



ENGINEERING TRAINING SUPPLEMENT

No. 11

LIGHTING FOR TELEVISION
OUTSIDE BROADCASTS

by

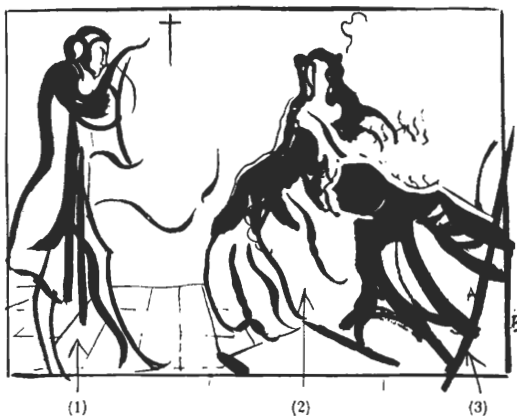
H. E. H. Mayhew

THE BRITISH BROADCASTING CORPORATION

LONDON

1957

LIGHTING FOR TELEVISION
OUTSIDE BROADCASTS



1. CALM: *Calm curves, but confined steadiness of upright lines, floor pattern, etc. No agitation in background.*
2. FRIGHT: *Lines trembling and agitated. Also movement on candle flames, etc.*
3. ANGRY INTEREST: *Violent direction of line away from lines A and B.*

Tonal Balance from 'Story Illustration' by H. Forster

with acknowledgements to Amalgamated Press and the Artist Publishing Company

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ISSUED BY
THE BBC ENGINEERING TRAINING DEPARTMENT

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LIGHTING FOR TELEVISION OUTSIDE BROADCASTS

I. INTRODUCTION

The basic principles of television lighting have been adequately covered in Training Supplement No. 7. The emphasis of that publication however is mainly towards the controlled conditions of studio technique; this supplement is concerned with the more unorthodox conditions prevailing on outside broadcast locations.

The basic principles of course are common to both, but whereas in the studio every television lighting facility is readily available for covering the most complex productions, no lighting facilities at all are to hand at the average outside broadcast, and the complexity of some of these location productions may equal or even exceed those in the studio.

In the studio, settings are designed and positioned to suit mood, action and equipment. Pictorial content and composition are thoroughly considered in the design and planning stage before the production ever reaches the studio floor. On actuality outside broadcasts the settings already exist, fixed and immovable. Contrast ratios may be either too high or too low for the image orthicon tube, pictorial content is more often than not conspicuous by its absence, while the possibility of employing really good camera angles is severely curtailed by the physical limitations of the location.

If therefore lighting is still to create mood, to preserve or evolve atmosphere and to infuse some artistic merit into often inartistic subjects, both approach and principle must be adapted to meet these more variable and haphazard conditions; and the lighting supervisor must be prepared to sacrifice some of the delicacy of touch he might employ on his studio Whatman, in favour of a broader, bolder technique on his location canvas.

On page 16, paragraph 2, of Training Supplement No. 7 it is stated that "when lighting any (studio) production, the best way to start thinking about it is to imagine what the scene would look like if it were a real place." The O.B. team is usually presented with the real place, and the problem becomes how to supplement the existing conditions of light to satisfy technical requirements while still preserving the reality. The effort on the part of the lighting supervisor in the studio to create reality out of unreality, as opposed to the effort on the part of the O.B. lighting supervisor not to create unreality out of reality, is perhaps the most fundamental difference between studio and O.B. approach and it is a difference which should be very fully appreciated.

As an example one may quote a night scene, say, of the Ceremony of the Keys at the Tower of London. In a ceremony such as this, large areas of paved courtyard and cobbled walk, very light in tone, have to be traversed during the ceremonial ritual, and however skilfully lighting may be employed to produce the necessary mysterious low-key effect upon castle wall and turret or on shadowed arch and portcullis, the general effect may still be completely false and unbalanced, as compared with the actual scene.

Where any courtyard is in the foreground—and of necessity there will be quite a lot—the foreground effect will approach more nearly the brightness of high noon while the rest of the picture will fade through an indeterminate sort of twilight in the middle distance to battlements dark-etched against the night sky, and *there* there will be much more of the ‘witching hour’ atmosphere. But, however hard you try, high noon and midnight cannot mix in a single frame! A tactful approach to the local fire-fighting section however will usually result in an enthusiastic hosing-down of the offending areas before transmission. This will automatically lower the tone and will provide those high-light reflections in odd puddles . . . those brilliant gleams on the edges of wet cobbles which so emphasise the shade detail and make all the difference to the mood of the picture.

However awkward or however unprepossessing a subject, there is usually a way out. Léonard Missonne has said “The Subject is nothing . . . the Light everything”, and if the student exercises his observation with true sincerity, the force of this statement will be obvious. It must be admitted however that the cold hard facts of economics as applied to television O.B.s tend toward a reversal of this ideal. As it would need a genius to give graphic effect to either point of view, for the purpose of this supplement we will take the middle course.

2. ELEMENTS OF PICTORIAL COMPOSITION

There is such a wealth of literature on pictorial composition that the intention here is merely to introduce the subject and to impress on the student that he should not slavishly apply rigid principles to each and every pictorial effort he may contemplate, but that he should intelligently adapt them to his own assessment of the scene he wishes to portray.

If he endeavours to do this, not only will he begin to appreciate more fully the significance of natural phenomena he has hitherto hardly noticed, but a new life and vitality will begin to creep into his pictorial representation of such phenomena, as he builds up confidence in his ability to balance the more expressive elements of his composition in a logical and compelling manner.

Once he has developed this ability, he will discover that the correct balancing of lights, darks and mezzo-tones for the best pictorial effect within the rectangular format will provide a harmony of tone ideal for adequate reproduction by the television system. He will find that, contrary to popular conception, the photographic art can attain quite a high standard and still function within the limitations of equipment peculiar to the electronic medium.

From whatever angle this matter of composition is approached the fundamental fact we have to learn is that composition is only an artifice by which the imagination is stimulated and an illusory concept created; it cannot compete with or improve on nature in its uninhibited domain.

When we as individuals survey a landscape on a summer evening, there are quite a lot of things about it which affect us. We look at it with two eyes and become aware of colour of aerial perspective, of depth in the hazy distance, of form, of light, of shade. We smell the sweetness of the meadows and other subtleties of perfume that are an integral part of the countryside. We hear the lazy drone of insect life, the trill of birds, the lowing of cattle and all the indistinct harmony of sound that so emphasises the apparent quiet of a summer evening. We feel the springiness of turf beneath our feet, the breeze fresh and clean on our cheeks and we can almost taste the richness in the air.

ALL these things react on our inner consciousness to produce a sensation which is indicative of our appreciation of what we say we 'see' although it is really so very much more than that. The quality of this sensation will vary considerably from individual to individual, and it will more or less control the way in which each individual (after the first cursory glance) will scan this subject matter spread out before him on Nature's catholic canvas. This is true of most natural and material things, and the way we LOOK at things is decidedly a matter of how we FEEL about them.

When our questing eye roves any natural scene, it has the ability to select in that scene the point of interest which has the most dominant features as far as the individual is concerned. It may be a function of colour ... form ... mass ... position, but whatever it is, focus can be maintained on that point to the apparent exclusion of fussy detail although there is still an 'awareness' of such detail. Similarly, should the detail be of more appeal, the eye can just as easily emphasise that aspect to the apparent exclusion of the more dominant feature. It is completely free and untrammelled—it can wander where it will—settle where it will, and it knows no boundaries except those of the horizon.

If we leave the material scene and contemplate the artificial spectacle created for our entertainment in the theatre, where the auditorium is darkened expressly for the purpose of concentrating our attention on the

stage, although some restraint has now been forced on visual freedom, the eye still has a quite considerable scope and a fairly wide field of adventure. Further, because the stage has depth, width and height and because this is accentuated by carefully devised scenic perspective and coloured lighting effects, a three-dimensional and colourful interest is automatically preserved. In spite of this, however, if the stage grouping, lighting and decor are not in complete harmony visual interest will wane however good the actual programme material may be. The eye will find no balanced stimulation and will therefore become fidgety. It will convey a sense of futility to the brain and a feeling of frustration and irritation will result.

If therefore, we ever hope to capture and hold the interest of this nomadic eye by some graphic and monochromatic representation of a scene within a rectangular format and moreover in a single plane, it is obvious that we have got to be quite piquant in our pictorial appeal—not in a blatant and obvious way, but in some subtle, stimulating manner that will entice and hold the gaze in spite of its natural urge to be up and away after the first cursory and exploratory glance. There is none of the natural atmospheric mood of the actual landscape to help stimulate the eye—none of the colourful scope of the theatrical spectacle . . . just a flat, unlovely rectangle into which we have to coax the eye and there imprison it amongst a muster of whites and blacks and greys.

Obviously therefore, some form of quiet gentle persuasion is necessary in order to successfully accomplish such a feat, and this persuasion is what is generally known as the art of pictorial composition. It is the art that compels you to look at a picture and, having looked, leaves you soothed, stimulated or shocked, but never emotionally static. Yet the builder of pictures is fairly limited in scope; all he has is a flat surface and a small amount of space within a boundary line. This boundary line may take the form of a square, a rectangle, a circle, or practically any shape whatever, but for our purpose we are primarily concerned with the rectangle.

Now somehow or other we have to introduce into the space at our disposal some element of interest, and whatever element we introduce must of necessity cause some division of shape. The main thing to remember here is that if we divide the shape equally either vertically or horizontally, all we succeed in doing is to produce two shapes of equal dimensions and no interest.

If however, our elements are arranged in the space so that its division is unequal, some interest is immediately forthcoming due to unequal volume within the given boundary. Suppose that, without any real thought we introduce into the picture plane a few loose lines to render the 'emptiness' a little more palatable (Fig. 1) thus dividing the space unequally.

Although unequal division has created some slight interest, all we can really do is to speculate upon the puzzle.

If now we take these self-same lines and re-arrange them with a little more thought and care as in Fig. 2, an immediate impression is created and the imagination has something to work on. The frame is still unequally divided and in proportions not quite a third and not quite a half.

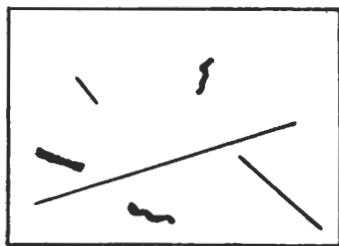


FIG. 1

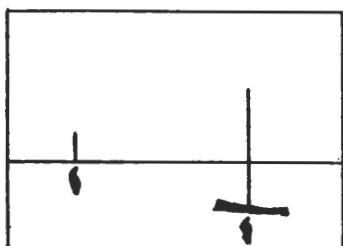


FIG. 2

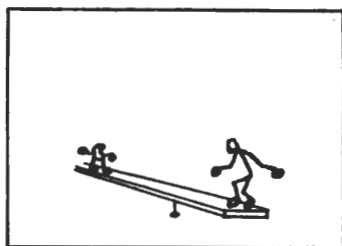


FIG. 3

Another point to notice is that the difference in size of the two vertical lines has definitely given an impression of depth so that our picture plane no longer looks flat but produces a feeling that we are looking into it. The illusion created is that we are looking at the representation of a stretch of water on a quiet, still day with a boat in the foreground and one on the distant horizon. And yet there are only six lines within the rectangle, but lines which have been introduced in an orderly manner rather than in a haphazard fashion. This diagram is capable of considerable development. Ripples can be indicated in the water, detail can be introduced into the boats, clouds into the sky. It can be worked up to such an extent that it no longer leaves anything to imagination; and at that point it will most likely cease to have any aesthetic appeal to the beholder. One of the most difficult things about pictorialism is to know what to put in and what to leave out; but we shall return to this subject later.

A further point to observe in Fig. 2, is that the small boat on the horizon appears to balance the larger boat in the foreground and the reason for this is illustrated by the 'see-saw' in Fig. 3.

From these few elementary indications, therefore, it should be fairly obvious that this rectangular shape (within which we hope to assemble our pictorial elements in such a manner that they compel attention, promote interest and carry some conviction) is a much more complex format

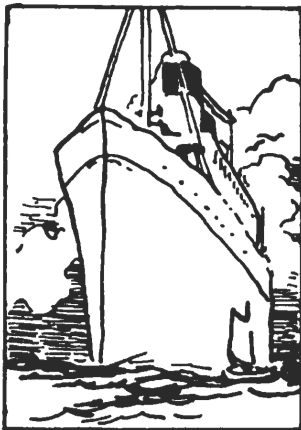


FIG. 4 EMPHASIS CREATED BY LOW ANGLE OF VIEW
with acknowledgement to 'Composition' by Cyril Pearce

than was at first apparent. Complex that is, to those who do not understand its significance in pictorial terms—to those who are unacquainted with its laws and its conventions.

The student should therefore try and find out something about these laws and conventions, and a very good introduction to the subject can be obtained from a Batsford publication *Composition* by Cyril Pearce, R.B.A.



A

FIG. 5 CONFUSION CREATED BY DIVERSITY OF TRACKS

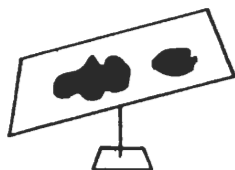


B

UNITY CREATED BY ALL TRACKS LEADING TO POINT OF INTEREST

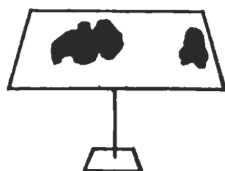
with acknowledgement to 'Composition' by Cyril Pearce

In this book the field of pictorial composition is explored in an interesting, practical and concise manner eminently suited to the needs of the tyro. Figs. 4 and 5 show three illustrations from this book which speak for themselves.



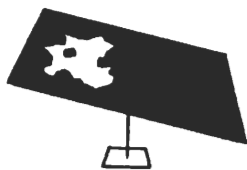
A

Tone area not central. Picture surface heavier and weighed down on one side



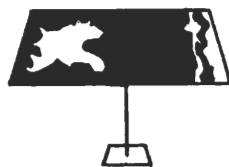
B

Balance restored by placing small area of tone on opposing side and near to edge of picture surface



C

White on dark imperfect balance, one end lifted by the area of light tone



D

Balance restored by placing area of light tone at opposing side

FIG. 6 EXAMPLES OF BALANCE AND UNBALANCE

Another book which deals with the subject more specifically in the photographer's terms is *Composition for Photographers* by Richard N. Haile (Fountain Press) and illustrations from this publication are shown in Fig. 6.

