NEVELECTOR

– THE RECTIFIER.

"any trim at the turn of a switch"

PATENTS PENDING

0 40 50 60 70 80 90

Arc amperes – D.C.

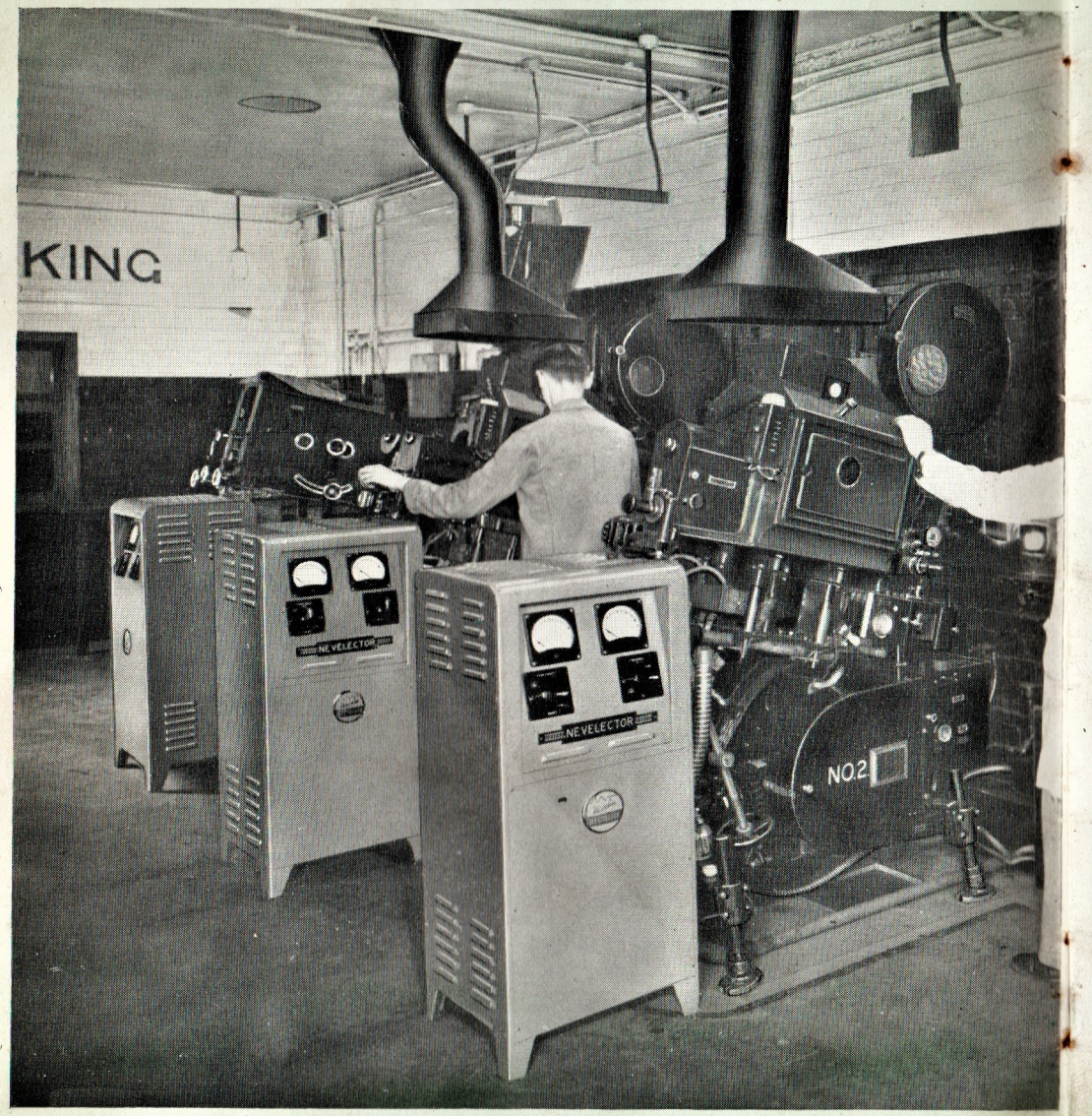
Nevelector—the Rectifier, is one of the most outstanding and sensational developments in Kinematograph Equipment that the industry has ever seen. We believe that it is destined to revolutionise Projection practice not only in this country, but throughout the world.

If you will follow us in our reasoning for this belief you will most likely agree.

