rectifier.

MAINTENANCE

The maintenance of the Rectifier is as simple as its installation and operation—there is literally nothing to attend to except the very occasional replacement of a valve. There are no shunt regulators, no relays or elaborate switching devices, no cooling fans and no moving parts.

As previously mentioned, dependability is assured by the provision of three valves, two of which will maintain the load if one valve fails. To insert a new valve merely means unlatching the side panel of the Rectifier, disconnecting two leads, withdrawing the valve from its socket, putting in a new valve and reconnecting the two leads. It is not even necessary to connect the leads to a given terminal.

This ease of maintenance means less cost and is added to the advantage of low first cost, negligible cost of installation, and big savings in current consumption. All complete Rectifiers and valves carry a full guarantee and complete after-sales service is available.



Standard Outputs, Oxide Cathode Rectifiers for Cinemas for 3-phase A.C. Mains

Single Rectifiers--D.C. Output 70, 80 or 90 volts

Model No.	Continuous Rating Amps.	For Two Arcs each	Approx. Full Load Efficiency	Mains Consumption		Power Factor	Floor Space Occupied	Nett Weight
				No Load	Full Load			
SCT 015	18	15 amps.	78%	142 watts	1.54 kw.	0.91	5 sq. ft.	260 lbs.
SCT 025	30	25 amps.	80%	180 watts	2.5 kw.	0.91	5 sq. ft.	320 lbs.
SCT 045	54	45 amps.	81%	325 watts	4.4 kw.	0.91	5 sq. ft.	430 lbs.
SCT 060	72	60 amps.	81%	642 watts	6.0 kw.	0.91	5 sq. ft.	550 lbs.
SCT 075	90	75 amps.	81%	662 watts	7.45 kw.	0.91	5 sq. ft.	675 lbs.
SCT 090	108	90 amps.	82%	670 watts	8.9 kw.	0.91	7.5 sq. ft.	850 lbs.

Single Rectifiers--D.C. Output 100 or 110 volts

Model No.	Continuous Rating Amps.	For Two Arcs each	Approx. Full Load Efficiency	Mains Consumption		Power Factor	Floor Space Occupied	Nett Weight
				No Load	Full Load			
SCT 115	18	15 amps.	81%	142 watts	1.85 kw.	0.91	5 sq. ft.	260 lbs.
SCT 125	30	25 amps.	83%	180 watts	3.05 kw.	0.91	5 sq. ft.	320 lbs.
SCT 145	54	45 amps.	83%	325 watts	5.4 kw.	0.91	5 sq. ft.	430 lbs.
SCT 160	72	60 amps.	83%	642 watts	7.25 kw.	0.91	5 sq. ft.	550 lbs.
SCT 175	90	75 amps.	84%	662 watts	9.0 kw.	0.91	5 sq. ft.	675 lbs.
SCT 190	108	90 amps.	84%	670 watts	10.8 kw.	0.91	7.5 sq. ft.	850 lbs.

Special "Twin" Rectifiers--70, 80 or 90 volts

Model No.	Continuous Rating Amps.	For Two Arcs each	Approx. Full Load Efficiency	Mains Consumption		Power Factor	Floor Space Occupied	Nett Weight
				No Load	Full Load			
TCT 025	30	25 amps.	80%	250 watts	2.5 kw.	0.91	5 sq. ft.	340 lbs.
TCT 045	54	45 amps.	80%	366 watts	4.4 kw.	0.91	5 sq. ft.	436 lbs.
TCT 060	72	60 amps.	81%	500 watts	6.0 kw.	0.91	5 sq. ft.	560 lbs.
TCT 075	90	75 amps.	81%	522 watts	7.45 kw.	0.91	5 sq. ft.	684 lbs.
TCT0100	120	100 amps.	81%	1105 watts	9.9 kw.	0.91	7.5 sq. ft.	942 lbs.
TCT0120	144	120 amps.	82%	1165 watts	11.8 kw.	0.91	7.5 sq. ft.	1020 lbs.
TCT0150	180	150 amps.	82%	1205 watts	14.7 kw.	0.91	7.5 sq. ft.	1250 lbs.

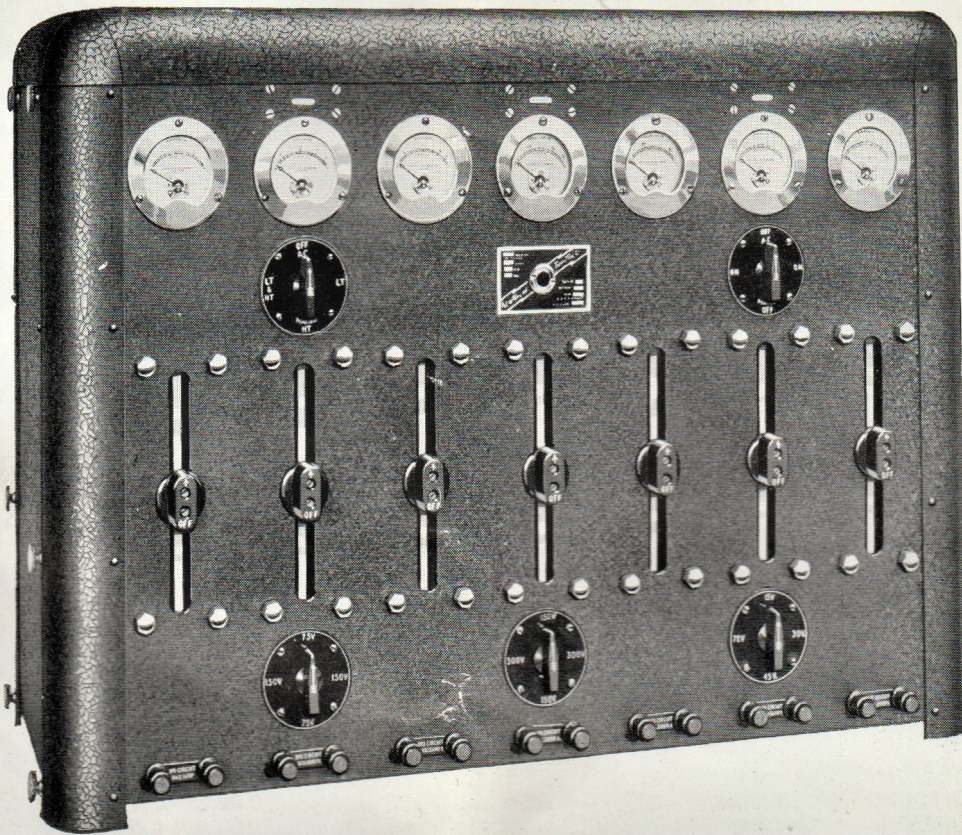
Special "Twin" Rectifiers--100 or 110 volts

Model No.	Continuous Rating Amps.	For Two Arcs each	Approx. Full Load Efficiency	Mains Consumption		Power Factor	Floor Space Occupied	Nett Weight
				No Load	Full Load			
TCT 125	30	25 amps.	83%	250 watts	3.05 kw.	0.91	5 sq. ft.	340 lbs.
TCT 145	54	45 amps.	83%	366 watts	5.4 kw.	0.91	5 sq. ft.	436 lbs.
TCT 160	72	60 amps.	83%	500 watts	7.25 kw.	0.91	5 sq. ft.	560 lbs.
TCT 175	90	75 amps.	84%	522 watts	9.0 kw.	0.91	5 sq. ft.	684 lbs.
TCT1100	120	100 amps.	84%	1105 watts	12.0 kw.	0.91	7.5 sq. ft.	942 lbs.
TCT1120	144	120 amps.	84%	1165 watts	14.3 kw.	0.91	7.5 sq. ft.	1020 lbs.
TCT1150	180	150 amps.	85%	1205 watts	17.8 kw.	0.91	7.5 sq. ft.	1250 lbs.