Each of these books, of course, deals with both line and tone in terms of a static medium, and it may be a little puzzling to know why the rudimentary aspects of a static medium should be considered at all by personnel whose essential interest is in a decidedly quick and animated medium, a medium moreover which is so 'live' that it does not permit of a 'light and strike' for each 'take' and a subsequent editing of the material.

While, however, our material is 'live', it still has to be metaphorically 'shoe-horned' into this unlovely rectangle we have already discussed, and if we have any pride at all in our medium, we shall want the natural material to seem at home in our rectangle as though this were its normal habitat. This is not a simple case of, shall we say, spontaneous migration on the part of such material. We have to groom the untamed subject

matter and then exercise a considerable amount of persuasion in order to introduce it sweetly and graciously into the cage. If we do this with sufficient skill, the subject matter will appear to be there quite naturally—and quite uncaged. But, even to attempt this, we must be familiar with the laws and conventions of the rectangular kingdom as applied to graphic representation.

In studying the compositional works referred to above, the student will notice the emphasis which is placed on the creation of a balanced tonal pattern within the frame—the sort of light and dark pattern (as opposed to light and shade) which results when a subject is illuminated by a broad, soft and even frontal light.

For our purpose, however, we are mainly concerned with tone in its 'light and shade' aspect in order to produce a three-dimensional effect where shadows give modelling and roundness as opposed to the flatness of sheer pattern. Even so, before considering the three-dimensional aspect of a contemplated picture, it is still very necessary that the general pattern of the tonal arrangement with respect to the frame should quite definitely be decided first and that the modelling function of the shadow should be interwoven with this pattern so that the ultimate impression is one of a harmonious whole.

This is not quite as straightforward as it sounds, for when attempting to interpret a subject in terms of tone, such an infinite variety of gradation will usually be apparent in that subject that confusion will result unless some simplification of the tonal range is attempted.

If the eyes are partially closed, the eyelashes will filter out quite a lot of this tonal confusion, and with practice, it will be possible to assess the average subject in terms of three tones—light, mid-tone and dark. Now if a tonal pattern is built up into a pleasing arrangement on the basis of such a restricted range, it will be found that the intermediate tones will quite easily fall into their proper places as the modelling or accent is introduced.

From the television outside broadcast point of view it is very necessary that subjects should be reduced to their very simplest pictorial forms, for this quality of simplicity which is inherent in even the most apparently complex material will often prove the 'open sesame' to projects that would otherwise be rejected on the grounds that they were impracticable. This aspect will be referred to again when dealing with the methods adopted on actual outside locations.

It has been indicated that the modelling or three-dimensional impression is achieved by the use of shadows, and the shape, direction and intensity of shadows are of paramount importance. They must assist the composition and not detract from it. The term 'shadow' does not imply

the use of ugly areas of heavy black tone. These are no asset to any pictorial representation. Very rarely indeed is a shadow black and it will be appreciated that while a shadow may be 'strong', it should not be heavy. There is a distinct difference. A strong shadow, for all its strength, still retains some quality of richness—some luminosity which is a function of induced light. It LOOKS like a shadow and, properly introduced, it will emphasise the form.

A blob of heavy, unsympathetic tone masquerading as a shadow will never look anything else and it will kill any tonal arrangement on to which it is dropped—for that is the impression it creates. Shadows—especially in the television field—should be treated with a nice respect for they have a language all their own and it will pay the student to learn it.

Broadly speaking, by the shadows we build the picture and give it its natural vitality, yet they are such a normal attribute of everyday life that their supreme significance in the visual scheme of things is usually quite overlooked (until they pop up in the wrong places on the television screen; and then, at least, the whole of Engineering Division is painfully and vociferously conscious of their existence!)

If a subject is graphically represented only in terms of its shadow shapes it will possess much more vitality than if it is drawn only in terms of its outline. The former conveys an impression of what is seen and felt about the subject, while the latter approaches a diagram, and natural objects are not visually registered in diagrammatic form. This brings us back to the point of what to put in and what to leave out. We can lean either towards the vigour and suggestion of the wood-cut or towards the diagrammatic precision of the engineering drawing. So there is a fair amount of latitude between these extremes for the development of either technique, and it is purely a matter of individualism as to whether the resultant product is a piece of sheer impressionism or a detailed map. When composing with pencil or brush on paper or canvas, personal preference in this direction can be given almost unlimited rein. The artist has complete control of all his materials and he can select both medium and textured surface to suit whatever style he adopts.

It is a very different matter, however, when painting with light in ultimate terms of a fluorescent screen. The television process is essentially a product of precise electronic engineering, and the liberties that can be taken with such a process in the interests of artistic licence are strictly limited. Yet the lighting supervisor will continually be pressed to interpret artistic requirements quite outside the capabilities of the medium. This is where a sound knowledge of the compositional laws relating to pictorialism can be of immense value, for the knowledge of why a picture takes on a certain aspect or mood, or the knowledge of how that aspect

or mood is pictorially created or suggested, will often permit one to prune and relate these laws in such a way that a fairly satisfactory compromise can be effected between the artistic requirement and the electronic limitation.

To quote an example. A programme was envisaged in an old and supposedly haunted mansion at Bexleyheath. Some spooky midnight sequences were required in a corridor and down a grand old staircase leading into this corridor. A ghostly mediaeval maiden was to glide down this stairway and float along this corridor in elusive and ethereal suggestion. The effect required involved a light level and a tonal balance quite outside the scope of the equipment. The programme depended on the possibility of obtaining the correct effect, and a decision was required on the spot. To add to the difficulties, reverse angle shots were required in the corridor, there was nowhere to conceal a light source and the assessment of the possibilities had to be made during a daylight visit.

Now, pictorially speaking, it would have been of no use to contemplate an odd and unrelated ghostly gleam down the stairway, or a patch or two of eerie and unrelated luminance along the corridor—there must be good reason for such gleams if they are to be effective—and, because the areas of black in the picture would take up such a large proportion of the picture space, all suggestion of a corridor would be lost unless an impression of it could be created to start with.

First and foremost therefore, the corridor had to be established. If this could be accomplished at the commencement of the sequence it could be made to 'sing on' through the sequence if assisted here and there by a judicious little luminant prod. But the 'here and there' had to be in the right places to stimulate the illusion. Fortunately, there were some latticed windows in this corridor facing a quadrangle, and on the other side of the quadrangle there were some buildings with old-fashioned chimney stacks which looked solid enough to support an ersatz moon.

In discussion with the producer it was decided to have a moon, to take an opening shot of the front of the house (illuminated by a different moon cheating the correct angle of the one required for the corridor effect) and then to track into the corridor through the creaking old doorway. This was the point at which the commitment was accepted, for we now had a reason for spilling moonlight acutely across the opening door and on to the wall of the corridor as an establishing function, and an excuse for pulling the far end of the passage-way with the same type of moonlight to give a sense of its depth. The intervening latticed windows provided the possibility of the 'judicious little luminant prods' in the right places to patch out the sections in between so that the visual impression would carry over, and the black areas would pick up some life from induced light

in spite of their strength of tone. There was also an excuse for a moonlight beam from an imaginary lattice over the staircase, but out of shot. This meant that a tone form could be built up which would balance quite nicely and still convey the effect required—especially when the ghostly form floated by.

But what about the electronic aspect of this artistic licence? To attempt to handle a subject of this type with a natural pictorial accent would only result in a grey, soggy-looking confusion on the screen due to under-modulation of the system. But if an odd high-light or two could be introduced—again in the right places—full modulation of the system would be achieved, the greys (which should have been blacks) would sit down to black and would, moreover, show sufficient life to approximate the effect required.

As, pictorially, it had already been decided that the patches of moonlight through the lattice windows would be about right to convey the effect in terms of both picture and tonal balance, it was thought that a close approach to the electronic requirement would be achieved if these patches could be intensified to the state of artificiality where they would fully modulate the system. There was, of course, the factor of unsuitable contrast ratios to consider because the falsifying of the moonlight accent, while providing the necessary modulation, and while infusing a little more life into the black, would still unhappily extend this ratio—especially as high-light and full shadow were in direct juxtaposition. This was undesirable from both the electronic point of view and from the pictorial point of view. From the latter angle, such a falsifying of the high-lights would tend to create so dynamic a mood that the required mystery aspect would be completely destroyed. As the incident light level would be low in value, camera lenses would be forced open to maximum aperture and depth of focus would be small. This implied that, except for the immediate point of focus, nothing would be really sharp and the falsified accents would therefore take up that quality of vague and out-of-focus lights in the darks which is so essential a feature of mystery moods.

Also, as a result of this small depth of field, it appeared that it might be possible to introduce two or three small soft sources into the corridor to ease the blacks without destroying their strength, for although these sources could not be entirely concealed, the actual light itself could be screened and it was assumed that the small, protruding mechanical parts would automatically merge into the general surroundings. Thus it was possible to mentally relate apparently conflicting requirements, and to assure the producer that it was worth going on with the programme as the effect required could be practically and satisfactorily obtained.

It is well to remember however that the viewer at home may be quite

a dabbler in tones himself. He can have a fine old time with contrast and brightness, and he can so caricature such atmosphere effects that by faulty manipulation of these controls they often become a mere travesty of the original theme. Generally speaking therefore, this artistic expression should be treated with considerable restraint, and where it is vital to the production some indication should be given to the customer at the commencement of the programme—as it was in the above example.

It should now be fairly obvious that the student cannot but benefit from a close and serious study of pictorial composition, and it is hoped that these few introductory notes will have dispelled the general misconception that the subject is merely an artistic, abstract form of idealism of no particular practical significance. If this fact is appreciated, the student will more easily be persuaded to explore the wide field of literature dealing with the subject and so attain a greater understanding of the fundamentals of graphic representation.

BIBLIOGRAPHY

1. Gordon, Jan, *Step Ladder to Painting*, Faber and Faber.
2. Pearce, Cyril, *Composition*, Batsford.
3. Richmond, Leonard, *Essentials of Pictorial Design*, Pitman.
4. Harrison, H. W., *The Theory of Pictorial Art*, Pitman.
5. Haile, R. N., *Composition for Photographers*, Fountain Press.

3. APPLICATION OF LIGHTING METHODS TO OUTSIDE BROADCASTS

3.1 INTRODUCTION

In considering the application of normal lighting methods to the average outside broadcast, it will probably be better to discuss such methods in specific rather than in general terms. For this reason, a selection of several typical programmes will be analysed so that the student may appreciate some of the problems.

At the same time, it must be emphasised that it is quite impossible to give a standard plot to which the student can work, as apart from the obvious fact that situations and local conditions vary enormously, lighting is so essentially an individualistic medium that working to any slide-rule concepts would prove utterly futile. What can be given with a fair amount of assurance is the method of approach and an indication of the skeleton foundation on which the lighting structure is built up. It should also be remembered that the dead and lustreless reproduction which results from just illuminating a subject and poking a lens at it is by no means what is required. Every scene has its individual 'life' and 'personality', and the lighting supervisor must capture and convey in pictorial form as much of this life and personality as circumstances and his individual ability permit.

3.2 HEAVY INDUSTRY FACTORIES

Generally speaking, the overall incident light level in a heavy industry factory is very low, seldom above 4 foot-candles incident, but the type of lighting installation in such factories is usually such that this level can be stepped up locally to approximately 9 or 10 foot-candles, and factory officials are, in most cases, only too happy to oblige; they have the same enthusiasm as the lighting supervisor for portraying their industrial processes in the most arresting and compelling manner. Nine or 10 foot-candles is quite a satisfactory general level on which to build, and where it can be obtained there is no need whatever to consider the lighting rig in terms of soft, basic light.

This local overall basic light will not be nice and even. It will be patchy, and in stepping up the level locally, this patchiness will have been retained and thus the general atmosphere of the scene will have been preserved. If however the overall light level cannot be raised locally, what soft basic light is introduced to boost this level must be employed in such a manner as to retain the character of the original light pattern. Remember that, if this pattern is ironed out into linear uniformity, some character will have been taken away from the subject, and it will seldom be possible to get it

back, thus, from the very start, the unreality we are trying to avoid will have been introduced.

Such subjects require more forceful tonal contrasts in order to preserve the reality of the scene and it will be found that the image orthicon will accept these contrasts provided they are balanced by intelligent distribution. As long as the ultimate tonal mosaic within the frame is right, considerable latitude as regards the contrast between individual elements can be permitted.

Let us now consider the producer's requirement. This term in the singular is, perhaps, a little modest when one considers the all-embracing enthusiasm of the average producer's demands, but the lighting supervisor should appreciate that enthusiasm for the subject is an essential to success, and that the effects the producer is after are usually translatable into practicable terms after discussion and mutual compromise.

Once all the factors affecting the production from the producer's angle have been appreciated, a systematic survey of the 'acting areas' must be made keeping in mind the line-up of the shots and the way the material is likely to fit into the frame. The general bias will be towards a low-key effect, and the subject must be interpreted on the basis of this key. Simplify everything down to three tones . . . dark, mezzo-tint and light. Ignore, for the time being, all the intermediate gradation and treat the subject as a broad and composite whole.

At this point it becomes necessary to introduce the accents to assess the lighting required, and finicky consideration of small incidental details will only prove confusing. Considering the subject in this broad manner, mentally arrange the general form of the tonal pattern that will best suit both the pictorial and technical requirements of the producer, and once this pattern has been decided upon, do not be persuaded by any incidental material to work outside this form. It is now possible to sectionalise the individual areas, and again thinking in broad terms, to arrange mentally their tonal distribution so that it is correct for interlocking with the broader scheme. Review the whole arrangement in terms of close-up, intermediate and tracking shots, and if in these terms the arrangement still seems satisfactory, a rough approximation to the kilowatts required to produce the visualised effects is now possible and if this system is adopted it is really surprising how quickly such an approximation can be made by an experienced lighting supervisor.

The rule of thumb method of allowing 20 watts per square foot (for image orthicon equipment) should be treated with the utmost reserve, especially when considering requirements for heavy industry factories. Nevertheless, this method will sometimes give a close approximation of the power required and should not be completely ignored.