NEVELIN ELECTRIC CO. LTD.,

PURLEY WAY, CROYDON, SURREY

Telephone - CROydon 2268
Telegrams NEVELIN CROYDON
Codes : A.B.C. 5th Edition, Bentleys.



A set of Nevelectors installed in a London Cinema of a leading circuit.

The PROBLEM

Standard Kinematograph projection uses—and is likely to go on using—as its source of illumination the Carbon Arc Lamp.

There are available to the Exhibitor literally dozens of types of Arc Lamp and for each type—with a few exceptions—it is possible to choose from several alternative combinations or "trims" of carbon.

Some early types of Arc Lamp were supplied with Alternating Current, but certain difficulties presented themselves and the A.C. Arc Lamp was temporarily discarded.

Of recent years however, some of these difficulties have been overcome with the result that we now have in use both Alternating Current and Direct Current Lamps.

In each type electrical energy is supplied to the arc and is converted into light at the tips of the carbon electrodes, and the problem which has been ever before the Kinematograph Engineer is how to convert that electrical energy into light in the most reliable, efficient and economical manner.

Q. E. F.

The light source must be reliable and not subject to sudden failure ; it must be efficient from an optical point of view ; and, compatible with these requirements, it must represent the minimum of expense to the exhibitor in the consumption of electricity, carbons, lamp accessories, and upkeep generally.

The combined ingenuity and scientific research of Lamp Manufacturers, Carbon Manufacturers and of those who designed and supplied the apparatus for "feeding" the arc lamp with electrical current of suitable characteristics have been applied for the last half-century and more to just this problem.

For various technical reasons connected with the distribution of electricity over large areas of country, Alternating Current became generally employed and for other reasons, both technical and commercial, this Alternating Current has come to be supplied to consumers' premises at a voltage around 230 and a frequency of 50 cycles per second.

Since the Arc Lamp used for Kinematograph Projection has until recently required a Direct Current Supply only, various means have been employed to convert the A.C. supplied by the mains

to D.C. for use in the Arc. Motor-generators, rotary convertors and rectifiers of various types have been tried in turn. Each has shown certain advantages . . and certain disadvantages.

The motor generator was an efficient convertor of electrical energy from A.C. to D.C., provided that it was not seriously under-loaded. But a carbon arc could not be fed steadily from such a source except through a "ballast" or compensating resistance. And this resistance was a source of considerable waste in electrical energy which, although paid for, was dissipated in the form of heat and did not appear in the Arc as light. Ballast resistance losses were largely eliminated by the introduction of the ordinary mercury arc rectifier where control was exercised on the input or A.C. side by means of "chokes." However, this avoided one trouble only to introduce another, since these choke-controlled rectifiers could not—without major alterations—supply any current and voltage combination lying substantially outside the limits for which they were designed and set.

In short they were not flexible, and a change in Arc Lamp or in Carbon trim all too frequently necessitated a change in the rectifier equipment with all the heavy costs involved thereby. With these disabilities in view there was a tendency, shortly before the war, to swing in the direction of Alternating Current lamps, which, as we have seen, had been laid on the shelf as unsuitable for projection some fifty years since.

By certain scientific work on the part of a Carbon Manufacturing Company the chief drawback of the A.C. arc (namely the "beat" effect set up between the lamp flicker and the shutter frequency) was virtually eliminated and the Exhibitor was presented with a lamp which gave true "High Intensity" results while demanding, by way of conversion apparatus, only a small step down transformer or "inductor" which could simply be plugged in to the A.C. mains and connected direct to the lamp terminals.

The shortage of generators, rectifier bulbs and of replacements of all kinds incident upon the war undoubtedly had the effect of speeding up the popularity of the A.C. Arc Lamp, but despite its many excellent features this lamp suffers—and must necessarily suffer—from the fact that its "utilisation efficiency" is low.

Since, under the influence of the A.C. each of the carbons in turn is the Positive, it follows that for half the time the crater is presented away from instead of towards the collecting mirror.

Moreover since both carbons are necessarily of the same diameter and are worked with their tips in close proximity, the crater presented to the mirror is inevitably obscured to a large extent by the opposing carbon. The use of high current values in the arc goes some way towards overcoming these disadvantages, but the light thrown on the gate per watt expended in the arc does not commend itself on the grounds of economy.