Single Phase Rectifiers are also available up to 80 volts. Details on application

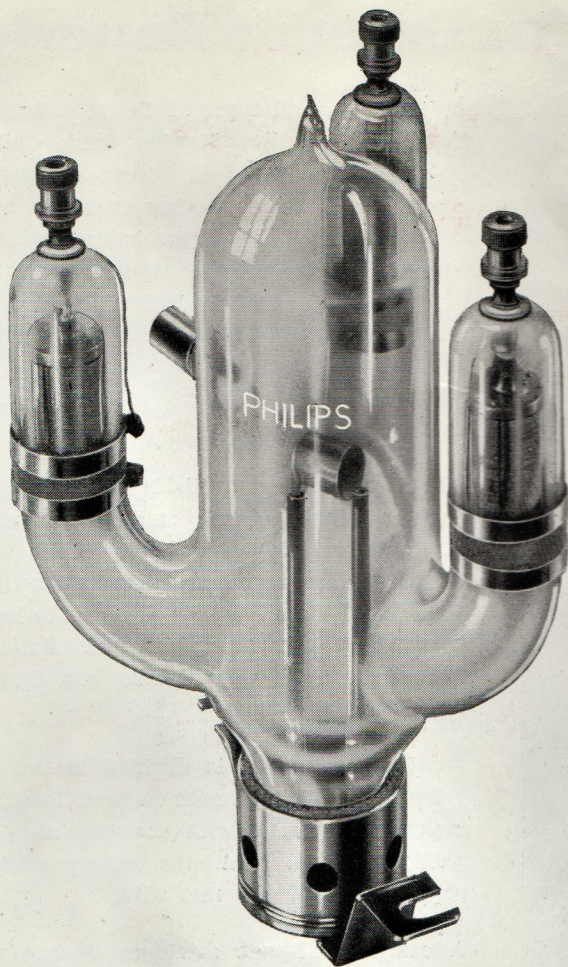


OXIDE CATHODE RECTIFIERS FOR BATTERY CHARGING



There is no purpose for which Oxide Cathode Rectifiers are more suited than constant current Battery Charging. Their simplicity, reliability, extreme economy, low first cost, their small size and absence of moving parts and their safety in operation make them eminently satisfactory for the economical charging of from a single cell up to 120-cell stationary batteries.





Standard Three-Phase Oxide Cathode Valve

Oxide Cathode Rectifiers have been in successful use for battery charging for over seven years. In this country alone nearly 15,000 Rectifiers are in use. They offer advantages for battery charging which make them indisputably superior to any other type of plant. Rectifiers are available for charging from a single radio cell or car battery up to a complete 120-cell stationary battery, and for charging rates from a fraction of an ampere up to 180 amperes.

The Newton range of Battery Charging Rectifiers is so extensive that it can be truthfully stated that there is no requirement within the range of outputs available, which cannot be met, with the minimum of expense and the maximum of economy. A wide range of standard Rectifiers is available, of which details are given in the following pages, but it should be particularly noted that where existing requirements cannot be exactly met by the standard unit listed, Rectifiers of special output can conveniently and inexpensively be designed.

NO OTHER METHOD OF CONSTANT CURRENT BATTERY CHARGING IS SO SIMPLE, SO EFFICIENT, SO INEXPENSIVE AND SO EMINENTLY SATISFACTORY AS NEWTON OXIDE CATHODE RECTIFIERS.

Study their Advantages

NO MOVING PARTS

No commutators, no brushes and no revolving wires, no bearings, not a single moving part in the whole Rectifier; just a transformer and valves assembled in a distinctive chromium and crystalline wall or floor mounting sheet-steel cubicle.

HIGH EFFICIENCY

The high efficiency of the Rectifier (from 50% to 90%, dependent upon its output) ensures maximum operating economy. The small size and light weight, freedom from foundations, negligible cost of installation and low cost of maintenance, make the Rectifier easily the cheapest method of battery charging.

SIMPLE IN OPERATION

Close a switch, and within 30 seconds the Rectifier will commence charging. Open the switch, and charging stops. This is the extent of the operation necessary, other than the normal adjustment of charging current, which is provided for by easily adjustable charging resistances and ammeters in each circuit.

LONG LIFE

Only one part can wear, the valve, and this is **guaranteed** for 2,500 hours, and has an average life of 5,000 to 10,000 hours. Valve replacements are low in cost and a new valve can be fitted in a matter of seconds—literally as easy as putting in a new electric lamp.

DEPENDABLE AND SAFE

Proved dependability is accompanied by absolute safety of operation. Should the electric supply fail, charging stops, and automatically recommences when the supply is restored. Specially calibrated fuses or circuit-breakers protect against overload.

NO FOUNDATIONS REQUIRED

A wall or firm floor is all that is necessary; no foundations or bedplates of any kind are required. This advantage is also coupled with minimum space requirements, which enables the Rectifier to be placed practically anywhere.

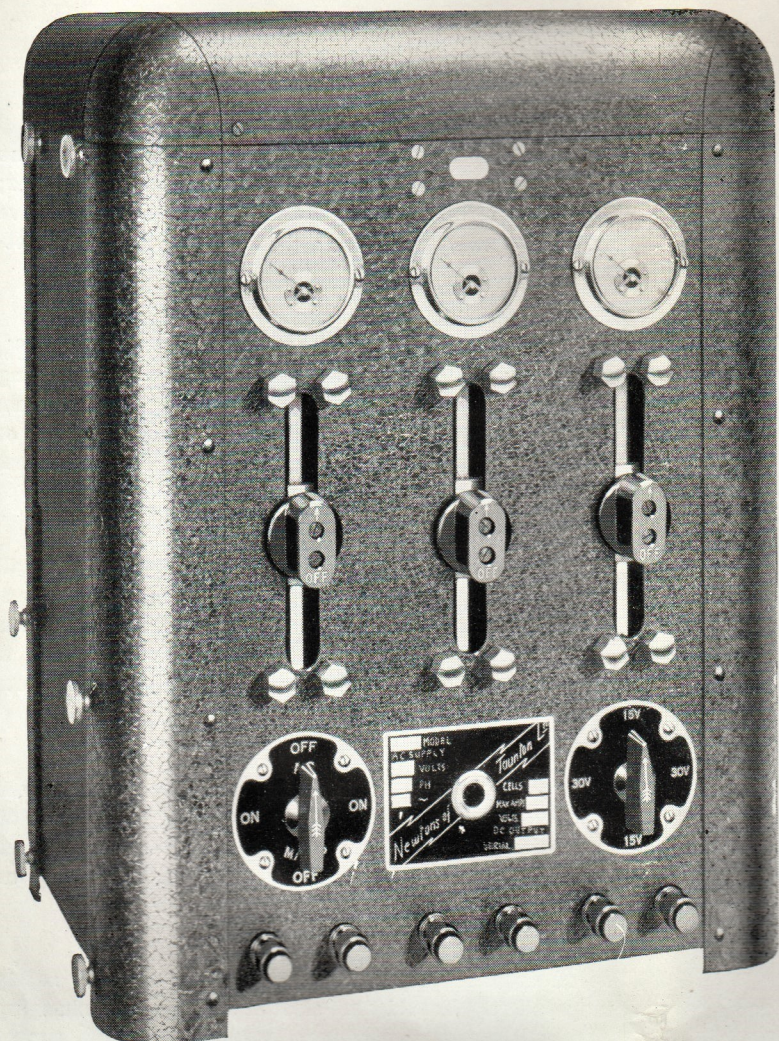
INEXPENSIVE IN FIRST COST

The first cost of a Rectifier for a given capacity is lower than for any other type of charging equipment.

Car and Radio Batteries, Electric Vehicle Batteries, Stationary Accumulators, Emergency Lighting Batteries, Telephone and Telegraph Batteries, can all be charged more simply, more economically and with assured dependability by Newton Oxide Cathode Rectifiers.



An Ideal Method of Charging Portable Batteries



For charging all types of Portable Batteries from A.C. supplies, Newton Oxide Cathode Rectifiers are ideal. The large demand for Rectifiers of this type has resulted in the development of a comprehensive range of standard units designed specifically to deal with radio and car batteries. One of the standard Portable Charging Rectifiers is illustrated from which the distinctive design and comprehensive equipment provided will be evident.