Up to this point, only the acting areas have been considered without regard to the background. This should now be related to the general picture and a rough estimate made as to what position in the tonal range this should be given to achieve the necessary feeling of depth within the format. In this respect, it should be remembered that the background will be mostly a function of the wide-angle shot, and therefore it must not be too heavily biased towards the bright end of the scale or it will look unreal. Having decided the tonal level of the background it should now be possible to estimate the load required and to find out whether it is available. (There is rarely any difficulty in this in a heavy industry factory).

Before continuing with the more precise planning of the lighting rig, there are several other quite important things regarding the factory layout which must be discussed with the factory management, otherwise, when returning to site for the actual broadcast, some very unpalatable shocks will be experienced.

The operations which take place in the manufacture of heavy engineering commodities are generally arranged in lanes with quite broad gangways running the length of the factory and crossed by subsidiary walks at varying intervals. These gangways (which will form quite a large area of foreground in the picture) are normally littered with all sorts of impedimenta associated with the various manufacturing processes, and this impedimenta is usually quite strong in tone.

Visually, these gangways present a distinctly untidy appearance but pictorially they are tonally intriguing and provide a natural and interesting foreground. They are also an integral part of the factory atmosphere and have already exercised a considerable influence on the mental assessment of the overall tonal pattern.

Quite often, between the planning meeting and the actual broadcast, a passion for tidiness will seize the factory management, and these gangways will be cleared and swept till they resemble anything but factory gangways. It is essential to ensure that the urge for tidiness should be kept in check, and its effect on atmosphere, reality and pictorial unity should be made very clear to the management.

Care should also be taken to ensure that personnel appearing in shot do not wear freshly laundered overalls, especially if these are white. Small matters perhaps, but they provide vivid accents which destroy the reality of live material. Further, if major changes of this nature are made, they may involve a re-rig of lighting to counteract such changes and time is not always available for such re-rigs. Thus always arrange with the factory directives that the factory layout will remain substantially as it is seen on the planning visit or that such changes as are contemplated will enhance the general scheme.

Where welding processes are in operation arrange as far as possible suitable pictorial positions for these processes so that the actual high intensity areas are suitably screened behind some part of the material being welded. Factory personnel will be found very accommodating in these matters and, by the careful placing of such processes to fit in with the broad scheme, really outstanding results can be achieved.

Having settled these main points, the problem of working out a detailed lighting plot can be approached with confidence. There are several methods by which this can be accomplished. The lighting supervisor may imagine himself as the camera and approach each section from that angle, or he can make a fairly detailed sketch of the respective sections and camera angles and plan accordingly. The writer prefers to take up a position by the machine or object to be lit, and from that position to survey the possible location of light sources on the basis of the available amenities. The positions and types of the sources are then quite precisely indicated directly to the charge-hand electrician, who makes his own rigging plot. There can therefore be no question of error due to transposition from the lighting plot to the rigging plot. At the same time, the writer makes it a practice to indicate quite clearly to the charge-hand electrician what the source is for and how it is intended to use it.

The rig is usually put in before the lighting supervisor arrives on site to set the lighting, and it sometimes happens that a light source cannot be placed as originally indicated because, perhaps, it just will not clear an overhead crane, or for some similar cause that was not apparent on the initial survey. If the charge-hand electrician is aware of the precise requirement concerning that source, he can quite often select an alternative position that will approximate the requirement.

Coming now to the actual setting and lighting, an effort is made to balance the light, to preserve the original atmosphere as far as possible and, at the same time, provide the three-dimensional aspect and tonal balance required for pictorial representation. Fairly hard crosslight is the basis of the form and bold broad effects are the aim. If the general scheme has been correctly planned, rehearsal pictures should be about right and it will usually be found that only minor adjustments will have to be made to obtain the pictorial quality and to meet the technical requirements.

High Contrast Problems

The situation will not be quite so straightforward when furnaces or molten metal form part of the subject material. In these circumstances the contrast ratios are quite impossible, and lighting technique will be governed by how much emphasis is placed upon shots which include the actual furnaces or molten metal.

Where this emphasis is specific such as a shot into a boiling cauldron of liquid metal, nothing short of an amber filter on the camera lens will suffice. This will mean hitting the immediate surroundings really hard with focused light from fairly close quarters, and a level of 300 foot-candles will be necessary to pull such surroundings into register. For such shots local conditions are invariably on the side of the lighting man, for to obtain pictures of this nature the camera has usually to be static and built up into a position suitable for the inclusion of the material required; it cannot therefore be used for anything other than the subject matter in the area concerned. This permits the heavy filtering required, and allows the lighting supervisor to treat this particular area as an isolated entity.

Where the emphasis is not specific and is only an incidental part of the shot, there is little that can be done about it without considerable detriment to the rest of the material, for heavy filtering would involve such a high incident light level over such a large area that it would prove economically impracticable. Camera angles can, with difficulty, be arranged so that no direct pan into the furnace is possible, but a better method is to try and arrange some natural and related action with figures between the furnace and the camera. This will prove quite effective pictorially with partial silhouette and rim-light, and as a general rule it will also prove quite acceptable electronically as any tendency towards plasticity will not be unpleasant in a shot of this nature.

3.3 LIGHT INDUSTRY FACTORIES

The lighting of light industry factories should be more airy in character and presented in a higher key. Soft basic light can be more even and cross-light less hard. More individual detail is required, but not at the expense of the picture sequence as a whole. It is easy to soften off the accent until no depth remains and the resultant animated pattern conveys little information and no sense of reality.

In light industry factories, the incident light level is usually higher than in heavy industry and it often approaches 10 to 15 foot-candles incident. Just as often it is preponderantly fluorescent, and generally of the natural daylight variety which usually results in an unwanted emphasis of the capillaries beneath the human skin and produces dark, blobby flesh tones—especially in close-up. If there is any doubt at all as to whether focused accent will prove sufficient to balance out this effect, it is far better to reduce the fluorescent incident to 5 foot-candles and to augment it with incandescent soft-light sources even if this does involve a little extra time for installation. Where fluorescent factory lighting is of the warm white or warm white de luxe type normal flesh tones are unlikely to be adversely affected.

3.4 THEATRE AND MUSIC HALL

For outside broadcasts from theatres, a mobile unit either moves into a theatre to take excerpts from an existing production, or the theatre is specially hired in order to televise a variety show, a music-hall programme or a dramatic production.

Although the fundamental methods of approach are similar in each case, the practical development of these methods will vary considerably. In the former instance, a public performance is often sandwiched between the television rehearsal and the actual transmission, so that the lighting plot has to be arranged in such a way that it does not interfere with the normal theatrical performance and as theatre lighting technique and television lighting technique are as far apart as the poles, this imposes a very severe limitation on the lighting supervisor's activities. In the second instance, although some of these limitations no longer obtain, it should be realised that a theatre is not a television studio and is not designed to cater for the usual camera and scenic 'gymnastics' normally associated with such studios. The Hallé Orchestra does not attempt to mount a recital in a circus tent any more than Billy Smart contemplates Studio 1 at Maida Vale as a possible venue for his activities, and to the uninitiated it seems just as absurd for television to attempt to apply studio technique in a theatre. One should not be surprised that theatrical personnel generally are inclined to look askance at the invasion of the television unit and it will make for closer liaison and understanding if the lighting supervisor takes the trouble to explain to his theatrical associates where his technique differs from stage technique, and why he requires the apparently peculiar facilities for which he asks. Once this sort of understanding is established, cooperation will be surprisingly whole-hearted whatever liberties are taken with the normal theatrical layout, and as a general rule local facilities will be offered which will often considerably simplify otherwise complicated effects.

Before considering our approach to a typical production, it may be advantageous to consider some of the underlying principles of a theatre rig for television purposes. Fig. 7 illustrates a stage and proscenium opening, the apron, stalls, circle and upper circle of a typical theatre. Average camera positions are also indicated. Camera 1 is a tracking camera on a ramp usually built up to stage level. Camera 2 is a static camera in the centre of the Circle and camera 3 is a cross-shot camera normally built up on a rostrum to stage height. This camera is also often used for audience shots and for shots of personalities in the 'prompt-side' boxes.

Key Light

Now a key light will undoubtedly be necessary from the front of house

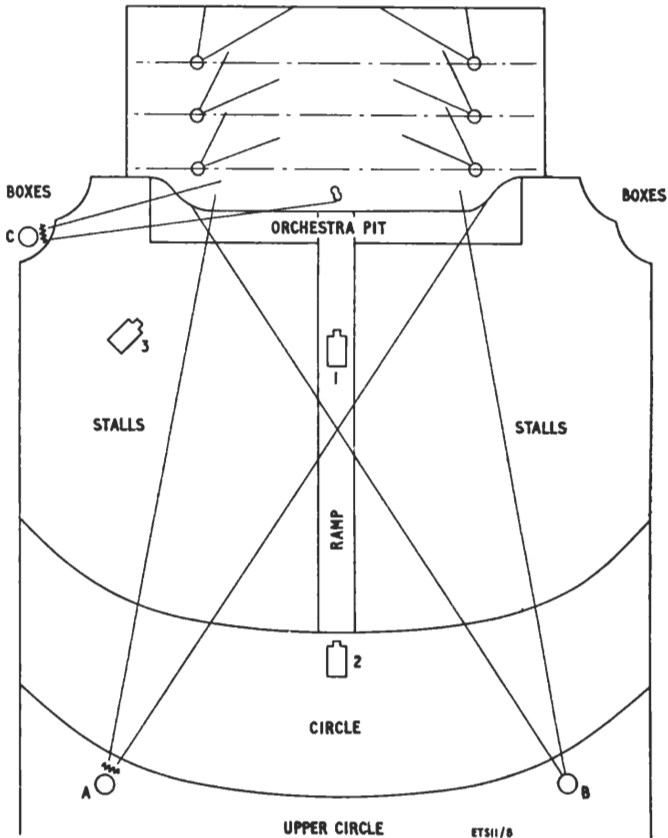


FIG. 7 LIGHTING RIG FOR TELEVISIONING FROM A THEATRE

for music hall, variety and other light programmes, although it may not be wanted for a dramatic production. The position of the key light will have to be decided with regard to the production, but there are one or two general points which should be considered first. The best angle to bring in this key in the vertical plane is between 40 and 45 degrees as this provides a reasonably natural angle of incidence. (This angle has another advantage which will be referred to later).

Let us suppose we place the key in the upper circle which will generally provide an angle approximating the 40 to 45 degrees we want, and let us suppose we place it at 30 to 40 degrees in the horizontal plane (Source A). Imagine an artist forward on the apron as indicated, and playing to cameras 1 and 2, and then the producer cutting to camera 3. The shot on camera 3 will pick up a different background to cameras 1 and 2. This

background will generally comprise the wings and the wing legs and will almost invariably 'sit down' on the background of cameras 1 and 2 because it is not lit to the same level. If the shot is really a cross-shot (as it should be, the artist still playing to 1 and 2) there is a reason for this change of background because it will be related to the change from full-face to profile, and it will not provoke any false impression.

If as nearly always happens, the artist is told to play to the camera cue-lights, when the cut to camera 3 is made the artist will veer round and play to camera 3. In itself this effect is unpleasant; one can almost sense the artist putting the helm hard over, and we are faced with another bow-on shot as on cameras 1 and 2, but this time against a different background.

Now look at the key light. From being to the left of camera it has now, for no earthly reason as far as the viewer can tell, suddenly hopped over to right of camera, and this will accentuate the false note of the unrelated change of background. In the real cross-shot, this accentuation would probably pass unnoticed, but it certainly will not pass unnoticed in the cross-shot which is not a cross-shot. In fact a few cuts of this nature may prove enough of an irritation to the viewer to mar his enjoyment. As the cross-shot is so often misused, it is almost fatal to pictorial unity to employ a key light in this position whatever the demands of the production.

Now it is a mistake to assume that the producer misuses this cross-shot camera just to signify his contempt for compositional precepts in terms of the picture frame and on these grounds to ask him to shift it into a more accommodating position. The producer also has his problems, forced upon him too by the incompatibility of studio and theatre techniques, and (apart from its other duties) this camera does provide a very handy break-away to allow for the re-alignment of the main cameras during a production. So the producer places this camera in its precise position with a full knowledge of the difficulties involved by his misuse of it, and he depends on the lighting supervisor to iron out such compositional creases as are introduced into his production mantle by the use of this ersatz cross-shot. Therefore, the key light must be arranged in such a way that it does not aggravate the false effect and it should not be located at position A.

If the key light is located in position B it will be about right for cameras 1 and 2 though it will be almost a rim light for camera 3. If we now place a filler in position A and add another filler to the left of camera 3, we can adjust the intensities of these sources so that position B is the key light for cameras 1 and 2, and position A the filler; while for camera 3, position A takes up the key and the source in position C becomes the filler. When, now, this camera is used for a true cross-shot, the main key will emerge as

practically a rim light which will prove more beneficial than otherwise. In the case of the bow-on shot also, an additional crispness will usually result. In practice, for a camera set-up as shown, this skeleton arrangement of the main accents produces quite sparkling pictures. It does mean that camera 3 will usually be one stop open on cameras 1 and 2, and this fact must be remembered when building up on this type of framework.

It was mentioned earlier that an angle in the vertical plane of from 40 to 45 degrees was a fairly natural angle to bring in the frontal accent, and it was also stated that there was another advantage associated with this angle. Because artists often work close to the tabs down-stage, it is essential to ensure that their shadows are thrown down as much as possible, and the steeper the incident angle the less dominant are these shadows. If the angle is too steep facial shadows will become too pronounced, especially under the brows and chin, and difficulties will be encountered in trying to fill them adequately. This will involve low-angle filler of such an intensity that it will dapple the tabs with vague shadows of a size quite comparable with the artists themselves. This creates a distinctly irritating impression, and the main object is to bring in the front-of-house key at an angle and at an intensity which promotes a fair compromise and a not unnatural representation.

It is better to try to put the shadows where they are wanted at the start rather than to put in the key in a haphazard manner, hoping later to cancel out the resultant shadows with other sources. Properly placed and natural shadows can help the pictorial appeal enormously, and it is always worth quite considerable effort to get the key light in the right position at the very outset. The horizontal angle is also important in this respect as careful location in this plane can often throw shadows out of picture in medium and close-up shots where they might prove unusually worrying.