The many and often conflicting requirements of supplying the Exhibitor with equipment for feeding his various arc lamps with electrical current of suitable characteristics had been studied for many years by the Nevelin Electric Co. Ltd. whose wide experience in Rectifier design and manufacture generally peculiarly fitted them to solve the specialised problems connected with Kinema Arc Lamps.

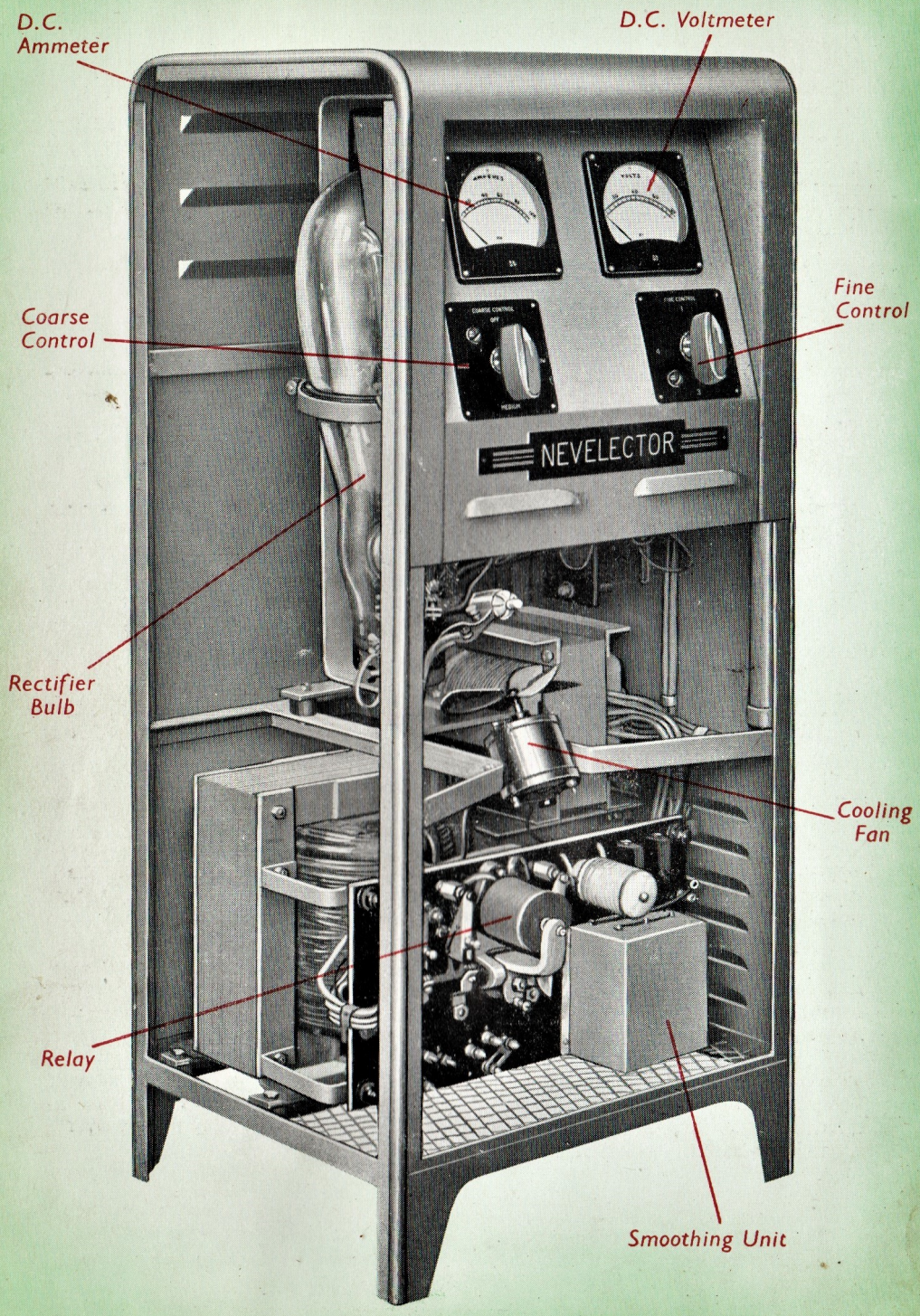
It was apparent from the start that these problems could not be solved by following a line of research which, however sound theoretically, failed to take account of the large numbers of Arc Lamps, the still larger numbers of High and Low Intensity Carbon trims used with those Arc Lamps, and the operating conditions in the Theatre itself, where, for instance, the Main Arcs may be run on H.I. trims and those for spots and slides on L.I.