The standard range available covers Rectifiers with a single circuit and an output of 0.3 amperes, 300 volts, for H.T. Radio Batteries, up to a complete seven-circuit Charging Station Rectifier, designed to handle a mixed load comprising H.T. Radio Batteries, L.T. Radio Cells, Car Lighting and Starting Batteries.

Particular attention is directed to the provision of multiple circuits on most Rectifiers, making it possible with economy and simplicity to deal with the widely variable requirements usually met with.

A complete 28-page catalogue dealing with every aspect of Portable Battery Charging, and including complete details of the full range of standard Newton Rectifiers, is available on request.

Twelve Standard Rectifiers for Portable Battery Charging

The following list gives brief details of 12 Standard Newton Oxide Cathode Rectifiers for Portable Battery Charging.

Model No.	Amps.	Voltages available.	No. of circuits.	Max. Charging Current per Circuit, amps.							Dimensions.	Weight.
				1	2	3	4	5	6	7		
NV3	0.3	300 & 150	1	0.3	—	—	—	—	—	—	11 1/4" x 17 3/8" x 12"	40 lbs.
NV1	6	15	1	6	—	—	—	—	—	—	11 1/4" x 17 3/8" x 12"	40 lbs.
NV2	6	30 & 15	1	6	—	—	—	—	—	—	11 1/4" x 17 3/8" x 12"	43 lbs.
NV6	6	30 & 15	3	1/2	2	6	—	—	—	—	14 1/2" x 17 3/8" x 12"	52 lbs.
NV7	6	30 & 15	4	1 1/2	1	2	6	—	—	—	17 1/3" x 17 3/8" x 12"	55 lbs.
NV14	6	50, 30 & 15	3	1 1/2	2	6	—	—	—	—	14 1/4" x 17 3/8" x 12"	60 lbs.
NV8	6	72, 45, 30 & 15	3	1 1/2	2	6	—	—	—	—	16 1/2" x 19 1/2" x 14 3/4"	70 lbs.
NV9	10	72, 45, 30 & 15	3	1	3	10	—	—	—	—	16 1/2" x 19 1/2" x 14 3/4"	80 lbs.
NV4	10	72, 45, 30 & 15	4	1	3	10	Combi- n- ed L T & H T Model			—	20 1/2" x 19 1/2" x 14 3/4"	90 lbs.
NV4	0.3	300 & 150	4	0.3	—	—	—	—	—	—	—	—
NV10	15	72, 45, 30 & 15	2	7 1/2	7 1/2	—	—	—	—	—	20" x 19 1/2" x 14 3/4"	120 lbs.
NV12	4	150 & 75	3	1 1/2	1 1/2	2	—	—	—	—	16 3/8" x 19 1/2" x 14 3/4"	80 lbs.
*NV5	1410 watts	Various	7	0.3	1/2	1 1/2	2	1	3	10	28 1/2" x 19 1/2" x 14 3/4"	180 lbs.

*Special model No. 1 Circuit, 300 & 150 v., Nos. 2, 3 & 4, 150 & 75 v., Nos. 5, 6 & 7, 72, 45, 30 & 15 v.



Rectifiers for Charging Industrial Batteries

For Emergency Lighting, Telephones, Electric Vehicles, Power Stations, Sub-Stations, etc.

The wide range of Rectifiers available makes it impossible to give complete details. The following list, however, serves to indicate the extent to which practically all Battery Charging requirements can be met by purely standard units, and it can therefore be appreciated that no matter what the requirements may be, a Rectifier can conveniently be designed to meet them. Newton Rectifiers for Battery Charging can be supplied for either manual, semi-automatic or fully automatic control and for charging on the constant current or constant potential system.

It should also be noted that the available range of Rectifiers is rapidly being extended and as the size of Rectifying bulbs increases, so will the range of Newton Rectifiers increase proportionately. Enquiries are invited for any size of Rectifier not covered by the following list, or for any Battery Charging equipment. Full details of requirements should be given so that the most efficient and economical type and size of Rectifier can be offered. Prices will be found particularly attractive and operating costs lower than any other method.

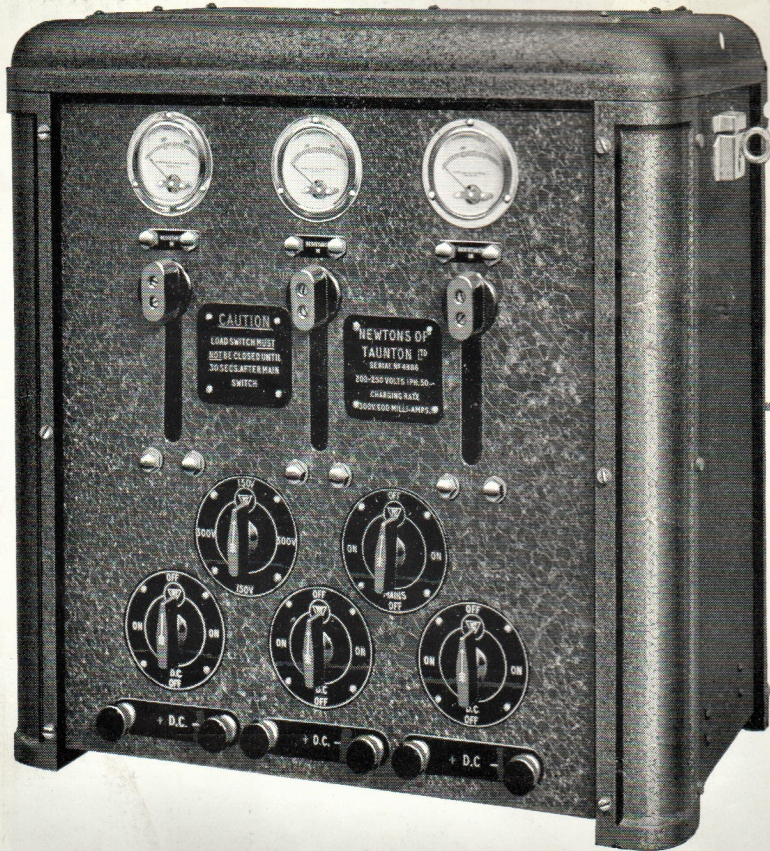
Rectifiers for use on Single-Phase A.C. Mains

Model No.	Max. No. of Cells.		Max. Charging Current.	Model No.	Max. No. of Cells.		Max. Charging Current.	Model No.	Max. No. of Cells.		Max. Charging Current.
	Lead	Nickel			Lead	Nickel			Lead	Nickel	
BS31	3	4	1.3 amps	BS301	30	45	1.3 amps	BS4050	40	60	50 amps
BS61	6	9	1.3 "	BS302	30	45	2 "	BS4075	40	60	75 "
BS123	12	18	3 "	BS303	30	45	3 "	BS40100	40	60	100 "
BS126	12	18	6 "	BS306	30	45	6 "	BS40150	40	60	150 "
BS151	15	22	1.3 "	BS3010	30	45	10 "	BS1001	100	150	1.3 "
BS2025	20	30	25 "	BS3015	30	45	15 "	BS1006	100	150	6 "
BS2040	20	30	40 "	BS3030	30	45	30 "	BS10012	100	150	12 "
BS2050	20	30	50 "	BS3045	30	45	45 "	BS10015	100	150	15 "
BS2075	20	30	75 "	BS403	40	60	3 "	BS10018	100	150	18 "
BS2080	20	30	80 "	BS4010	40	60	10 "	BS10025	100	150	25 "
BS20120	20	30	130 "	BS4015	40	60	15 "	BS10030	100	150	30 "
BS20130	20	30	130 "	BS4025	40	60	25 "	BS10045	100	150	45 "
BS20180	20	30	180 "	BS4030	40	60	30 "	BS10050	100	150	50 "
				BS4045	40	60	45 "	BS10075	100	150	75 "