Now it is quite undesirable to set the front-of-house lighting so that it penetrates right up-stage. The farther up-stage it is focused, the shallower becomes the angle and the larger and more dominant are the shadows on successive sets of tabs and cloths. It is therefore preferable to cut the front-of-house light just a little up-stage of the apron. This is done by the operation of the 'barn-door' flaps on the light sources and although a clean cut-off cannot be achieved by this means, it is sufficiently clean for most practical purposes. The front-of-house accent is then 'cheated' through up-stage from the stage itself by suspending lighting barrels from the stage grid, and these cheaters are indicated on the diagram. They will generally come in at a little steeper angle than the sources they are cheating but, with care, they can be so closely matched that the deception will not be obvious.

So, when assessing the requirements of a theatrical outside broadcast, the first thing to do is to locate the front-of-house sources in terms of both camera positions and production requirements and then to follow up with the cheaters on the stage. This will dispose of the main frontal accents and leave the mind clear for a systematic approach to the incidentals such as back-light, effects-light, etc.

Light Entertainment

Programmes will vary considerably, and the approach to a dramatic production will obviously differ from the approach to a music-hall type of show. If we now consider this latter form it will, due to wide action and general airy lighting, give an overall picture of a full stage rig which can be adapted in any manner once the fundamental principles are appreciated.

It is always a good plan to ask the T.V. designer to be on site when dealing with theatre programmes. It is essential to know the positions of the tab-rails etc. and to discuss with the producer, the designer and the theatrical staff which sets of lines are available on the stage and how they are going to be shared between design and lighting. It is normal practice in a theatre to number lines from down-stage up-stage but, as well as indicating the lines by their numbers, it always pays to go up on the fly-rail with the persons concerned and actually mark the lines as well. There is then no possibility of error. If a position is given on the boards as so many feet up-stage, this measurement is generally taken as from the carpet cut.

When computing the line-up on the stage, having disposed of the cheaters, the next consideration is, of course, the basic light.

The normal stage lighting is provided by sets of battens of unfocused lanterns supplemented by spot-bars, perches, towers or booms and wing lights. Usually the battens (with colours removed) will give a basic level of between 20 to 30 foot-candles (depending on the stage), and they can be dimmed or held in check at any desired level. If they are in the right position they can be used to provide soft foundation light but the writer prefers to install such soft light independently in the form of five-light fittings, and only to supplement with stage battens when necessary. This is because the five-light fitting design is such that it provides three lobes of light—one forward, one backward and one straight downward, the latter being the least pronounced. This means that although the light is of the soft order, it still has a directional emphasis which can be used to advantage. Further, these fittings can be varied in power in the following ways: 1, $1\frac{1}{2}$, 2, $2\frac{1}{2}$, 3, $4\frac{1}{2}$, 5 and $7\frac{1}{2}$ kilowatts each depending on whether 500-watt, 1,000-watt, or 1,500-watt bulbs are used and depend-

ing on whether two, three or five circuits are used. (These fittings switch either two or three or five bulbs). With the added possibility of diffusion therefore, these five-light sources can prove very adaptable.

The positioning of barrels on the stage to carry the additional lighting required is governed by the positions of the main tab-tracks needed by the producer. Excluding front-of-house tabs, there are usually four to six tab-tracks set up on a reasonably sized stage and, although it may not always be possible, it is desirable to have a lighting barrel on a set of lines immediately down-stage of each tab-track. This is in order to be able to use back-light effectively to 'pick' the artists off the tabs, otherwise they merely become part of the tabs and appear to be an animated pattern thereon.

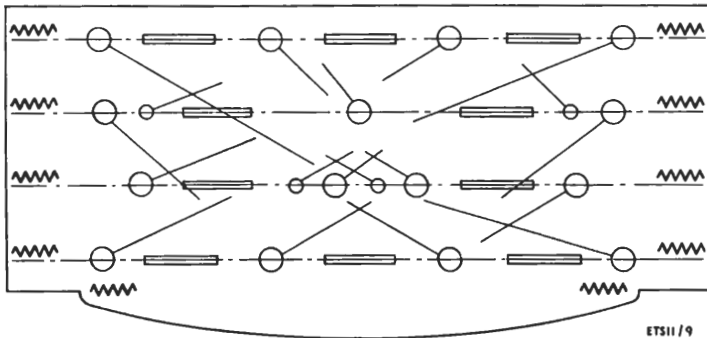


FIG. 8 ILLUSTRATING A METHOD OF PLANNING A LIGHTING BUILD-UP

On an average the number of lighting barrels usually scales down to four or five as shown in Fig. 8 although, of course, the number will vary with the production and local conditions, as will their positions. The diagram is merely an indication as to how the lighting build-up is planned. With five-lights staggered as shown, a fairly sound overall basic is provided and, as already pointed out, this has some directional emphasis with up-stage and down-stage lobes. The manner in which these fittings are angled will also give additional control. A disadvantage associated with five-light fittings is their physical depth, and where a tight scenic rig is flown they can prove of quite high nuisance value unless a sufficient clearance is allowed either side of the lines supporting the barrels for flying cloths and cut-outs. Where this clearance is not obtainable, four-light fittings should be used instead. These fittings are more diffuse and much less adaptable than the five-light fittings.

Having disposed of the basic light, it is now a question of introducing back-light, accent-light and effects-light. This, of course, will be governed by the particular production and only the principle can be indicated.

If we consider, first, the full stage spectacle with all tabs open and all cloths flown, it is obvious there will be action all over the stage area and, if care is not taken, artists will be unpleasantly shadowing each other. It is also obvious that there will be no depth in the stage as far as the picture plane is concerned unless we indicate it by artifice. To satisfy the first condition we must cross-light the stage, and to satisfy the second we must progressively increase the light level from down-stage up-stage.

The way in which the stage is cross-lit will depend upon the type of action etc., but the general method is indicated in the diagram. As regards depth, if an incident level of 30 to 45 foot-candles is registered down-stage on the apron, an incident level of 40 to 50 foot-candles should be aimed at right up-stage at the cyclorama, depending on the type of scenery, etc. Although this method is indicated it must be emphasised that the whole secret of lighting a stage satisfactorily lies in the balancing of the sources, and unless these sources are properly balanced, the effect is likely to be quite appalling. Unfortunately this aspect of lighting technique can only be learned by experience.

Now when any of the tabs are closed, we are likely to run into considerable trouble unless some elementary precautions are taken. We have focused light shooting both up-stage and down-stage. If a set of tabs is closed immediately behind one of the lighting barrels, the focused sources on the barrel angled up-stage will 'burn out' these tabs pictorially and, practically, such sources may scorch and damage the tabs. If a thin cloth is dropped in, the up-stage focused sources angled down-stage will penetrate the cloth and, if a gauze is lowered in, any light up-stage of the gauze will completely destroy its effect unless it is required and carefully controlled, e.g. transformation scenes. Therefore some switching system must be incorporated in the rig. Ideally, every source should be under individual control but this is rarely possible for a number of reasons. Rigging time is usually very short, space is invariably limited and available methods within the economics of the system are rather primitive.

As a start, an effort should be made to switch every barrel separately in two sections . . . soft and focused. This will mean two switch trucks on the stage, and even then will only leave four switches for individual effects. As it is often difficult enough to find room for even one switch truck in a suitable position, two or more can cause considerably greater embarrassment. The switching problem therefore develops into quite an intricate puzzle which can only be solved in terms of each precise production, but it must be considered very thoroughly in the planning stage.

Even in a light and airy production there may be an effect which requires a complete change of key involving a considerable lighting change, and it is very disturbing to discover on rehearsal that this change cannot

be made because insufficient attention was given to switching arrangements in the planning stage. Time will rarely be found to correct such an error and a hurried, haywire hook-up which MAY work will have to be improvised. In this respect (and when, perhaps, an unexpected effect has to be introduced subsequent to the original plan) it is often possible to press into service some of the individually controlled theatre spots. If this has to be done it will normally be found preferable to replace the theatre spot by a fresnel-lens source. (With the theatre source, once the filter is removed, trouble will be experienced with filament shadows which the image orthicon will exaggerate to a distressing degree—especially in close-ups).

In this matter of stage installation, it is stressed that great care must be taken to 'phase out' correctly. To comply with safety regulations, the phase used on the stage level by television must coincide with the phase used on the stage level by the theatre and, similarly, with regard to the grid the same phase used in each bay by the theatre must be used by television. Otherwise there is a risk of getting two phases on adjacent barrels without the necessary separation. Great attention must be paid to this point.

So far no mention has been made of footlights—those 'monstrosities of the modern theatre' as they have been so aptly termed. These contraptions should never be used for television unless dire necessity forces their introduction. Should such a necessity arise, they should never be run up beyond the just glowing stage, for if they are, their effect will be obvious on the features of artists working down on the foats, and the tabs will be feathered with indefinite and grotesque shadow shapes quite out of this world. For very special effects they may have their uses, but where such under-lighting is required, it is usually better to obtain it by more controllable means.

Up-stage at the cyclorama, a request should always be made for a 'ground row' to conceal lighting troughs on the boards at the base of the cyclorama. Pulling the cyclorama at the base helps to create a feeling of height as the brightness tails off towards the grid. Special silhouetting effects are also frequently asked for against the cyclorama which necessitate some form of concealment for sources on the boards up-stage; if no provision is made for this facility, it will inevitably be asked for at the last moment. Clean shadow effects are also often needed on the cyclorama for various production effects. Clean shadows cannot be obtained with a fresnel-lens spot but can be approximated by removing the fresnel lens; the effect is best obtained, within the limited area of the stage, by the use of a low-power open arc. When the lens is removed it should be replaced by plain glass which quite effectively cuts the ultra-violet component.

As regards the general cross-lighting effect interwoven with key and filler for the open overall full-stage action, there is always the possibility of objectionable multi-shadow formations when tabs are closed or when cloths are dropped in. This factor must be taken into consideration and every effort must be made to put shadows only where they are wanted.

In following out this technique the unwanted shadows have got to go somewhere—and they usually finish up on the boards. In a full-scale spectacle they are unlikely to be of any real nuisance value as the stage is fairly well populated and large floor areas will not generally be seen. In individual acts much more bare floor space is likely to be in shot and, although it is better to have several quite obvious shadows on the boards rather than even one faint shadow on a sky-cloth, individual acts will exercise quite a lot of influence on the manner in which cross-light is employed and on the quality of the balance. The fact that the stage does become sectionalised with the progressive runner positions and with the positions of the drop-in cloths and cut-outs, permits the partial sectionalisation of the light, but having regard to limitations of rigging time, of space and of control facilities, this sectionalisation must not be emphasised at the expense of the full-stage effect. It therefore calls for considerable ingenuity and quite a flair for improvisation on the part of the lighting supervisor to handle successfully the individual sections in such a way that they will, with a minimum of change, eventually unite into a composite whole. All this, in spite of the frustrations imposed by the incompatibility of theatre and television techniques: experience is the only tutor.

With regard to compères and artists working in front of front-of-house tabs, there is really very little that can be done to separate them from the background. Occasionally it is possible to bring in an acute side-light from a stage box, but this type of accent should be used with extreme caution and, generally, one has to grin and bear the sub-standard pictures which are so typical of action before the front-of-house tabs.

Drama

The televising of a dramatic production in a theatre presents a different set of problems. High-key lighting often gives place to low-key effects, contrasts are more pronounced, shadows are more significant and action is much more individualised. Mood and atmosphere become more dominant and scenic effect more relevant. There is less margin for error and, in consequence, a very full assessment of the production from both psychological and practical aspects is essential. Stylised lighting is rarely possible for each and every scene, yet more vigorous effect has still to be obtained scene by scene by a change of emphasis which does not demand a too complicated or versatile installation.

Generally speaking, a dramatic production is taken as it stands in the theatre except for some slight scissoring to tailor it a little more towards the television form. This seldom means a great deal to the lighting man as the scenery is normally taken *in toto*, and such scenery is inevitably designed expressly for low-level and coloured lighting effects. It therefore loses much of its suggestion so far as the theatre audience is concerned when bounced with even a reasonable level of white light—to say nothing of its interpretation in terms of the monochromatic medium.

If the designer is at all famous, he will be considerably perturbed at the appearance of his settings under white light from the point of view of the theatre audience, and a little disturbed about the ultimate reproduction on the viewer's screen. A little tact and patience in this direction will be necessary right at the start, otherwise interruptions while lighting will be frequent, forceful and occasionally quite embarrassing. Remember that it is a case of transposing from one medium into another, and if an explanation of the process is offered at the beginning, appreciation of this aspect is usually immediate and subsequent interference is negligible.

The best approach to the lighting problems involved in a production of this nature is, as always, a systematic one. Go to the theatre several times to get the feel of the production, and during these visits try to sort out the various scenes into related and unrelated scenes. With regard to the unrelated scenes, note whether the change of key is moderate or violent. Rough out a plot for the related scenes. Do the same for the unrelated ones and try to be precise in the matter of locating the main accents of the scenes. Then consider the respective plots together; you will probably find that by a little judicious juggling, adaptations can be made which will simplify apparent complications and permit their practical interpretation in terms of three or four barrels.

It is then a case of studying the actual stage layout in company with the theatrical designer and the theatre and television producers to define what modifications to the normal set-up such a simplified lighting plot would involve. A fairly reasonable scheme can nearly always be developed which will bring installation and operation within both practical and economic limits.

In productions such as these, key light seldom comes from front of house, and front-of-house lighting is merely employed to ease contrasts which might otherwise prove a little unmanageable. The main disadvantage of keying from stage barrels lies in the fact that the angle is liable to be too steep to obtain shadows long enough to be truly representative of the hour or the mood it is desired to portray. It is scarcely ever possible to lower-in a television lighting barrel in order to obtain the correct angle without upsetting the shape of the composite plot but, if the

previously mentioned 'good companion' footing has been established with the theatre personnel, there will be no difficulty in getting a stage spot bar lowered-in and a source or two patched into the theatre switch-board to help out with such incidental requirements.

It was mentioned earlier that if four barrels were flown, and if the general lighting were switched in terms of soft and focused light on each barrel with two switch trucks, this would only leave four switches for special effects. On dramatic productions it is usually necessary to take these switches to dimmer trucks, and in this way each switch can be made to provide individual control to four or six circuits. A typical example appears in Fig. 9. If accommodation for such extra equipment can be found and sufficient time is available for the extra work involved, it is possible to increase the flexibility of the rig, but it is still prudent to plan in the simplest terms. Where a patch into the theatre system becomes necessary, it should be remembered that this involves a split control and cue sheets must be precisely worked out and marked up in time for the dress rehearsal, otherwise lighting changes will be ragged and the effect will be lost. Smoothness of control is a prime necessity.