The only logical way of tackling this job, in fact, was to make an exhaustive study of the arc supply problems in a wide variety of Theatres and, with this knowledge carefully sifted and tabulated, to work *backwards* from the lamp terminals to the supply mains.

It is doubtful whether the many problems involved could have been solved or the many theories tried out in practice, had it not been possible to have ready to hand a complete range of H.I. and L.I. Arc Lamps, samples of every possible trim of carbons, and a theatre equipped with the latest photometric instruments for recording the intensity and steadiness of light as well as providing all other relevant data.

Fortunately all these advantages were to hand in the Laboratories of a leading Carbon Manufacturer who offered to co-operate, step by step, in producing the ideal Rectifier equipment.

That offer was accepted and the result of this long and carefully prepared 'combined operation' is now placed at your disposal.



Q. E. D.

A Rectifier equipment has been evolved, tried out in practice and proved to possess the following advantages to an outstanding degree,—

1. Economy in first cost, space, installation and upkeep.
2. High conversion efficiency.
3. Extreme flexibility enabling it to be adapted to any required arc conditions (H.I. or L.I.) by the simple turn of a switch.
4. An accurate recording of Arc Current and voltage constantly under the eye of the Projectionist.

These claims will be borne out by a study of the pages which follow.

GENERAL DESCRIPTION

The Nevelector consists essentially of a Nevelin mercury arc rectifier bulb, a control choke, a transformer and a smoothing unit.

The whole is mounted in a simple sheet-steel cubicle of pleasing modern design and finish.

A particular feature is the flood-lit control panel which carries, in addition to the Coarse and Fine switches (described in detail later), a pair of Grade 1 accuracy moving coil instruments.

These respectively record the current flowing in and the voltage impressed across the arc, and provide the Projectionist with constant and accurate information concerning what is going on in the lamp-house.

The unit as a whole is of compact design, readily portable and very simple to install. Two leads only are necessary ; one to connect the input to a 50 cycle single-phase 200/250 volt A.C. main, the other to connect the output to the Arc.

ECONOMY

It is in the all-important matter of Economy that Nevelector scores its greatest triumph . . . and by Economy we don't mean cheapness.

There is nothing "cheap" about Nevelector. From the specification of laminations, windings and the internal equipment not normally on view, to the instruments and switches on the panel, it is what it sets out to be—a good example of British Electrical Engineering.

Let's glance at some of the features that make Nevelector a money-saving—and, therefore, a money-earning—proposition.