Rectifiers for use on Three-Phase A.C. Mains

Model No.	Max. No. of Cells.		Max. Charging Current.	Model No.	Max. No. of Cells.		Max. Charging Current.	Model No.	Max. No. of Cells.		Max. Charging Current.
	Lead	Nickel			Lead	Nickel			Lead	Nickel	
BT2060	20	30	60 amps	BT4060	40	60	60 amps	BT10025	100	150	25 amps
BT2090	20	30	90 "	BT40150	40	60	150 "	BT10030	100	150	30 "
BT20120	20	30	120 "	BT456	45	67	6 "	BT10045	100	150	45 "
BT20180	20	30	180 "	BT504	50	75	3.9 "	BT10050	100	150	50 "
BT3015	30	45	15 "	BT1001	100	150	1.3 "	BT10075	100	150	75 "
BT3025	30	45	25 "	BT1002	100	150	2.5 "	BT1203	120	180	3 "
BT3040	30	45	40 "	BT1004	100	150	4 "	BT12010	120	180	10 "
BT4010	40	60	10 "	BT1006	100	150	6 "	BT12015	120	180	15 "
BT4015	40	60	15 "	BT10010	100	150	10 "	BT12025	120	180	25 "
BT4025	40	60	25 "	BT10015	100	150	15 "	BT12050	120	180	50 "
BT4045	40	60	40 "								





Oxide Cathode Rectifiers for Electric Vehicle Batteries

Of the superiority of Newton Rectifiers for battery charging there is no question. The re-charging of electric-vehicle batteries is a special example where such Rectifiers are indisputably superior to any other method. The low first cost of the Rectifier, its simplicity, economy and dependability, the absence of moving parts, the small space required and light weight, are facts which prove Newton Rectifiers to be the logical method to adopt.

LOW IN FIRST COST

Economic considerations as applied to the cost of electric vehicles make the first cost of the Battery Charger a matter of considerable importance. It is on this account that the Newton Rectifier has found such favour, for, consistent with efficiency and dependability, it is the lowest priced of all methods.

ECONOMICAL IN OPERATION

Economy in re-charging electric vehicle batteries is even more important than the first cost of the charger. The installation of a Newton Rectifier carries with it an assurance that this cost will be lower than any other method plus the advantage of low maintenance cost.

ABSOLUTELY RELIABLE

No moving parts. Only one part to wear, the valve, and this covered by 2,500 hours' guarantee, with an average life up to 10,000 hours or more. Valve replacements are low in first cost, and new valves are fitted in a matter of seconds. Such are the facts which prove the reliability of Newton Oxide Cathode Rectifiers, and they have been amply proved in practice.

THE SIMPLEST TO OPERATE

All Rectifiers are connected direct to A.C. mains. Connections are made to batteries, and the Rectifier is switched on. Merely adjust the charging current, and beyond an occasional re-adjustment, nothing else is required. Automatic charging can be arranged if desired. Full protection is provided. All-night charging is possible and safe.

BUILT FOR SINGLE AND THREE-PHASE

Rectifiers are available for use on either single-phase or three-phase A.C. supplies. On single-phase, full wave rectification is provided; on three-phase, either three-phase or six-phase rectification, depending on the size of the unit. All types are equally satisfactory for all Battery Charging requirements.

BIG RANGE OF STANDARD OUTPUTS

The list overleaf gives full details of the wide range of outputs available as standard units. Any other output can, without difficulty and at low expense, be provided. Alternative equipment to meet individual needs can also be supplied at low cost.

DISTINCTIVE DESIGN AND CONSTRUCTION

The distinctive design and high-class appearance of the Charger will be evident from the illustration. Construction is of robust sheet-steel with rolled corner pieces and domed top. Finish is black crystalline, and all metal parts are bright chromium. Charging resistances are of new design, comprising two separate sliding resistance units mounted "edge on" with parallel spring controlled adjustable contacts.

SUPPLIED COMPLETE READY FOR USE

All Rectifiers are supplied complete and ready for use. Units are supplied as standard, with special terminal boards, enabling them to be connected for any standard single-phase supplies from 200 to 250 volts; or three-phase, 400 to 440 volts. Rectifiers for any special voltage or frequency can be supplied on request.



Standard Outputs of Oxide Cathode Rectifiers for Electric Vehicle Batteries

The Rectifiers listed below can be quoted with any required external equipment in the form of ammeters, voltmeters, control switches, etc. Either a single charging circuit or multiple charging circuits can be arranged. Rectifiers of standard output as listed have the advantage of being particularly low in first cost, but any intermediate output can be quoted with any desired equipment at extremely reasonable prices.

Quotations will also be submitted for Rectifiers designed for automatic control and enquiries with details of exact requirements are invited.

The standard internal equipment includes a double-wound mains transformer of robust design, tapped for easy adjustment to exact A.C. voltage, plus the necessary full-wave rectifying valve or valves with ballast resistances. The cubicle is of Newton exclusive design, fitted with main switch, fuses, charging resistance and ammeter or such other equipment as specified. All Rectifiers are supplied complete ready for use. As will be noted from the details given below, the Rectifiers are small in size and of light weight, making installation a particularly simple matter.

Rectifiers of any required capacity can be designed, but the following schedule indicates the wide range of standard models which are available. These standard Rectifiers are available for Single-Phase and Three-Phase A.C. supplies of standard voltage.

Model No.	Maximum No. of Cells		Maximum Charging Current	Mains Consumption		Commercial Full Load Efficiency	Dimensions			Nett Weight
	Lead	Nickel		No Load	Full Load		W.	H.	D.	
EVB 1215	12	18	15 amps.	62 watts	790 watts	45%	1ft. 4½in.	1ft. 6¾in.	1ft. 2¾in.	60 lbs.
EVB 1220	12	18	20 amps.	67 watts	1050 watts	45%	1ft. 4½in.	1ft. 6¾in.	1ft. 2¾in.	70 lbs.
EVB 1225	12	18	25 amps.	86 watts	1320 watts	45%	1ft. 4½in.	1ft. 6¾in.	1ft. 2¾in.	80 lbs.
EVB 2015	20	30	15 amps.	77 watts	1060 watts	51%	1ft. 4½in.	1ft. 6¾in.	1ft. 2¾in.	80 lbs.
EVB 2020	20	30	20 amps.	91 watts	1400 watts	51%	1ft. 8 in.	1ft. 6¾in.	1ft. 2¾in.	100 lbs.
EVB 2025	20	30	25 amps.	96 watts	1760 watts	51%	1ft. 8 in.	1ft. 6¾in.	1ft. 2¾in.	110 lbs.
EVB 2415	24	36	15 amps.	79 watts	1220 watts	53%	1ft. 4½in.	1ft. 6¾in.	1ft. 2¾in.	100 lbs.
EVB 2420	24	36	20 amps.	94 watts	1620 watts	53%	1ft. 8 in.	1ft. 6¾in.	1ft. 2¾in.	110 lbs.
EVB 2425	24	36	25 amps.	101 watts	2005 watts	53%	1ft. 8 in.	1ft. 6¾in.	1ft. 2¾in.	130 lbs.
EVB 3015	30	45	15 amps.	82 watts	1450 watts	55%	1ft. 8 in.	1ft. 6¾in.	1ft. 2¾in.	110 lbs.
EVB 3020	30	45	20 amps.	101 watts	1920 watts	55%	1ft. 8 in.	1ft. 6¾in.	1ft. 2¾in.	130 lbs.
EVB 3025	30	45	25 amps.	110 watts	2400 watts	55%	1ft. 10in.	1ft. 6¾in.	1ft. 2¾in.	160 lbs.
EVB 3615	36	54	15 amps.	83 watts	1690 watts	57%	1ft. 8 in.	1ft. 6¾in.	1ft. 2¾in.	130 lbs.
EVB 3620	36	54	20 amps.	110 watts	2250 watts	57%	1ft. 10in.	1ft. 6¾in.	1ft. 2¾in.	160 lbs.
EVB 3625	36	54	25 amps.	127 watts	2800 watts	57%	1ft. 10in.	1ft. 6¾in.	1ft. 2¾in.	190 lbs.
EVB 4015	40	60	15 amps.	94 watts	1850 watts	65%	1ft. 8 in.	1ft. 6¾in.	1ft. 2¾in.	130 lbs.
EVB 4020	40	60	20 amps.	123 watts	2460 watts	65%	1ft. 10in.	1ft. 6¾in.	1ft. 2¾in.	190 lbs.
EVB 4025	40	60	25 amps.	145 watts	3090 watts	65%	1ft. 10in.	1ft. 6¾in.	1ft. 2¾in.	220 lbs.
EVB 4415	44	66	15 amps.	124 watts	2000 watts	67%	1ft. 8 in.	1ft. 6¾in.	1ft. 2¾in.	160 lbs.
EVB 4420	44	66	20 amps.	138 watts	2660 watts	67%	1ft. 10in.	1ft. 6¾in.	1ft. 2¾in.	190 lbs.
EVB 4425	44	66	25 amps.	182 watts	3340 watts	67%	2ft. 3 in.	1ft. 6¾in.	1ft. 9 in.	240 lbs.
EVB 5415	54	81	15 amps.	163 watts	2420 watts	72%	1ft. 10in.	1ft. 6¾in.	1ft. 2¾in.	190 lbs.
EVB 5420	54	81	20 amps.	210 watts	3200 watts	72%	2ft. 3 in.	1ft. 6¾in.	1ft. 9 in.	240 lbs.
EVB 5425	54	81	25 amps.	240 watts	4025 watts	72%	2ft. 3 in.	1ft. 6¾in.	1ft. 9 in.	280 lbs.
EVB 6015	60	90	15 amps.	179 watts	2640 watts	75%	2ft. 3 in.	1ft. 6¾in.	1ft. 9 in.	220 lbs.
EVB 6020	60	90	20 amps.	224 watts	3540 watts	75%	2ft. 3 in.	1ft. 6¾in.	1ft. 9 in.	280 lbs.
EVB 6025	60	90	25 amps.	255 watts	4400 watts	75%	2ft. 3 in.	1ft. 6¾in.	1ft. 9 in.	320 lbs.