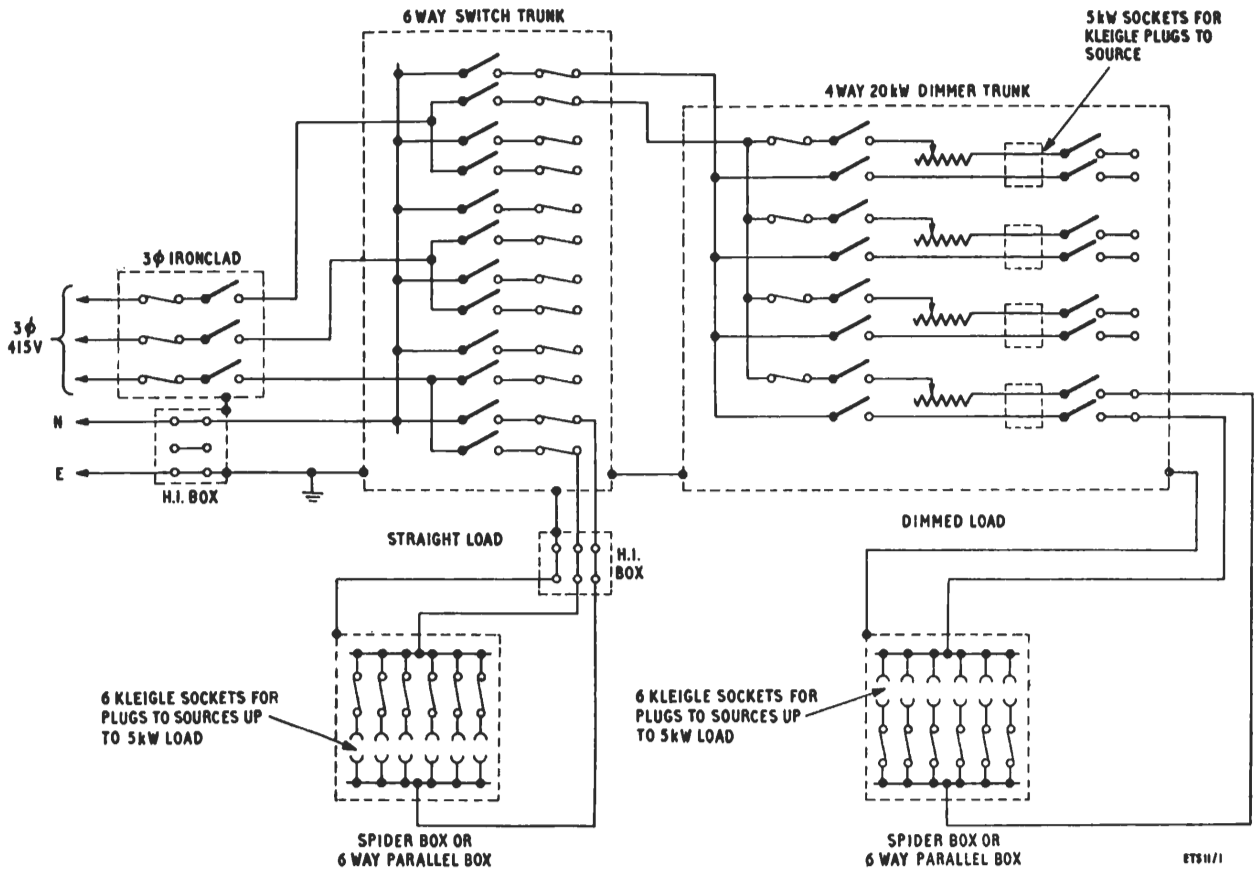
The greatest enemy of dramatic effect however is the stage floor itself. This is very light in tone and takes up quite a large foreground area in the picture frame. Permission to paint it down (as in a studio) is never forthcoming because powdered colour is left over in the cracks between the boards and works up for weeks after it has been cleaned off. Even if a low-toned canvas is available it can seldom be used as it invariably interferes with scene changing in the time available. So the unhappy fact must be accepted and played down pictorially as much as circumstances will permit.

Light Entertainment in Drill Halls

It often happens that Light Entertainment productions are mounted in drill halls or other odd buildings where stages and auditoriums do not exist as in the theatre. Under these conditions, although some modifications are imposed by the local architecture, the fundamentals still apply.

Roof girders or beams are usually available in such halls for slinging sources to approximate the normal form, but where none exists, some kind of tubular scaffolding will be necessary.

Occasionally (as in some outlying R.A.F. stations or Army camps) the lighting supervisor will be faced with a poky, low-ceilinged hut where none of the normal methods can be applied. In circumstances such as these improvisation is the only thing—and improvisation holds few terrors for the lighting supervisor who thoroughly understands the underlying principles of the normal theatrical approach.



ETS11/1

FIG. 9 SCHEMATIC OF POWER DISTRIBUTION FOR LIGHTING LOADS

Some limitation will have to be imposed on camera positions and movements (although the local structure almost automatically takes care of this) and the closer, tighter action which results from such restriction largely plays into the lighting supervisor's hands. It permits him to treat the project in a much more intimate manner and, in turn, such intimacy pays good dividends on the television screen.

It is for this reason that such good results so often—and so surprisingly—emanate from such apparently hopeless venues, and one should never turn down a location out of hand without very carefully considering this aspect.

Once the significance of this intimacy is fully appreciated, improvisation rarely applies as such. The situation develops itself and treatment becomes obvious.

3.5 THE CIRCUS

From the sophistication and comparative decorum of the theatre to the flamboyant and more elemental *joie-de-vivre* of the circus represents quite a sizeable swing of the pictorial pendulum. There is a more full-blooded feel about the circus—a more primitive anticipation, and these reactions, as well as the swirl of the sawdust and the swell of the Big Top, must be caught and put over to the viewer if the programme is to carry any conviction at all. Therefore some attempt must be made to try and retain some of the starkness of the circus lighting in spite of the modifications that will be necessary, and for this reason, soft light as such should not be introduced. Generally speaking, circus lighting is extremely 'toppy', and the image orthicon is not amenable to this type of illumination. Nevertheless this 'toppy' flavour must be preserved to some extent, otherwise much of the elemental feeling of the circus will be lost and once a fundamental characteristic has been destroyed, it is very difficult to re-create it.

Normally the circus lighting consists of a selection of acting-area lanterns, floods and spots suspended from one—or perhaps two—circular tubular fittings hung from the king poles on a catenary over the centre of the ring. These fittings can be raised and lowered on tackles. For general circus acts they approximate from 15 to 20 feet above the ring. For high-wire acts this lighting is cut and replaced by floods from the top. Stanchions are frequently set at intervals round the ring itself to support conical reflectors containing either 500-watt or 1,000-watt sources. All such stanchions should be removed. One or two spotlights are usually mounted on the band gallery either near or over the artists' entrance, while over the artists' grand parade exit, a gantry is usually located which also supports several floods and one or two spotlights.

The incident light level on the ring is usually of the order of 30 to 40 foot-candles. The overhead fittings above the ring should not be scrapped. They should be taken up to about 25 feet, and the sources should be fitted with straw, amber or pink filters, except for one circuit, which should be left white. This will help to retain some of the toppy emphasis but will bring it within manageable limits. When the cameras look up at any act

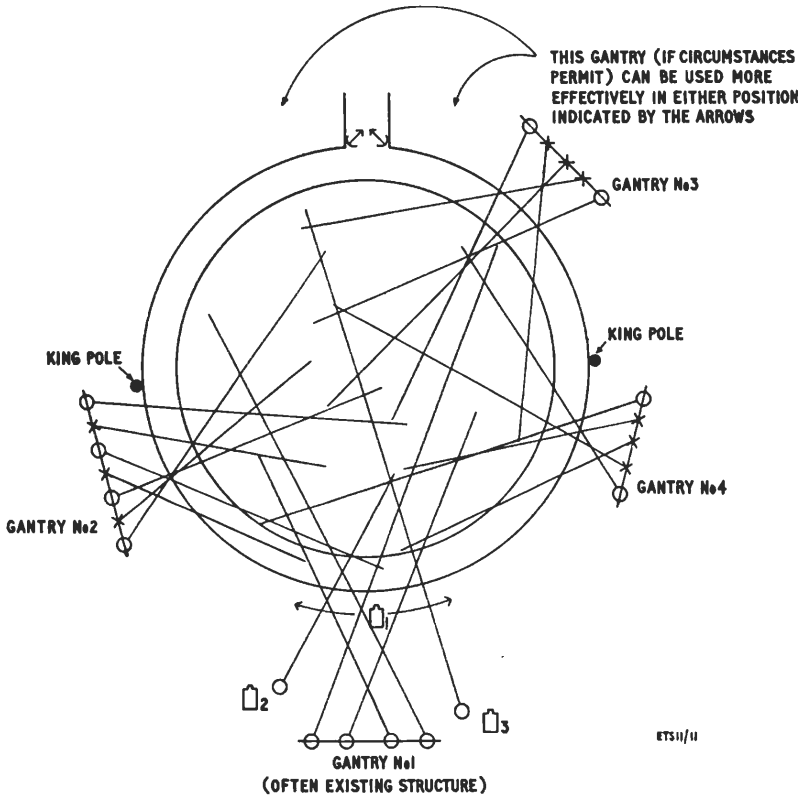


FIG. 10 A TYPICAL CIRCUS LAYOUT SHOWING AVERAGE CAMERA POSITIONS

such as a trapeze act, or a three-men-high on a horse act, the white circuit can be taken out leaving in the coloured circuits. These circuits will then figure as part of the pictorial content, they will convey some of the feeling of the Big Top atmosphere and they will cause no discomfort to the image orthicon. The spotlights in the Big Top which are normally incandescent, can usually be left white. A diagram of a typical circus layout indicating average camera positions is given in Fig. 10.

In supplementing the existing lighting to meet television requirements, some lighting gantries will be required and a great deal of cooperation

with the tent-master will be necessary. Big Tops are very temperamental things and the tent-master has supreme control of everything appertaining to his canvas kingdom. A very close liaison with him is therefore an absolute necessity, and any arrangements made with him should not be altered in any way whatever without first obtaining his sanction for the change. Once you have been in one of these giants with a 60-m.p.h. gale tearing at its canvas you will appreciate why.

Approximate positions for the lighting gantries are indicated on the diagram, but a word or two about their construction is necessary. Apart from the two main king poles, there is a series of poles all round the tent leaning outwards at an angle of about 20 degrees, to support the canvas. The gantry should be erected so that the lighting rail itself is on the ring side of the poles although its base will normally be on the tent side of the poles. At no point should the scaffolding foul the free movement of these poles. The height of the lighting rail should be such that there is at least 2 feet 6 inches to 3 feet clearance between the head of the lamp and the canvas. The tent-master will always indicate the clearance he requires. Sometimes the tent-master will permit a barrel to be lashed across the top of a pair of these poles for under-slinging sources, but this is not a good practice because if weather conditions are unfavourable and the canvas works too much they may have to come down. Even if this eventuality does not arise, there can be considerable 'dancing' on these sources if there is anything of a high wind.

It might be thought that the lower part of the suggested gantry No. 3 in Fig. 10 would be in full shot from all cameras. This is not so for when the tiered audience is seated, the lower part of the gantry is hidden and the remainder merges into the general background. Any light sources on this particular gantry must however be barn-doored; they must also be remotely switched, for on slack-wire acts, three-man-high acts, and high-wire acts they must be taken out, otherwise the ring-side tracking camera will look right into them and the higher static cameras will also suffer from severe flare.

A rough idea of the general angles of the lighting is given in Fig. 10. The balance must be arranged so that it still leaves some of the toppy accent for, as already explained, this is a circus fundamental and some suggestion of it should be retained. It is also important to bring out the texture of the horses and other animals in the ring, and this is primarily a function of the three-quarter backs. There will be no doubt at all when these lights are set correctly for when the angle and the intensity are right, the various patterns pressed into the horses' flanks will be quite obvious—and very effective. One great difficulty in lighting the ring is that the king poles get in the way, and it is quite an art lighting so that no obvious

shadows of these poles are thrown across the sawdust. The method indicated is one of the ways in which such shadows can be avoided although it is not as straightforward as it appears from the diagram. Care should be taken to cater for mid-air action such as juggling, slack-wire and trampoline acts. At least two sources—an acute side and a frontal—should be set to cope with this ‘up in the air’ action. A back light would also be very useful but can seldom be employed. All balancing acts and juggling acts must be asked to approve the lighting plot once sources have been finally set, and when they have expressed their satisfaction with the rig, no sources should be altered without first acquainting such acts of the proposed changes and without obtaining a subsequent approval. With regard to the high-wire act, in no circumstances whatever may light sources be placed in such a position that they are substantially in line with the king poles. Apart from this very definite ‘don’t’, high-wire and trapeze acts are very accommodating about lighting. They can often be rendered much more effective by keeping a light source down at the ring-side and throwing shadows of the performers on to the canvas. This gives a greater feeling of space and much more pictorial force.

The Circus Audience

There is now the vexed question of the audience—to light, or not to light. It is possible to pull up the lighting of the ring, keeping light off the audience, so that when cameras are stopped down correctly for the ring, the background audience sits down to black rendering the beams of the spotlights more obvious, and some producers lean towards this technique as a means of capturing the correct atmosphere and of emphasising the artists. Such technique inevitably demands a preponderance of wide-angle shots, otherwise the required atmosphere is not, in any case, conveyed to the viewer.

Yet such wide-angle shots, on the average receiver—except as establishing shots—are quite meaningless. This fact should always be remembered. In one single, static photographic print, this black setting to a light and brittle foreground might, in spite of the flagrant flouting of pictorial convention, have some passing appeal but it is too sombre and depressing a technique for forty-five minutes or so of live O.B.

The audience is a psychological asset and one cannot just blot it out with a sort of smog cloud and hope to get away with it. The ring is completely tiered with people and, although the eye is focused on the ring as the centre of interest, it is still very much aware of the all-embracing humanity—of its strained gaze—of its taut amazement—of its ribald merriment as act succeeds act. These things **MUST** be carried over if the reality of the circus is to invade the home. Therefore the audience should

be visual as a background, though not so visual as to dominate the frame. If anyone doubts this, he should sit through a performance in an empty circus tent.