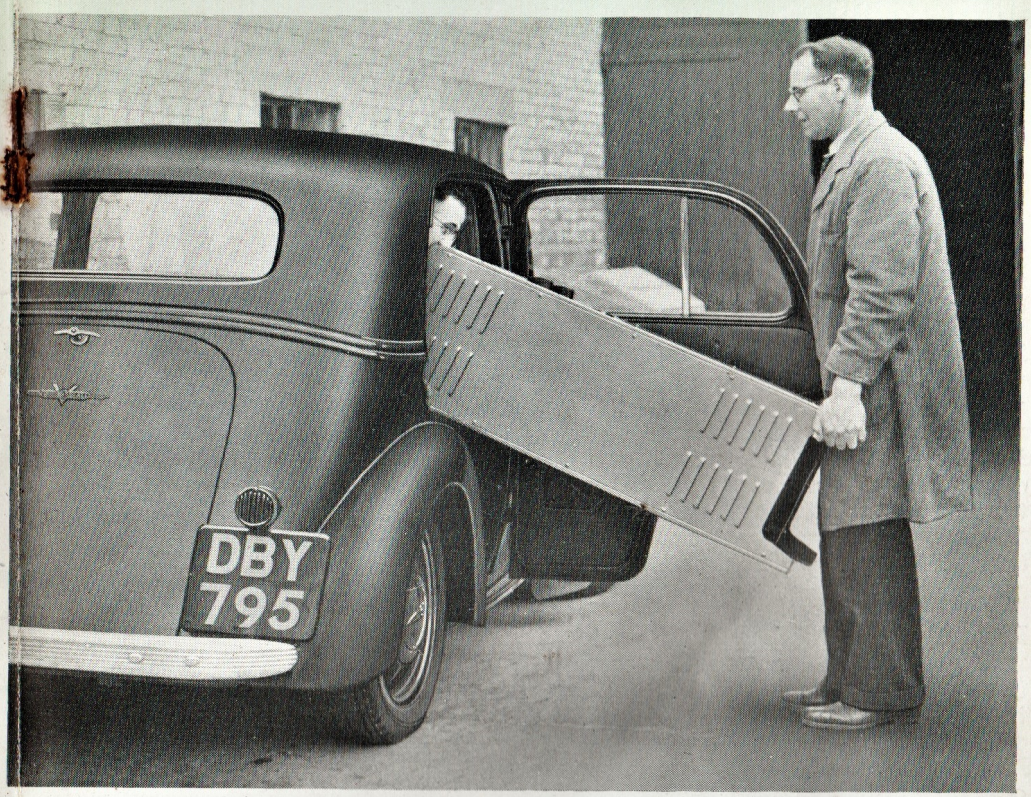
1. LOW FIRST COST

Although two Nevelectors will look after the projection requirements of the average Theatre, most Exhibitors will feel that a third unit is called for to supply slide lanterns and spots. By a simple switching arrangement the three Nevelectors can then be wired to take care of any likely projection requirements.

The combined cost of the three equipments will be found to compare very favourably with that of a single rectifier capable of performing the same duties, and, under average working conditions, a Nevelector installation will, in a matter of two years, recover its own cost by the saving effected in current and carbons.

2. LOW INSTALLATION COSTS

Nevelector is a portable job. Its steel cubicle measures nineteen inches wide ; sixteen inches deep and stands 3′ 9″ high. In working order it weighs 250 lb. It takes up very little space whether in transit or in operation and it is usually feasible to instal it alongside the arc lamp which it supplies (see page 2). It is worth noting, incidentally, that the rectifier bulb is fitted in the cubicle in its specially sprung mounting at our works—there is no need for an engineer to attend specially at the installation to fit and wire-up the bulb. Nor will any harm come of tilting—or laying—the Nevelector on its side. It can be carried to the site in the back of a touring car and put into operation forthwith. There is no need to knock down walls or widen doors to get it in position. It will carry easily up a narrow winding stairway.



". . . Nevelector is a portable job."

The actual installation is simplicity itself. It calls for no extended wiring or conduit work, and can be undertaken without calling in specially skilled assistance.

We would suggest that the A.C. input terminals of the Nevelector be wired to the supply mains through a double pole ironclad switch situated in the Projection room itself ; thus enabling the operator to throw the entire Nevelector out of circuit instantly should he desire.

A pair of D.C. leads taken to the lamphouse (through an isolating switch which can be pulled whilst carboning) completes the job.

3. LOW OPERATING COSTS

If the Nevelector competes in the matter of first cost and installation, it wins at a canter in the "long run."

Its conversion efficiency is as high as 70 per cent. varying according to load factor.

But there are three important facts to be noted. **First**; the figure given represents an OVERALL efficiency indicating the percentage of electrical energy taken from the mains that is supplied TO THE ARC. There is no ballast resistance to waste energy in the form of heat.

Second; because Nevelector delivers Direct Current the utilisation efficiency of the arc is much higher than for an A.C. arc. Thus, assuming in both cases the same efficiency in mirrors, lenses and screens, comparison between the performance of an A.C. arc and a D.C. arc run from a Nevelector shows that more light is projected on the screen for a D.C. trim of 6mm. H.I. Pos. and 5mm. H.I. Neg. working at 40 amperes 35 arc volts (mains consumption 2,300 watts) than for an A.C. trim of 8 mm. working at 90 amperes 26 arc volts (mains consumption 2,750 watts).

In comparison with A.C., therefore, the Nevelector not only gives more light for less current consumed, but it reduces considerably the cost in carbons and, in addition, affords the great advantage that whereas the A.C. trim is relatively insensitive in its light output response to increases in current, with a D.C. trim on Nevelector feeding you can step up the current by twelve finely graduated steps and secure an exactly economic light output under any conditions.

Third; The efficiency of Nevelector is maintained indefinitely. Its mercury arc rectifier has no hot cathode to lose its emission, no metal plates to deteriorate under overload conditions, and no devices which safeguard against overload, at the expense of putting a restriction upon the output characteristics.