PRICES ON APPLICATION

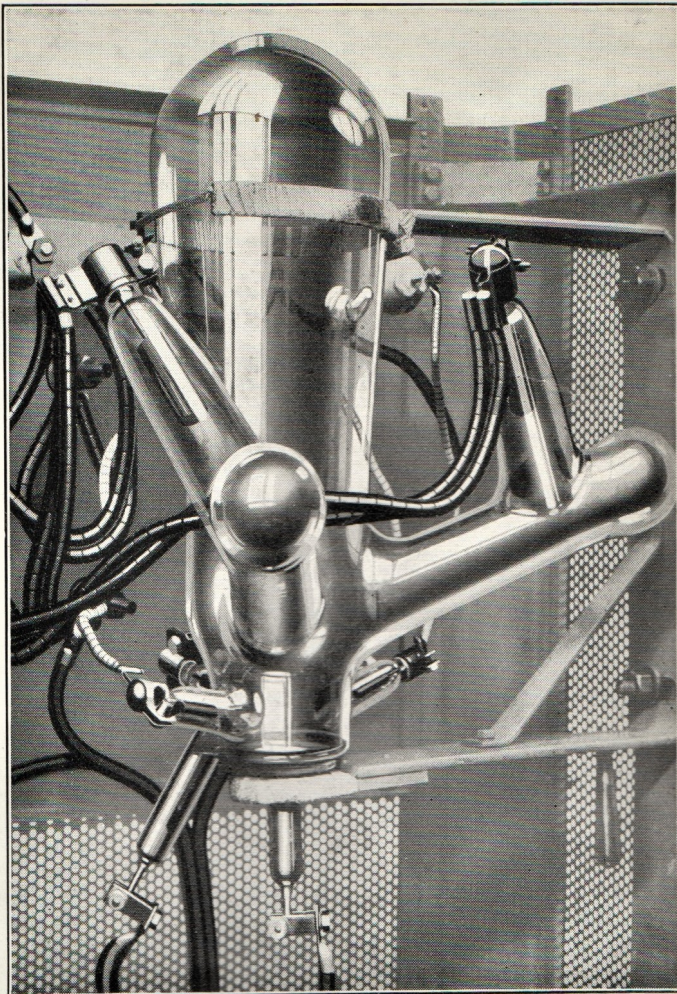


**MERCURY ARC
RECTIFIERS**
Design and Construction

**Built to a new standard of
design, appearance and finish**

Distinguished by their modern design, exclusive high grade construction and superlative finish. Incorporate the best and most reliable Mercury Arc Bulbs obtainable. Available in a complete range from 75 to 600 amperes in single units for operation on Single-Phase or Three-Phase A.C. Supplies





MERCURY ARC BULB

The Mercury Arc Bulb consists of a highly evacuated glass vessel containing a pool of mercury and a number of graphite anodes.

The bulbs fitted in Mercury Arc Rectifiers are of the highest quality it is possible to obtain. The glass is of 85% quartz, enabling them to withstand both normal and overload conditions without fear of any damage due to temperatures.

The dependability of the bulb has been established by many years of successful operation and it can be stated quite definitely that so far as efficiency and dependability are concerned, the bulb has no superior.

TRANSFORMER

The D.C. output voltage from the Rectifier has a fixed ratio to the A.C. voltage applied to the anodes. Thus to obtain any given required D.C. voltage, the incoming A.C. supply must be transformed to a suitable value and the Transformer becomes an essential component of the Rectifier. It also serves a further function of providing the negative D.C. pole.

The Transformers incorporated with Newton Mercury Arc Rectifiers are in all cases of double-wound pattern. They are of the air-cooled type in small sizes, and oil-immersed pattern for large outputs.

Air-cooled Transformers are usually incorporated within the cabinet, thereby making the complete Rectifier entirely self-contained. This is not possible with large oil-immersed Transformers, which are, therefore, usually arranged for exterior mounting.

Where air-cooled Transformers are provided and fitted inside the cabinet, the control gear for auxiliary circuits, etc., is mounted on an insulated panel, which is directly fixed to the front of the Transformer.

The "truck" type construction therefore enables the complete Transformer and auxiliary control panel to be withdrawn as a single component, providing extreme accessibility.

Auxiliary control panels are also fitted inside the cabinet in the case of oil-immersed Transformers.

IGNITION

As has been previously explained, it is necessary to form a "Hot Spot" to cause the Rectifier to excite.

Upon the means provided for forming a "Hot Spot" depends very largely the practical efficiency and dependability of the Rectifier. In Newton Mercury Arc Rectifiers a very simple means of ignition is provided. Singularly free from any complications, the method used has the important advantage that it does not necessitate any moving parts whatever in the bulb. It is thus free from the serious objections of other types of bulbs in which plungers, hot wire or bi-metal strips are frequently used. The method of ignition will be clear from fig. 17.

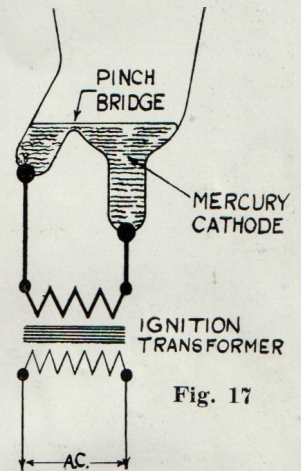


Fig. 17

The bulb is fitted with an extra arm. Mercury fills this arm and the main pool, leaving a narrow bridge of mercury between the two. A Transformer with a secondary output of approximately three volts is connected across the bridge. Immediately the Transformer is switched on, a repulsion effect is set up which is sufficient to overcome the hydrostatic pressure of mercury. A rupture therefore takes place, causing a small arc to form, thus setting up a "Hot Spot."