With the audience visual, some real sparkle can be infused into the picture, and some of the glitter and rumbustiousness of the circus can be captured. Therefore, if it lies within the lighting supervisor's power, he should render the audience visual. He should not sit the audience down unless specifically requested to do so by the producer.

3.6 CHURCHES AND CATHEDRALS

The lighting of churches and cathedrals for television is really a most difficult subject on which to offer any guidance to the student, and it is quite impossible to suggest even the nucleus of a plot. The writer has been faced with almost square churches with white-washed walls and light blue—almost powder blue—pews; with crypts scarcely 10 feet high and no place to conceal light sources; with lovely old cathedrals of magnificent vastness; with small and austere chapels and with tiny, intimate village churches all rich and mellow with age but singularly lacking in electrical amenities. Yet equally artistic and correctly atmosphered pictures have been expected from each in spite of these limitations, and in spite of the many interruptions to rigging occasioned by the sequence of normal ecclesiastical routine.

Church Services

From the television point of view churches fall more or less into two main categories; those in which either a service or some religious ceremonial is being performed, and those in which the 'show-place' angle is the primary consideration. In the former case, morning services are televised almost as frequently as evening services, and the morning aspect presents the lighting supervisor with a first-class problem quite apart from such difficulties as are imposed by the location itself. The altar is invariably at the eastward end of the church while the whole area above the altar is usually taken up by a stained-glass window or a leaded window of figured glass.

About the hour of morning service, the sun streams through this window and introduces an impossible contrast ratio, yet at least one camera—more often two, one with a zoom lens—will be trained directly on this section. This means that there will be very considerable throw-off round the window edges and that the whole of the area will tend to 'sit down'. Fairly violent lens flares will also be experienced however efficiently camera lenses are hooded. This unhappy factor cannot be ignored, but it can be mitigated by asking the producer to site his cameras so that the

angle at which they view the altar, the choir stalls and the whole of the chancel is fairly steep. It may then be possible—in mid-shot—to dodge all the window except the lower edge although, in wide angle, it will still prove an impossible subject both electronically and pictorially. It will be necessary, too, to improvise extended lens hoods to reduce flare as far as possible.

If, then, the whole of the eastern end of the church is 'pulled' fairly hard with focused light to counteract this powerful reverse-angle daylight, some semblance of a picture can be obtained, but the quality will always be thin and poor while, due to the high level of light needed to pull the chancel into register against this *contre-jour* effect, white surplices and altar vessels will ghost most unpleasantly—and so will bald heads! It is quite impossible to achieve a satisfactory balance under these conditions.

Even if direct sunlight is not present by reason of a cloudy day, the light through this eastern window will still be of an impossible intensity. Where such windows exist, therefore, the above facts should be remembered and everything that can be done to improve the situation should be worked out in the planning stage on location.

When supplementing daylight by artificial light, the added light must follow the general form of the daylight and, where shadows have to be relieved because of excessive density, care should be taken to avoid a too blatant and obvious filling. Where reverse-angle light is employed, some natural excuse for its use should be sought. In a church, this excuse can usually be found quite easily and the reverse-angle light can then either be truthfully matched or realistically cheated. Observance of these points will help to retain the right atmosphere. Bright, flat, even, overall illumination is seldom met in a church and, although in the instance under discussion the service is the main consideration, the fact that it is a church, and not a studio mock-up, must be conveyed—that is the whole object of the outside broadcast.

For services after dark the lighting is much more under the lighting supervisor's control, but again the natural light pattern must be retained. With the cooperation of the church authorities it is usually possible to find suitable locations for lamps although it may prove difficult and may require considerable persuasion.

Once again the altar area is the source of the greatest difficulty. The window which gave so much trouble in the morning now exerts a baleful influence after dark. It constitutes a large area of dark, unrelieved tone above the altar and upsets the tonal balance considerably. If light is directed at this window from inside the church, it does little to relieve the depressed tone. In fact, it tends to accentuate it for specular reflections from the various facets of the multiple components introduce high-lights

of a worrying intensity which, for reasons already propounded, stretch and emphasise the contrast ratio. If the window is lit from outside, although it may appear a little unnatural at night, with care it is possible to adjust the intensity of the external illumination so that the window registers more realistically. This however depends upon favourable external facilities, and in the writer's experience such facilities are rarely available. So again the angle of view should be fairly steep. In only a very few churches will it ever be possible to give the altar any real three-dimensional form. There is sometimes just enough room behind the altar to introduce discreetly a four-light or a 500-watt soft-light on the floor to help to set the altar forward, but normally, acute side light is the only possibility. Great care must be taken to avoid multiple shadows which can detract considerably from the solemnity of altar ritual, and which can create an impression completely alien to the calm dignity of the setting. This point cannot be emphasised too strongly for the margin between good taste and bad taste in this respect is very small indeed. A little quite unintentional lighting *gaucherie* here can easily cause considerable offence to viewers and to churchgoers generally.

It should be remembered that there still exists some prejudice towards the televising of religious ceremonies, and brash lighting effects must be avoided. For this reason, too, it is seldom possible to combine successfully the 'show-place' technique with the normal evensong approach. The same quiet dignity is common to both but, in the show-place technique, there can be a more exuberant edge to the light and a livelier kick to the shadow. It is really a difference in quality, and an appreciation of this difference can only be born of experience. Yet its effect is most decidedly obvious and, if extreme caution is not exercised, the solemnity of a devout occasion may be marred by the introduction of the show-place mood. However restrained, show-place programmes are still entertainment. Where religious services are concerned, the viewer expects to be a member of a congregation, not of an audience; the lighting supervisor should never forget this. If any doubt whatever exists about the delicacy of the lighting effect, a representative of Religious Broadcasting Department is always present on these occasions to advise both producer and lighting supervisor, and there should be no hesitation in asking for his advice.

Show-place

Where the straightforward 'show-place' aspect is to be emphasised, the lighting supervisor has much more latitude pictorially although he is still heavily impeded as regards source distribution by the peculiarities of the average church or cathedral. There is a general misconception that in large cathedrals, large quantities of light are the primary requisite, but if

this attitude is adopted by the student, he is doomed to failure at the outset. Quality is the first thing to consider—not quantity. The pictorial beauty of a cathedral can never be captured by bathing it in light however necessary it may be to bring out the intricate and intimate architectural detail. The pictorial appeal of a cathedral depends so much on the rich depth of the shadows, the luminosity of the half-light and the mellow beauty of its age-old architectural design as a whole. Scarcely any of this appeal is a function of the high-light as such.

Further, if the cathedral is kept in dead sharp focus all down the nave from porch to chancel, no conception of its stately depth and grandeur can be conveyed to the viewer. Therefore lighting levels should be kept down rather than up, and thus lenses will be forced open until differential focusing is automatically imposed. The lower the lighting level the more touchy lighting angles become and the placing of sources must be correspondingly more precise. This implies a very confident approach on the part of the lighting supervisor—an approach that can only be developed by a sympathy with the subject and a feeling for the medium.

‘The placing of the sources must be correspondingly more precise’ . . . how straightforward it would be if it were as easy as that! Inevitably it will be found that, just where a source is required, there are no means of supporting it, or if there are, it will be either in shot on reverse-angle or on cross-shot. If it is placed where it can be supported or where it will dodge the cameras, it fails to achieve adequately the purpose for which it is required. This is where the lighting man’s knowledge of his craft pays the greatest dividends.

The quality change in shadows when filled by direct light as opposed to reflected light can be conclusively and effectively demonstrated; shadows filled by reflected light are much more luminous, strong and lively; moreover, their strength can be varied widely while still retaining fullness and luminosity. Where a cathedral is concerned, this aspect of reflected light is the lighting supervisor’s mainstay—it is the one saving grace which permits him to take liberties with source positions which could not otherwise be tolerated.

In an earlier example, it was indicated that when lighting down to low levels, the high-light itself was more an instrument of system modulation than a function of pictorial appeal and, for this reason, it was recommended that it be rendered a little on the artificial side in order to fulfil this modulation requirement. It is thus possible to provide the high-light in such a position and in such a manner that the surface which promotes it also acts as a reflector and scatters light back into the shadows to induce in such shadows the richness and the luminosity which renders them so effective a force in graphic representation.

An example of this technique can be seen in the accompanying photograph (Fig. 11) taken at Ely with an average incident light level of only 4 foot-candles. The artificiality of the high-lights are quite obvious because the photograph was taken at $f/16$ and it was a time exposure (35 seconds). The O.B. cameras were of necessity working at $f/1.9$ to $f/2.3$ and tracking, so that this artificiality was somewhat toned down and did not appear unrealistic. The shadow detail is also obvious in the photograph although, on the television screen, much more richness was promoted in these shadows than is suggested by Fig. 11. The method of 'patching out' is also indicated in the photograph.

The fact that reflected light is the key which unlocks both the pictorial and the practical door on these difficult locations does not mean that the lighting supervisor can spot up his focused sources on to mellowed stonework indiscriminately. In fact, focused sources directed on to light stonework which is likely to be in shot spell disaster, for while they may provide the reflected light, they certainly will not provide the artificial high-lights. They will merely create high-lights of such piercing intensity that the cameras might just as well look directly into the light sources.

Until the beginner can 'feel' light as well as see it, he should not, when lighting down to low levels of 4 to 10 foot-candles, direct focused sources on to light stonework which is likely to be in camera shot. Such stonework should in general be covered by the double broad type of source and, even then, a precise though delicate adjustment will be necessary. The amount of latitude is very small indeed, and a full visual appreciation is very necessary if a reasonable electronic form is to be evolved.

3.7 ICE RINKS

The first requirement for meeting any type of production involving the somewhat considerable area of an ice rink, is a fairly even general light over the whole of the area. This is essential because action is so fast and so wide that any patchiness on the rink will be very obvious as the cameras pan rapidly over this large expanse. It is normally not practical or indeed desirable to obtain this even foundation with the five-light type of fitting. In an ice rink everything is so light and so similar in tone that there is little contrast in the scene, and if an attempt is made to obtain overall smoothness with soft light, such contrasts as exist will almost entirely disappear. Thus, unless the producer specifically wishes the place to take on an aspect of ethereal unreality, soft light should be avoided at all costs.

Existing overhead light in the average rink—excepting the Empress Hall type of location which has exceptional lighting facilities—will usually give about 10 foot-candles over the ice, but this will generally be

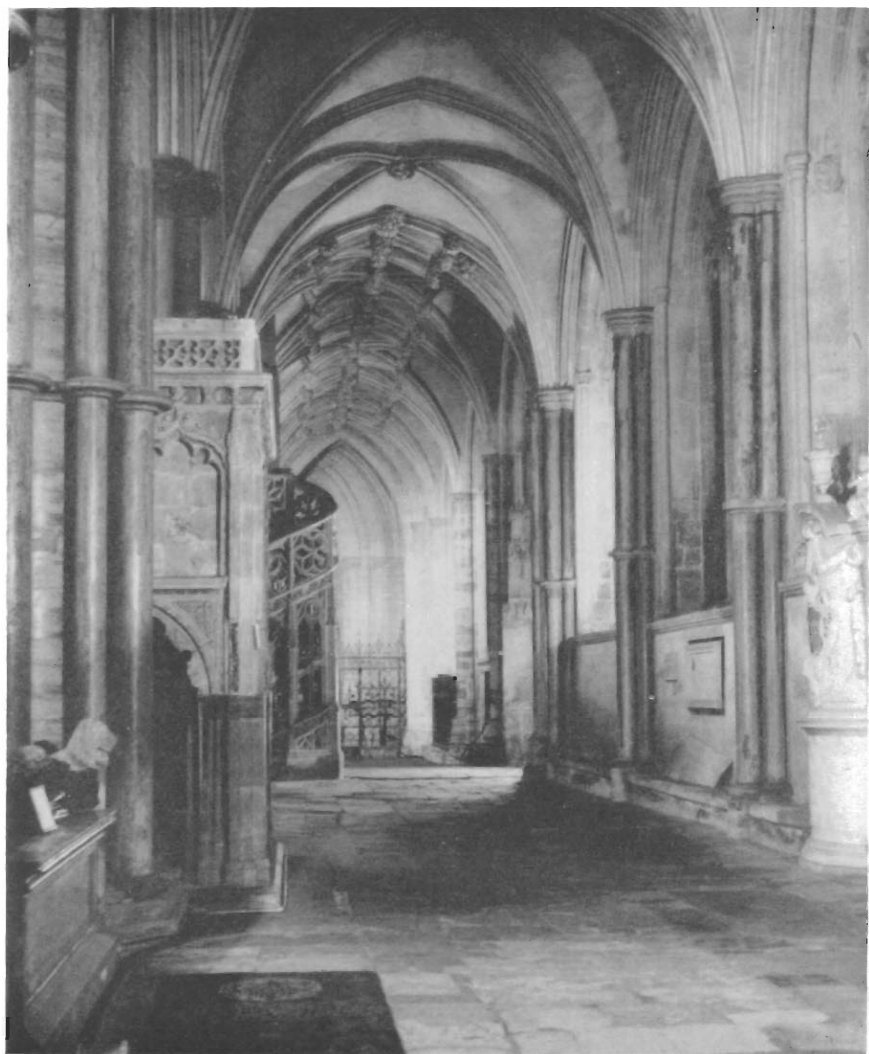


FIG. 11 TECHNIQUE FOR LIGHTING A CATHEDRAL

centralised leaving all the edges of the rink dark; many rinks are surrounded by a gallery which slightly overhangs the ice, thus accentuating this dark edge. From experience it has been found that the most satisfactory method of handling ice rinks within this category is as indicated in the diagram (Fig. 12). The pairs of 2-kilowatt spotlights shown over the ice down the length of the rink on both sides are slung from tabular perches specially erected for the purpose.