From the above it is apparent then that the conversion efficiency of the Nevelector is higher even than the figures given would indicate. It is considerably higher than that of any other form of conversion used for Cinema arcs.

A further point of interest is that the Nevelector is controlled in the A.C. circuit. When the Coarse Control is switched on current is

immediately available to run the arc; when it is switched off no current whatever flows in the Nevelector. There is no exciter circuit to be kept running, and no time is wasted in "warming up"—you just use current as and when you need it.

Finally, as regards actual operating costs, the Table on page 15 gives results of a carefully conducted test carried out under actual Theatre operating conditions by an impartial expert.

Comparison shows that with the Nevelector equipment the cost in current is approximately one half that of a standard cinema rectifier of conventional type.

4. LOW MAINTENANCE COSTS

Since the specification of Nevelector throughout provides a far more generous factor of safety than that normally demanded of electrical engineering products, we cannot foresee that maintenance should be necessary in any direction. There just is not anything to go wrong.

The life of the rectifier bulb is measured not in hours but in years. Moreover the efficiency of the bulb does not fall off—in ten years it will be as efficient as when new.

Nevelector has been designed to do its job thoroughly, to save you trouble and to save you expense.

HOW TO OPERATE

This close-up shows the arrangement of the flood-lit control panel.

Of the two rotary barrel switches the one on the left serves as an ON-OFF switch and also to supply approximately the desired current. Fine gradations of current are secured from the right hand switch.

Since there are three "live" positions on the Coarse Control or left hand switch, and four positions on the Fine Control,

it follows that the Nevelector offers a progressive series of twelve finely graded steps, enabling the exact conditions of arc current and voltage to be selected to handle any D.C. trim, L.I. or H.I. up to 65 amperes.

The characteristic curves for these twelve switch positions are given on the folding plate opposite page 14.

In general, the Fine Control enables the current to be stepped up in gradations of about $2\frac{1}{2}$ amperes, and the Nevelector thus gives all the advantages of current control associated with a motor generator, but without, of course, wasting a large amount of current in a ballast resistance.

It is not too much to claim, in fact, that, apart altogether from its outstanding economy, Nevelector combines all the advantages of other types of conversion equipment, whilst minimising and even eliminating their disadvantages.

All that is necessary, once the unit is wired to the mains and to the lamphouse, is to move the coarse control from OFF to LOW and strike the arc.

The act of striking the arc automatically brings the rectifier bulb into operation and the full current and voltage, as indicated by the controls is instantly available—there is no "warming up."

A point which will immediately suggest itself to the Projectionist is that a new trim can be burned-in and a perfect crater formed on a low current setting—for example, with the Coarse Control at Low and the Fine at "2."

Burning-in at a low current not only makes it possible to form a perfect crater in the first place, but avoids all risk of "drawing" the core of the positive by a sudden application of heavy load.

When burning-in is complete the Fine Control may be moved through positions 3 and 4. If more current is required the fine control is moved from 4 to 1 and simultaneously the coarse control is set at Medium.

This process is continued until the correct setting for that trim is reached.

Should still more light be needed, there is a choice of slightly overloading the existing trim or of putting in a larger one.

It will be observed from the chart for example, that the characteristics of the three H.I. trims, "B," "C" and "D" overlap. Thus Medium—1 and 2 will provide maximum current for 6mm. × 5mm., while it will also represent a low current setting for 7mm. × 6mm. There is thus an ample margin to give each trim exactly what is required.

The exact values of current and arc voltage in the lamp are shown on the ammeter and voltmeter on the panel. Knowing ourselves the importance to the Projectionist of correct information on these matters, we have incorporated only Grade 1 accuracy instruments with 5 inch dials. The needle lies close to the scale and gives a correct reading even when viewed at an angle.

As will be seen from the chart, any L.I. trim from 10mm. × 7mm. to 14mm. × 9mm. can be looked after comfortably by Nevelector. It is, therefore, a simple matter to arrange a Nevelector unit so that it can be switched from a main projector working on H.I. to a slide working on L.I. Two clicks of a switch and its fixed !

A final word may be given about the smoothing of the D.C. output. The old motor generator, when well cared for, used to give that smooth flow of current which made for perfect arc steadiness. Some Projectionists maintain that no Cinema rectifier has ever been known to give that same smooth output that they used to get from a motor generator.