AUXILIARY CIRCUITS

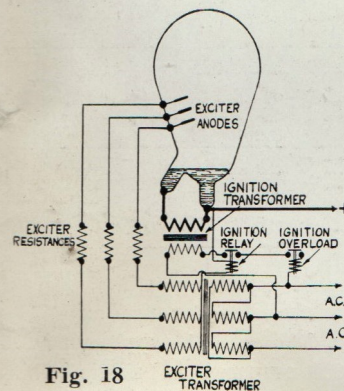


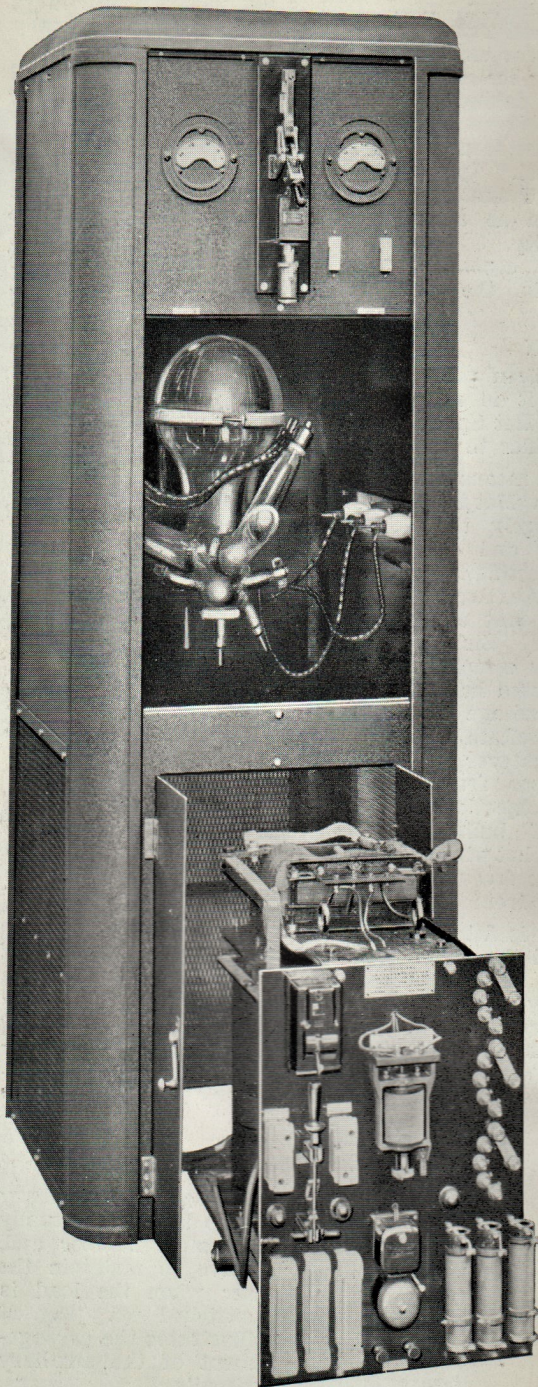
Fig. 18

The necessary auxiliary anodes are usually three in number and, serve to maintain the arc when the load is switched off. Fig. 18 illustrates the arrangement of the auxiliary circuits.

The auxiliary anodes are supplied with a low voltage, usually about 60 volts, from Exciter Transformer. Immediately a "Hot Spot" is formed an arc is struck between these anodes and the cathode. The

current flowing is limited by resistances. Immediately a load is imposed and the main arc current flows, a relay disconnects the Ignition Transformer.





DOMED CUBICLE CONSTRUCTION

The Rectifier consists of a heavy sheet-steel cubicle, black crystalline finish, with rolled corner pillars and round top. This construction combines strength and utility with a particularly attractive appearance. The internal pillars form a conduit in which the cables are neatly carried.

“TRUCK” TYPE TRANSFORMER DESIGN

The transformer is specially designed, both electrically and mechanically. An exclusive feature is the truck mounting, rendering installation and inspection an easy matter. Special attention has been paid to the design of the transformer to ensure the best possible regulation and the highest efficiency.

ARRANGEMENT OF AUXILIARY GEAR

As will be observed, the whole of the auxiliary gear is conveniently mounted on an insulated panel on the front of the transformer. All such gear is, therefore, immediately accessible merely by opening the front panel of the Rectifier. Everything necessary for starting up and maintaining the arc is provided, together with relays and fuses, which ensure full protection under all conditions.

In the case of Single-phase Rectifiers, a cathode inductance is incorporated to ensure smooth D.C. output.

CONTROL GEAR

All Rectifiers are fitted as standard with fuses in the D.C. output circuit, but if required a D.C. circuit-breaker can be fitted which, if necessary, can be arranged for automatic operation by push-buttons at remote positions. Ammeters and voltmeters can be fitted as required.

The A.C. control gear normally consists of a double-pole circuit-breaker, but if required, a contactor can be provided which can be automatically operated from one or more remote positions.

FAN COOLING

Larger size Rectifiers designed for special duties are fitted with motor-driven ventilating fans for cooling the bulb. The motor is of particularly robust construction, a fan of special design being direct-coupled to the machine. A special protective gear is fitted which operates an alarm bell should the fan stop when the Rectifier is operating under load.

TERMINAL CONNECTIONS

The input, output and signal bell connections are all fitted on a protected panel at the bottom of the main back panel on the Rectifier. This is a particularly convenient arrangement, since it enables the connections to be run direct into the Rectifier with the utmost ease.

RANGE OF OUTPUTS

Mercury Arc Rectifiers are available for use on either Single or Three-Phase L.T. or H.T. supplies, and for outputs up to 600 amperes in single units or any required output in multiple units.



The Distinctive Design, Robust Construction and Extreme Accessibility of the Rectifier will be clearly seen from the following illustrated description

Rectifier Bulb of 85% quartz glass with patent ignition. Firmly yet flexibly mounted in top of compartment. Immediately accessible.

Double-pole Circuit-breaker in A.C. mains, replaceable if required with a contactor which can be arranged for remote control by push-button.

Inspection Window provided, enabling visual indication of operation to be obtained.

Distinctive Design with Rolled-steel Corner Pieces, giving the cubicle an attractive appearance and forming on the inside a conduit in which the internal wiring may be carried.

Special "Truck" Type Transformer of ample proportions and readily accessible.

Substantial Porcelain Handle Fuses give complete protection to all auxiliary gear.

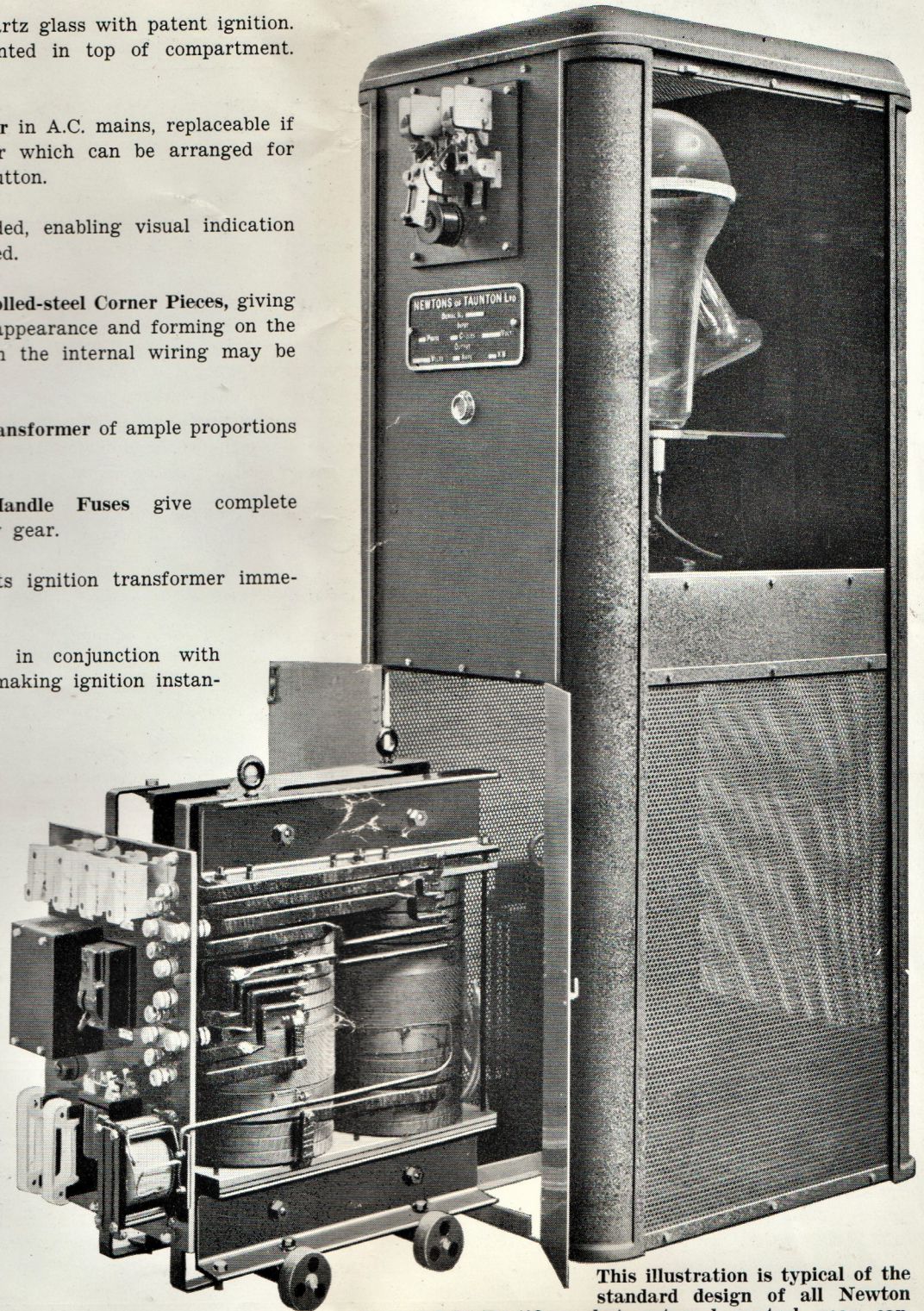
Circuit-breaker disconnects ignition transformer immediately arc is struck.