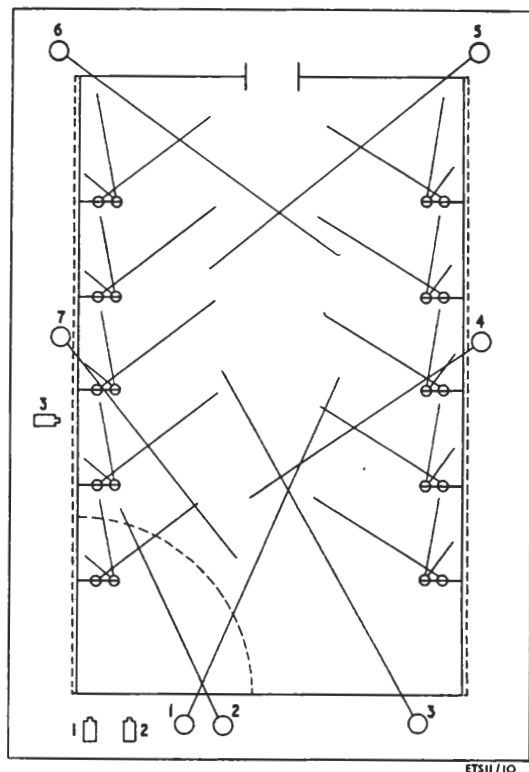


FIG. 12 LIGHTING AN ICE RINK

On the average sized rink, five to seven pairs will be necessary down each side, and the general method of angling the sources is indicated. It will generally be found necessary to diffuse the lower half of each of the spotlights which are pulling the edges of the rink with half-screens of either windowlite or fibre-glass—preferably the latter—to prevent the blobbiness which results from using focused sources at the angles imposed by the height of the galleries. With this system, and balancing these sources to the existing overhead, a fairly even intensity can be obtained over the ice. This has the added advantage of hard light and some

semblance of cross-light which will help to increase the contrast a little.

The general direction of the accent 5-kilowatt sources (referred to hereafter as 5 k's) is also indicated. Inside the dotted area there will normally be several interviews, so 5 k's Nos. 1 and 2 must be diffused with half-screens at the base of the fresnal lenses so that close-ups in this area do not burn out. Concerning 5 k's Nos. 4 and 5, considerable trouble will be experienced in getting these just right, but employing these sources can make so much difference to the sparkle of the picture that it is always worth quite a lot of effort to retain them in use. If source No. 4 is fully spotted up on the ice so that the main specular reflection rebounds midway between the camera 3 and main camera positions, and is then eased off to about three-quarter flood, it will be found that once the ice has been skated over and roughed up, there will be little trouble with actual specular from this source. If it is also carefully barn-doored so that the direct lens flare problem is solved, it should be possible to use it in this position and at this angle. The same is generally true of source No. 5, but this source may cause considerable trouble from direct lens flares in cameras 1 and 2, and it often becomes necessary to angle this lamp as shown rather than right down the rink, in which position it would give added crispness to the picture. Different types of production will of course call for modifications of this fundamental form. Skating championships in particular will call for very careful placing of supplementary lighting in order to avoid interference to both the contestants and the judges who are very touchy about focused light.

Where a large-scale spectacle on ice such as a pantomime at the Empress Hall is being televised, it is usual to employ the normal production lighting—including colour—with certain modifications and some supplementary. As far as the permanent lighting over the ice is concerned, all 'warm' circuits can be generally taken as they stand, and only the 'cold' circuits need to be cut. As regards the production sun-arcs, straws and golds are usually the best filters to use although pinks and reds can sometimes be quite effective. The difficulty here is to drill the arc operators into television practice. They are so schooled to using these arcs tightened up and as perpetual following spots that they invariably revert to their normal procedure during a television performance unless the lighting supervisor keeps a very tight rein on them through the production lighting director. It is therefore essential that the lighting supervisor should have a monitor installed in the lighting director's box so that close collaboration is established to check lapses of this nature.

It is preferable to keep the sun-arcs spread and mostly static except for specially rehearsed effects. To this end the marking up of cue-sheets with the production lighting director should be very precise. In spite of this,

it will still be necessary for the lighting supervisor to anticipate and, with his eye on the monitor, to check with the lighting director each lighting change before it is due. He will also have to keep a wary glance on the ice for the spot that starts to waver so that he can stall it instantly before it sweeps into habitual action. Even with all this care some trigger-happy electrician is almost sure to sight-up on his normal target before he can be checked. So, in a performance of this nature where an adaptation of the normal plot is involved, the lighting supervisor really has to be very much on his toes if he wants to avoid being involved in a chaos of following spots. Sometimes a special-effects spot can be used with advantage on the ice to pull a solo performer out of the background, but its intensity should be very carefully controlled. In short, all spot operation must be kept completely in hand if rehearsal effects are not to be ruined by the impetuosity of the normal production personnel.

3.8 SWIMMING BATHS

The introductory remarks regarding ice rinks are to a large extent also true of swimming baths. Here again everything is generally similar in tone and it is incredibly easy to produce thin and washy pictures. The physical settings of swimming baths vary considerably. In some, wide galleries set well back completely surround the pool; in others, narrow little galleries almost on top of the water traverse two sides only; still others have no galleries at all, and but little space on the edge of the bath. In these circumstances any suggested set-up can only be a mere indication.

A rough plot for a major pool is given in Fig. 13, cameras 1 and 2 being static and camera 3 a tracking camera on the edge of the bath. Now, in a swimming bath, the deep end will always appear as a dark-toned band at the top of the bath, and it is of no earthly use to spill more and more light on to this area in an effort to lift its tone. If this is done, all that will happen is that swimmers in the water at this end of the bath will be completely 'burnt out' whilst the dark tone of the water will appear to be darker in consequence of the juxtaposition of these 'burnt out' high-lights.

This low tone is a function of depth, and the only way in which it could be relieved is by driving focused light right down through the water from a steep angle and bouncing it back off the white tiles on the floor of the bath. As this is never practical, it can be forgotten. Five-kilowatt underwater lights are available but, again, for the average type of programme these are neither practical nor necessary. The change of tone from shallow to deep end is entirely natural and therefore it is best to accept it as such.

In championship contests and club tournaments, the swimmers usually line up at the shallow end, and cameras 2 and 3 are specifically interested

in this area in terms of mid-shots and close-ups. It is therefore always worth an effort—and it will be an effort—to try to introduce a barrel as shown on which can be perched or slung a pair of 2 k's and two or three

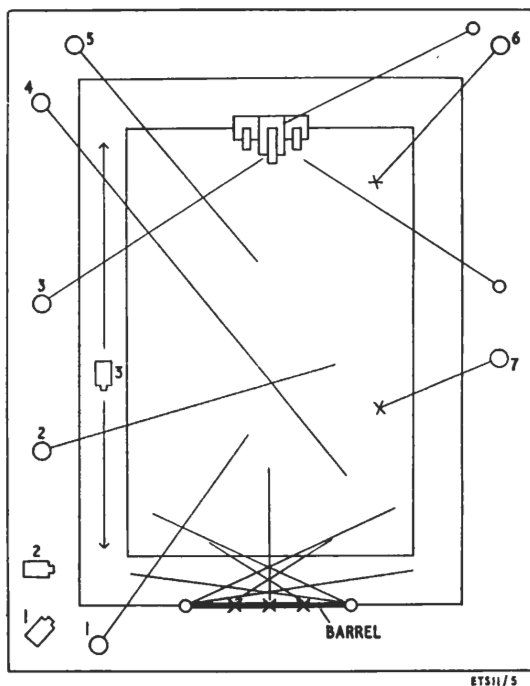


FIG. 13 LIGHTING PLOT FOR A LARGE SWIMMING POOL

500-watt spots as indicated. If these are angled approximately as shown, the 2 k's will ease two areas of the bath which are invariably under-lit; they will also spill three-quarter back on action at this end of the bath. The 500-watt sources should also be crossed as shown as this will help to pick contestants off the background.

The sources here which are really likely to cause trouble are the two 5 k's on the gallery opposite cameras. If source No. 7 is spotted up on still water in a position approximating the 'x' indicated and then three-quarter flooded, it will be found that when the water is disturbed—as it will be during the programme—the lamp can usually be used in this position. Provided source No. 6 is treated in a similar manner, it is usually technically acceptable also. Both these sources should, of course, be barn-dooed. In a location where galleries are small and almost on top of the water as it were, it will be quite impossible to use any sources on this side of the bath because the actual lamps will be reflected in the water.

The 2 k's indicated as in use for the diving board should be introduced if possible, although any sources focused on this board must be set in conjunction with the divers themselves, and where international championships are concerned, the lighting supervisor should ensure that these sources satisfy the senior champion—he should not accept an O.K. from any junior champion. If this is not done, the lighting supervisor will either be involved in a last-minute change or, more probably, will be requested to cut these sources entirely before any diving takes place—and the programme will be held up until they ARE cut.

3.9 TABLE TENNIS

Fig. 14 depicts a standard installation consisting of twelve five-light fittings rigged and angled as shown which has been agreed with the Table Tennis Association. This rig allows illumination of the table and playing area only. Normally the five-lights are skirted, but this requirement is often waived by the T.T.A. The five-lights should be suspended so that the base of the fitting is 18 feet from the ground. Modifications to this rig may be possible after discussion with local officials and contestants. Generally speaking, focused light will never be permitted, unless perhaps it is required to lift a background. In such circumstances sanction for focused sources may often be obtained.

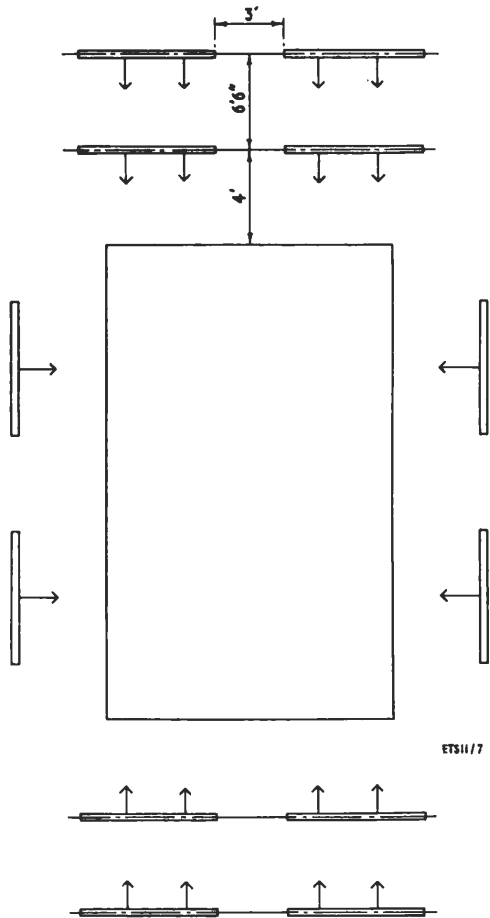


FIG. 14 STANDARD LIGHTING ARRAY FOR TABLE TENNIS

3.10 CELEBRITIES

The televising of celebrities requires quite a lot of experience in photographic portraiture. As far as an O.B. is concerned, it usually takes place at the celebrity's private residence or at some significant location such as Downing Street where the facilities for good live portraiture are usually non-existent.

People in the public eye have definite personal characteristics by which they have become known and if the lighting supervisor does not present these characteristics to the public the programme is inclined to lose much of its force. Therefore, the characteristics which have inspired the pen of the caricaturist must also inspire the lens of the television camera but, whereas the caricaturist can go to almost any lengths with impunity, the lighting supervisor must be very careful in his emphasis, and while giving effect to natural peculiarities, he will find it necessary to play them down without destroying their significance. In a studio this is not difficult, but it is not easy where it may be required to pan round the whole room when it is barely capable of accommodating the necessary television equipment and personnel, let alone any lighting paraphernalia.

It will generally be found, however, that one or two 13- or 15-amp plug-points will be situated in the room itself or in an adjacent passage-way, and these are enough to cater for the normal lighting requirements which usually consist of two 250-watt spots and two 500-watt spots. The positioning of these sources will mainly be governed by the local amenities but, if the 250-watt spots can be so located that they act as three-quarter backs—or, better still, as 'kickers'—the lighting supervisor has at his command the means of controlling his emphasis within fairly wide limits, for the positioning of key and filler generally presents few problems. The advantages of this four-point type of lighting in emphasising the peculiarities of a sitter's features are considerable, and a practical knowledge of balancing this combination to obtain the results required is essential.

In this respect, it may point a moral to quote James Thomas in the *News Chronicle* of 11 February 1955. . . "It is amazing what television can do to faces. Respectable clergymen acquire the impression of hangovers, elegant ladies grow black eyes, noses shorten, wrinkles abound, chins recede and baldness is shinily exaggerated. Life is hard in these days of the electronic close-up and the permanent 9 o'clock shadow. It takes more than a usual face to survive the cold scrutiny of T.V. It takes a face with more than the ordinary something-to-say to keep eight million other faces glued to their sets."

Particularly where faces are concerned, the subtlety of light is to be found in the shadows—and the shadows form the face. Get these right,

and the high-lights will generally look after themselves. It is necessary to examine the face, to note the bone structure and then to place shadows so that they strengthen or soften but never distort it. If shadows are placed so that they compete with the natural skull formation, nothing can save the resulting portrait and no impression of the sitter's personality will be captured. Cheek bones, for instance, may be high or they may be low, but, even where these bones are amply covered with flesh—as in a Billy Bunter type of face—they still exert their influence, and it is a mistake to attempt a portrait without first paying particular attention to the framework on which the flesh is modelled. It is because insufficient consideration is normally given to this fact, and to the fact that the human face is a cube and not an egg, that so many close-ups miss the mark. It is realised that, as far as television is concerned, the portrait is live but, if a really good close-up is the major aim, it must be so lit that the mid-shot will still prove fairly reasonable. The student is here referred to Engineering Training Supplement No. 7, and to any good book on portraiture. More than anything else, however, he is recommended to use his own observation and to give it adequate expression.