In Nevelector we have thought of that one too, and the result is our patented electrolytic smoothing device which comes into operation immediately the arc is struck, giving an oscillogram curve on single phase rectification equal in smoothness to that of standard 6-phase rectification as prescribed for public supply systems.

And, by the way, should your Cinema be in a district where the load on the supply mains is subject to wide industrial fluctuations, you will not forget that any irregularities of this sort can easily be remedied by a step up or a step down on the Fine Control.

Open this chart and examine the twelve different arc characteristics which are available from the Nevelector.

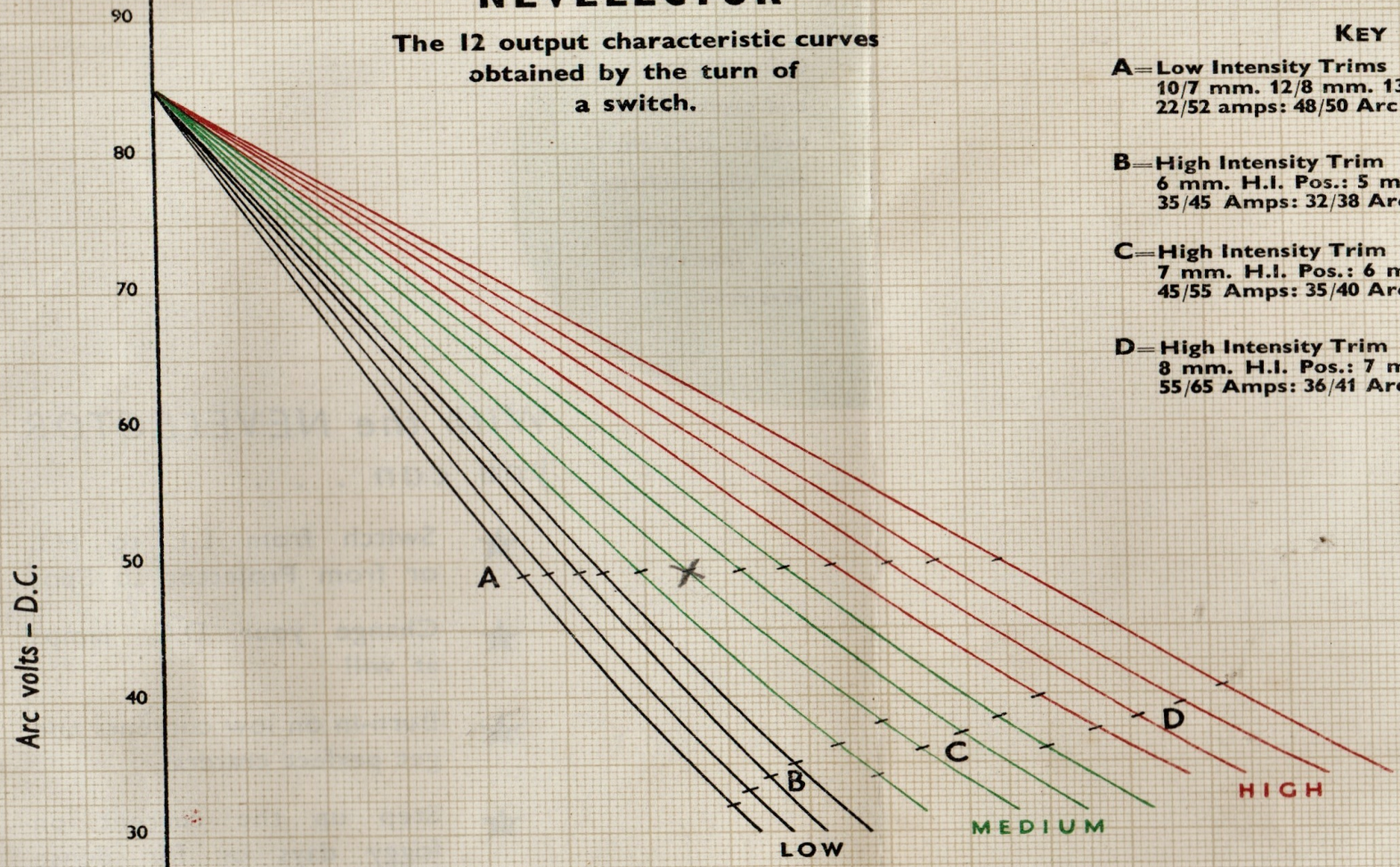
With the NEVELECTOR you can . . .