Ignition Relay operates in conjunction with ignition circuit-breaker, making ignition instantaneous and fool-proof.

Substantial Single-pole Porcelain Handle Fuses protect Rectifier from overloads.

Exciter Transformer, which, with the additional exciter gear, maintains the arc down to and at "no load."

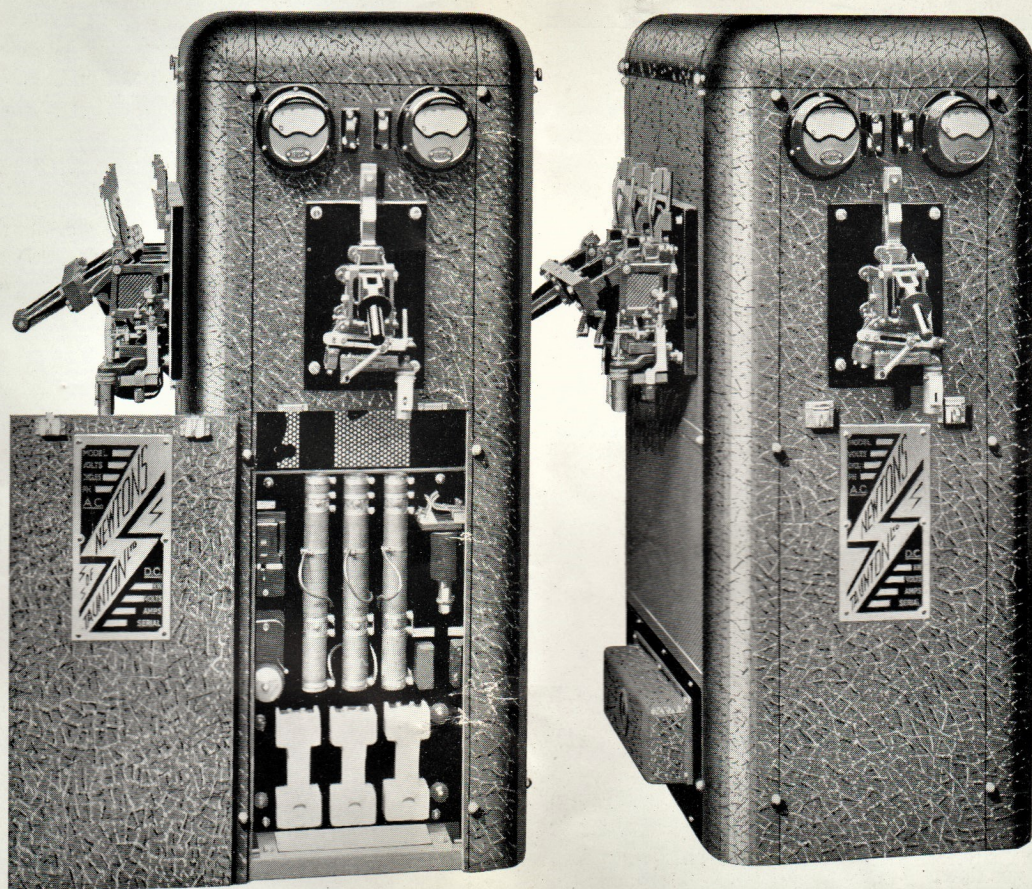
Substantial Transformer Windings of liberal rating, both electrically and mechanically ensuring the finest possible regulation. Transformers are tapped for fine voltage adjustment.



This illustration is typical of the standard design of all Newton Mercury Arc Rectifiers, but external design control gear can, without difficulty, be supplied to meet any required condition.



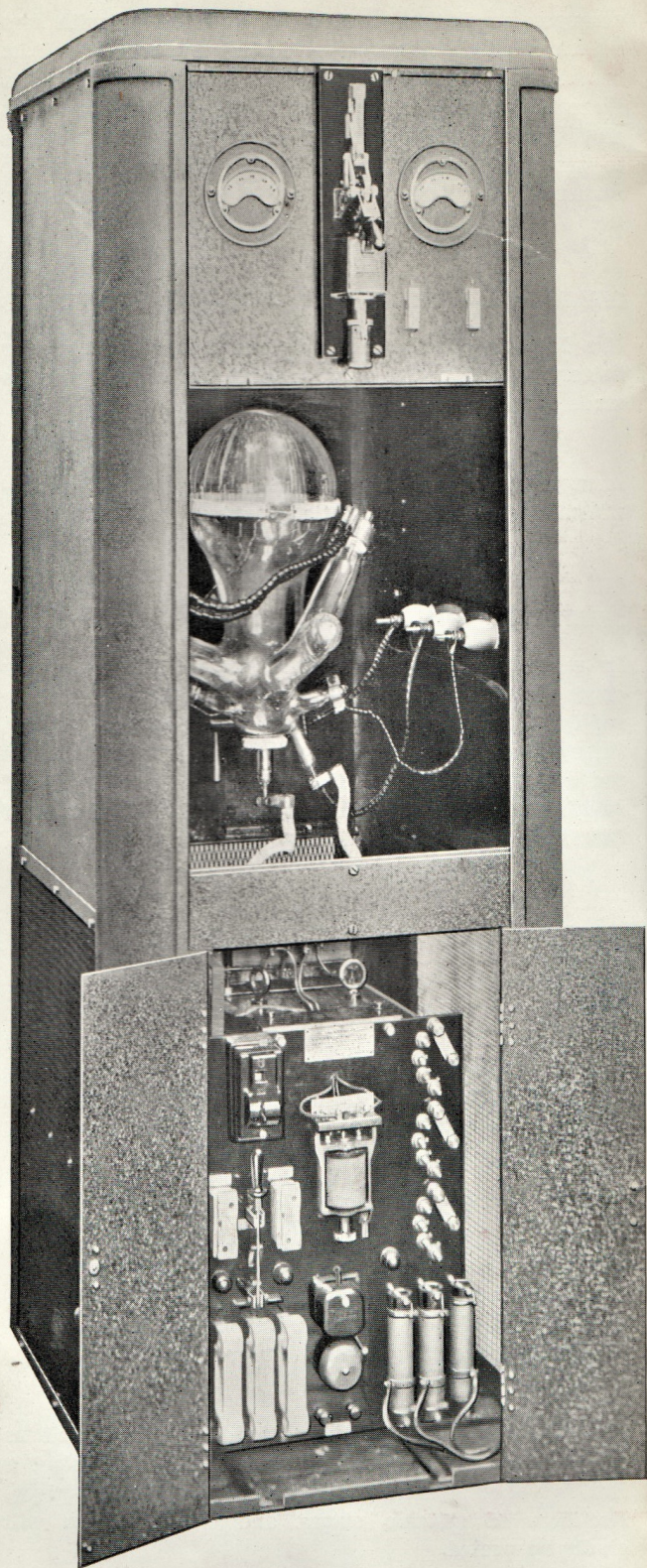
MERCURY ARC RECTIFIERS FOR CINEMAS



To the acknowledged advantages of Mercury Arc Rectifiers for cinema use is added in the case of Newton Rectifiers singularly attractive design, robust construction, high grade workmanship, extreme accessibility, ease of control and high efficiency. A study of the following pages will convince all engineers of the superiority of Newton Mercury Arc Rectifiers.



Acknowledged and proved by long experience as a dependable, simple and efficient method of supplying Direct Current for all Cinema requirements



BETTER PROJECTION

The superior projection obtainable with a Rectifier is now well known—arc formation is steadier and a clear white light is obtained.

EASY TO OPERATE

The operation of the Rectifier is simplicity itself. The main circuit-breaker is closed when the load can be immediately applied. Full protection is provided, should any difficulty occur in starting. No adjustments are necessary and the voltage regulation is perfect under all conditions.

PROVED DEPENDABILITY

Of the dependability of Mercury Arc Rectifiers there is now no question. Experience of many years has proved conclusively that they meet the most stringent requirements and can be depended upon to work satisfactorily for many years without breakdown or the necessity of valve replacements.

LOW CURRENT CONSUMPTION

Big savings in the electricity bill are guaranteed by the installation of a Newton Mercury Arc Rectifier. It can be proved in advance that the savings are sufficient to pay the cost of the Rectifier in a short time and leave an annual saving running into many hundreds of pounds during the normal life of the Rectifier.

LOW COST OF INSTALLATION

The fact that no foundations are required, that the Rectifier can be placed almost anywhere, that wiring is reduced to a minimum and no auxiliary gear is required, makes the cost of installing the Rectifier negligible.

SMALL SPACE REQUIRED

An important consideration. Space requirements are far less than with Motor Generators, representing a valuable saving.

GOOD REGULATION

This is an important consideration which ensures perfect projection. The regulation with Newton Rectifiers is well within 5%, enabling a constant arc intensity to be maintained during change-over.

NOISELESS

The absence of all moving parts, with the exception of the ventilating fan fitted to larger Rectifiers, is of great importance. The elimination of interference is also a further important advantage.



A Proved Method of Cinema Conversion with outstanding advantages over rotating converting plant

Although the Motor Generator is well tried and proved, the higher efficiency, lower running costs, elimination of moving parts and all the other important advantages detailed on the preceding page, make the superiority of the Rectifier indisputable. Whilst scepticism existed originally as to the dependability of the Rectifier, this has now been dispelled by practical experience.

Rectifiers have been in operation in important Cinemas for many years, and are still operating with equal satisfaction to the day they were installed, no expenditure whatever having been made on replacements.

EASY TO INSTALL AND SIMPLE TO OPERATE

The Newton Rectifier is delivered in three units: cubicle, "truck" type transformer, and the bulb. The cubicle needs merely to be placed in a selected position, the transformer wheeled inside the cubicle, the bulb unpacked and fitted. Wiring means merely bringing in the A.C. mains and taking out the D.C. mains. The whole job can be carried out in a matter of an hour or so.

The operation of the Rectifier is as simple as the installation. No elaborate starting gear or shunt regulators are necessary—merely close the circuit-breaker on the Rectifier panel and it is immediately available for load. No adjustments of any kind are necessary.

BIG SAVINGS IN ELECTRICITY BILL

The high operating efficiency of the Rectifier guarantees big savings in the electricity bill. The savings, whilst dependent upon the capacity and cost of current, are in all cases easily sufficient to pay the cost of the Rectifier in a matter of months. Figures based on practice prove that savings up to £500 can be effected during a period of ten years.

WIDE RANGE OF OUTPUTS

Newton Mercury Arc Rectifiers are built in a wide range of outputs which meet all requirements for Cinema projection. They are designed for operation on either single-phase or three-phase A.C. mains, the current and voltage being variable to suit the conditions.

SUPPLYING PROJECTORS AND SPOT-LIGHTS

It is possible to provide either one Rectifier for supplying both the projectors and spot-lights, or, alternatively, two Rectifiers can be installed for this purpose. A possible

arrangement is the provision of a Rectifier with two separate bulbs—frequently adopted by reason of its convenience and the possibility of using one bulb as a spare to the other. Consideration will gladly be given at all times to the design of Rectifiers of most suitable type to meet the prevailing conditions, and exhibitors are requested to submit details of their requirements.

CHARGING EMERGENCY LIGHTING BATTERIES

The Mercury Arc Rectifier is particularly suitable for battery charging, and arrangements can conveniently be made for this to be done.

Arrangements can be made either for manual, semi-automatic, or fully-automatic charging.

SUPPLYING CINEMA VENTILATING FANS

In many instances, particularly where the supply is single-phase, the difficulties of cost make it convenient to supply Cinema ventilating fans with Direct Current through a Mercury Arc Rectifier. This arrangement has the advantage of simplicity and economy. Details of suitable Rectifiers will gladly be submitted on receipt of details as to the number, size and type of fans in use.

SELECTING A SUITABLE RECTIFIER

The details given on the next page makes it easily possible to select a Rectifier of suitable size. The Rectifiers offered are of standard rating; if they do not exactly meet requirements, quotations for any other output required will gladly be submitted. Standard units as listed are designed for 100 volts D.C. output, but can be supplied for any required alternative output.

In selecting a Rectifier, the details given of arc capacity should be taken as the basis, rather than the standard, output, since the heavy overload capacity of the Rectifier makes it possible to supply a total load during change-over in excess of the standard output.

Care must be taken when an additional load, such as spot-lights, is added to the projector load, to select a Rectifier of sufficient capacity. If exact details are given, Rectifiers of suitable output and characteristics will gladly be quoted.



STANDARD OUTPUTS

of Newton Mercury Arc Rectifiers for Cinemas

Rectifiers for Single-Phase A.C. Supplies

Standard Output Voltage: 100 Volts D.C.

Model No.	Standard Output	For Two Arcs each	Efficiency		<i>Full details of floor space occupied, weight and price will be submitted on request.</i>
			Full Load	Half Load	
1/MC 30	24 amps.	20 amps.	79.5%	79%	
1/MC 40	36 amps.	30 amps.	80%	79.5%	
1/MC 50	42 amps.	35 amps.	80%	79.5%	
1/MC 50F... ..	60 amps.	45/50 amps.	80.5%	80%	
1/MC 100F	84 amps.	65/70 amps.	81%	80.5%	
1/MC 150F	114 amps.	90/95 amps.	81%	80.5%	

Rectifiers for Three-Phase A.C. Supplies

Standard Output Voltage: 100 Volts D.C.

Model No.	Standard Output	For Two Arcs each	Efficiency		<i>Full details of floor space occupied, weight and price will be submitted on request.</i>
			Full Load	Half Load	
3/MC 30	24 amps.	20 amps.	79.5%	79%	
3/MC 40	36 amps.	30 amps.	80%	79.5%	
3/MC 50	42 amps.	35 amps.	80%	79.5%	
3/MC 50F... ..	60 amps.	45/50 amps.	80.5%	80%	
3/MC 100F	96 amps.	75/80 amps.	81%	80.5%	
3/MC 150F	144 amps.	100/125 amps.	81%	80.5%	
3/MC 200F	174 amps.	135/150 amps.	81.5%	81%	
3/MC 250F	232 amps.	185/200 amps.	82%	81.5%	
3/MC 350F	300 amps.	245/260 amps.	82%	81.5%	

LARGER SIZES ON APPLICATION.

In addition to the Rectifiers detailed above, larger units up to 600 amperes capacity are available. Price of these units with full technical details will be gladly quoted on request. No matter what your requirements may be, a Newton Mercury Arc Rectifier will be found an economical and dependable method of meeting them.

Rectifiers for Special Requirements

Where rectifiers are required for special requirements such as spotlights or projectors and spotlights combined or for ventilating fans, quotations for rectifiers of suitable and economical output will be submitted on application. Rectifiers designed for automatic control are also available at slight extra cost.