- ★ Switch from L.I. to H.I. or from Projector to Spot
- ★ Change your D.C. lamps at will
- ★ Burn-in on low currents and get perfect craters
- ★ Step up the current on foggy days or for dense prints

You can do all these things "at the turn of a switch" and all the while the exact arc current and voltage is seen at a glance.

NEVELECTOR

The 12 output characteristic curves obtained by the turn of a switch.



KEY

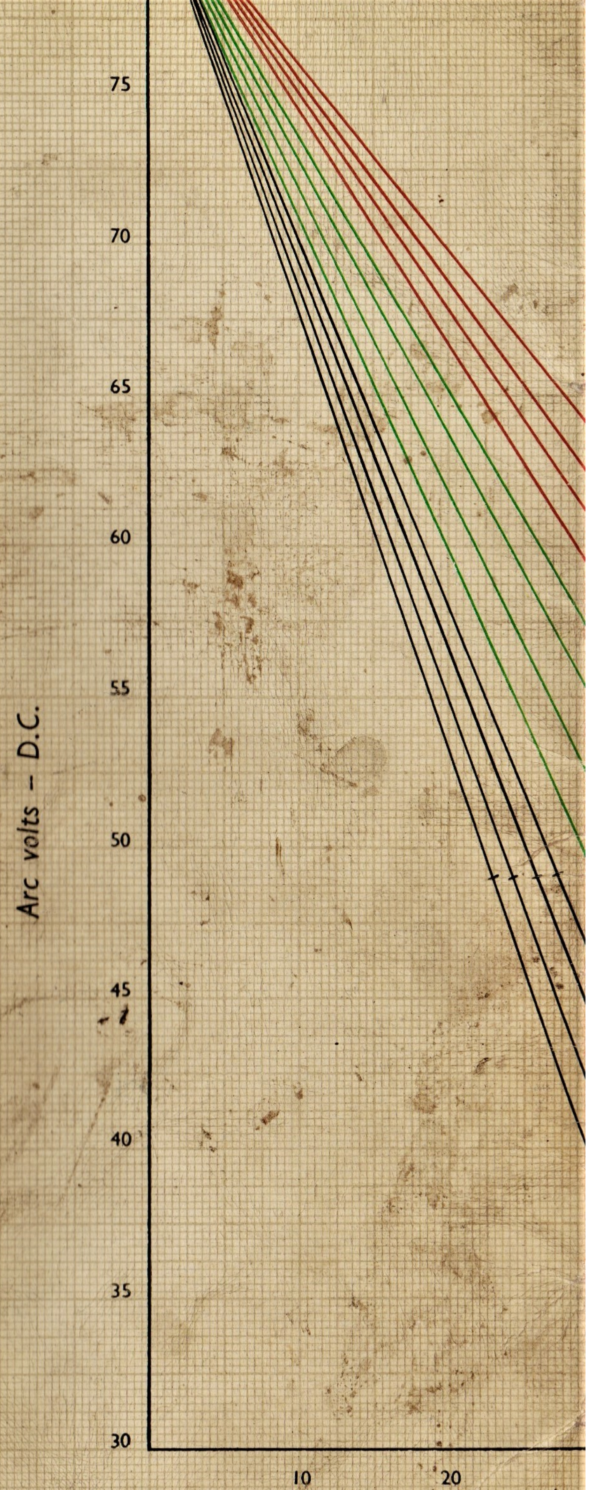
A=Low Intensity Trims
10/7 mm. 12/8 mm. 13/9 mm. 14/10 mm. } 12 positions.
22/52 amps: 48/50 Arc Volts.

B=High Intensity Trim
6 mm. H.I. Pos.: 5 mm. H.I. Neg. } 6 positions.
35/45 Amps: 32/38 Arc Volts.

C=High Intensity Trim
7 mm. H.I. Pos.: 6 mm. H.I. Neg. } 5 positions.
45/55 Amps: 35/40 Arc Volts.

D=High Intensity Trim
8 mm. H.I. Pos.: 7 mm. H.I. Neg. } 5 positions.
55/65 Amps: 36/41 Arc Volts.

Note:—The Carbon Manufacturers' burning recommendations should be consulted in respect of any given trim.



Brochure N.10. Dec. 1945.

PRINTED IN ENGLAND. H.C.10A.