3.11 AQUARIA

There are obvious reasons why it is not possible to obtain any reasonable pictures by trying to light aquaria from the front. They should be lit as indicated in the diagram (Fig. 15) where 1 and 2 are focused sources spotted up through the water on to the bottom of the tank. The power of

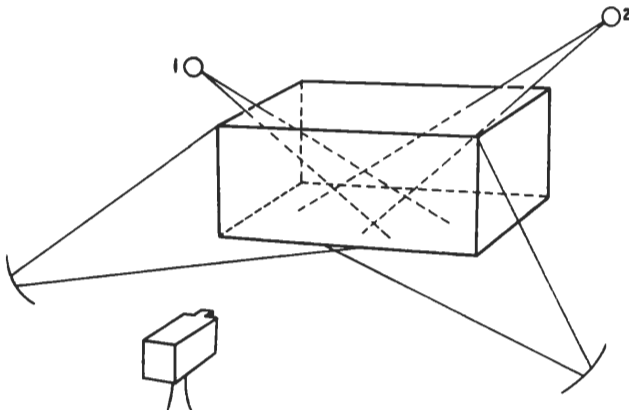
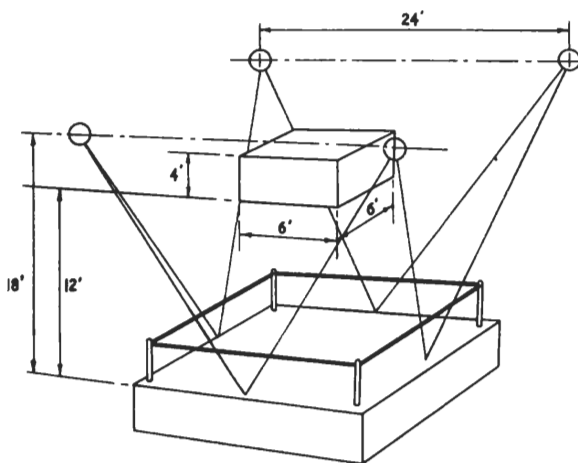


FIG. 15 METHOD OF LIGHTING AN AQUARIUM

the sources and the degree of spot will depend on the size of the tank. For the average tanks in the London Zoo Aquarium, two 2-k lens-spots per tank are normally employed, and these are used 3 or 4 feet above the water and at about half-spot. In front of the tank and at an angle such

that direct reflections of the sources are not visible to the cameras in the glass front, two soft-light sources are used as shown and at an intensity which is just sufficient to prevent the fish shading off when they approach the glass. As a rule, pictures obtained by this means are crisp and lively and possess plenty of sparkle. The curator should always be consulted about the effect on fish of focused sources punched through the water. No difficulty will usually be experienced in this direction. Fish should not be fed just before or during an O.B. If they are, sand and litter from the tank bottom will be swirled up by the excited fish, the water will go cloudy and the pictures will assume a dull, misty and lifeless aspect which will completely destroy the value of the programme both visually and pictorially.



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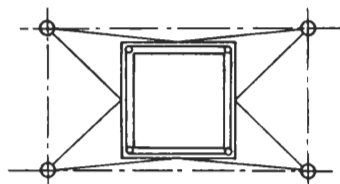


FIG. 16 LIGHTING ARRANGEMENT FOR A BOXING RING

3.12 AMATEUR BOXING

This normally comprises a standard rig agreed with the A.B.A. and any modifications made must be a matter of consultation with their representatives and local officials. The boxing fitting itself (see Fig. 16) consists of four five-lights strapped together on a tubular frame 6 feet square

and fitted with skirts which have a depth of 4 feet. Inside these skirts is inserted an egg-box type of partition to act as a baffle to prevent spread of light outside the boxing ring. The base of the skirts should be 12 feet above the ring floor. The weight of this fitting is approximately 600 lb. This fitting is supplemented by two barrels, each 24 feet long, slung over opposite sides of the ring. Each of these barrels supports two 2-k lens-spots, one underslung at each end of the barrel. The barrels are suspended at such a height that the source itself is 18 feet from the ring floor. These spots are used to pull up each corner of the ring and to give some semblance of angled light as opposed to the 'toppiness' of the centre fitting. They must be effectively barn-doored so that the light does not spill over the ring edges and affect the eyes of the judges and press representatives seated round the ring sides. Quite often it will not be necessary to employ the centre fitting, the fitting supplied for the normal boxing ring by the promoters proving quite satisfactory. Boxing pictures are normally of poor quality due to the toppy lighting, the whiteness of the canvas on the ring floor and the whiteness of the ropes.

4. GENERAL LIGHTING LEVELS FOR IMAGE ORTHICON CAMERA TUBES

In attempting to set down an average light level which will satisfy the image orthicon camera, it is stressed that the level suggested is that which has been found satisfactory over a fairly large number of O.B.s. It is not intended that this level should be taken as an irrevocable standard to be adhered to at all times and under all conditions. Quite satisfactory pictures have been obtained with lighting levels very much below those indicated and also with lighting levels very much above, and local conditions may compel the use of either one or the other.

An incident level of from 30 to 35 foot-candles is given as the level which satisfies the majority of O.B. requirements and which should permit of camera operation with 3-inch image orthicon tubes at a stop of $f/8$ (in order to meet the Watson Mark II zoom aperture) and approximately one 'f' number down with $4\frac{1}{2}$ -inch image orthicon tubes. This rule, of course, presupposes average programme content. Ideally this level of light should be built up on a diffuse overall foundation light approximating 10 to 15 foot-candles. If this basic light can be obtained by the reflection of focused sources off a white ceiling or some similar surface, there is a good chance of obtaining excellent picture quality. Normally it is simpler and much more efficient to employ the five-light type of fitting scrimmed down to supply this diffuse light over the whole

acting area. This general 'glow' will of course have its embarrassments where, perhaps, an isolated set requires specialised lighting, but in most cases it does provide an ideal foundation on which to erect a nicely balanced lighting form.

Normally, the key light should comprise a fresnel-lens spot and its intensity should approximate 1.5 times the basic level unless special effects are desired. It is better to try to achieve this intensity as a function of lamp-to-artist distance rather than to position the lamp regardless of distance and then to adjust the intensity by either gauzing down or by taking-off the edge with dimmers. Location difficulties will often prevent this possibility but it should always be tried where practicable. When filling to this key, it should be remembered that the image orthicon will register and exaggerate a tonal difference scarcely visible to the eye and, until the student has acquired some considerable experience, the adjustment of the filler is best done in slow stages and with an eye on the screen. The main thing to remember is that the filler must not compete with the key.

The intensity of the back light will vary considerably with subject and angle and, again, until experience is gained under practical conditions, this should also be introduced with an eye on the monitor.

All incidental lighting to meet scenic and location requirements must be built up into the general form so that the final result is a unified whole, which assists the mood as dictated by the key. On this sort of build-up peak-whites should average 28 to 30 foot-lamberts, average whites 25 foot-lamberts, flesh tones from 12 to 18 foot-lamberts and blacks from $1\frac{1}{2}$ to 2 foot-lamberts. This provides a contrast ratio of approximately 15 to 20 to 1.

Under these conditions quite reasonable pictures should result but, as has so often been emphasised, it is the balance which counts, and no mere lighting to light-meter readings and pre-set standards can ever produce quality pictures. The above figures are but an indication as to what satisfies the photo-cathode in terms of light values. In terms of correct tonal distribution and balance it is mostly a matter of experience, visual appreciation and plain common sense.

NOTE 1. Where the Watson Mark II zoom is used on the 6-inch to 30-inch range, lighting levels will have to be stepped up to 70 or 75 foot-candles incident in order to accommodate the $f/12.5$ aperture on this range. This will involve peak-whites of the 65 foot-lambert order. Average whites 58 foot-lamberts, flesh tones 25 foot-lamberts and blacks 3 to 4 foot-lamberts.

NOTE 2. A useful rule for stop assessment is to take the square-root of the foot-lamberts off average whites and double it. This has been found to indicate very closely a stop that will place the working condition directly on the knee.

5. PRACTICAL EXAMPLES IN LIGHTING FOR TELEVISION OUTSIDE BROADCASTS

The following examples illustrate some of the problems that a lighting supervisor has to solve. The photographs were taken by the author on locations.

The first four photographs demonstrate the light and airy treatment of a fashion show staged in the factory that made the nylon yarn. Large areas had to be handled in such a manner that both fashion and factory aspects were acceptable. This necessitated the use of some floor lighting and its attendant embarrassment. Plate 3 shows how such light can be arranged to cause least inconvenience to tracking.



PLATE 1

FASHION PARADE IN A FACTORY

In these two plates, fashion aspect is related to factory background

PLATE 2





PLATE 3

FASHION PARADE IN A FACTORY
This illustrates the awkwardness of the venue

PLATE 4

ERECTING
SETS IN THE
FACTORY

The subject necessitated studio lighting treatment where no studio amenities existed





PLATE 5

THE CIRCUS

In this example of unsuitable lighting the figures are isolated in the gloom. There is no circus atmosphere and the audience is ignored

PRACTICAL EXAMPLES OF O.B. LIGHTING

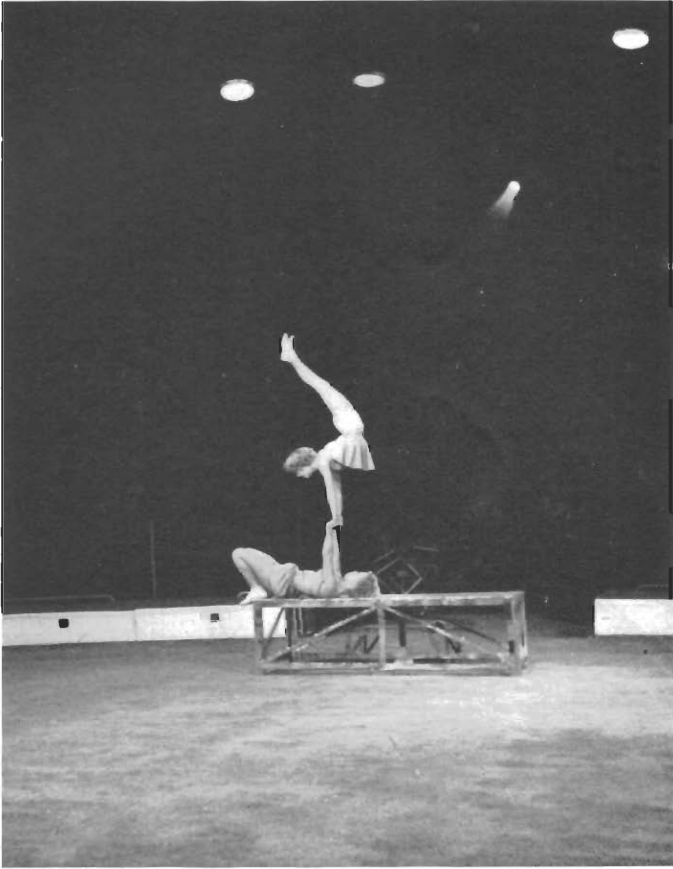


PLATE 6

THE CIRCUS

This illustration has defects similar to those in Plate 5 but here the fact is emphasised that spotlight beams do not show up against a dead background. Spotlight beams can only be emphasised by dust particles in the air



PLATE 7

SUBDUED DAYLIGHT

In this illustration the interior of a barn is artificially lit but the effect of subdued daylight is retained to match other subjects televised on a summer afternoon



PLATE 8

AT RONALD SEARLE'S WORKSHOP IN FULHAM

Preparations for Chelsea Arts Ball.

Note the retention of local colour. No tidying up to falsify this effect



PLATE 9

WHITEFRIARS GLASS WORKS, HARROW
A pictorial treatment of non-pictorial material
Now look at Plate 10

PRACTICAL EXAMPLES OF O.B. LIGHTING



PLATE 10

WHITEFRIARS GLASS WORKS, HARROW

Non-pictorial material just illuminated. There is no regard for framing or other pictorial effect

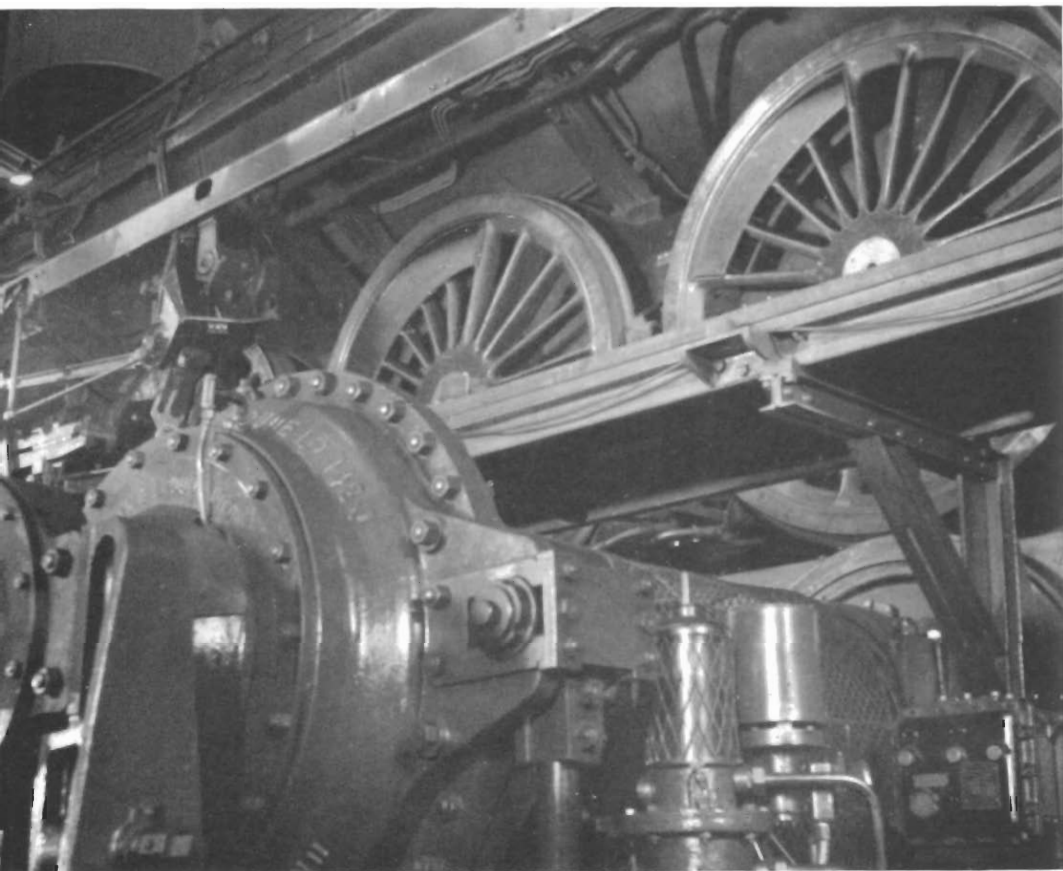


PLATE 11

ENGINE TESTING SHED, RUGBY

Note restrained lighting to keep highlights within bounds

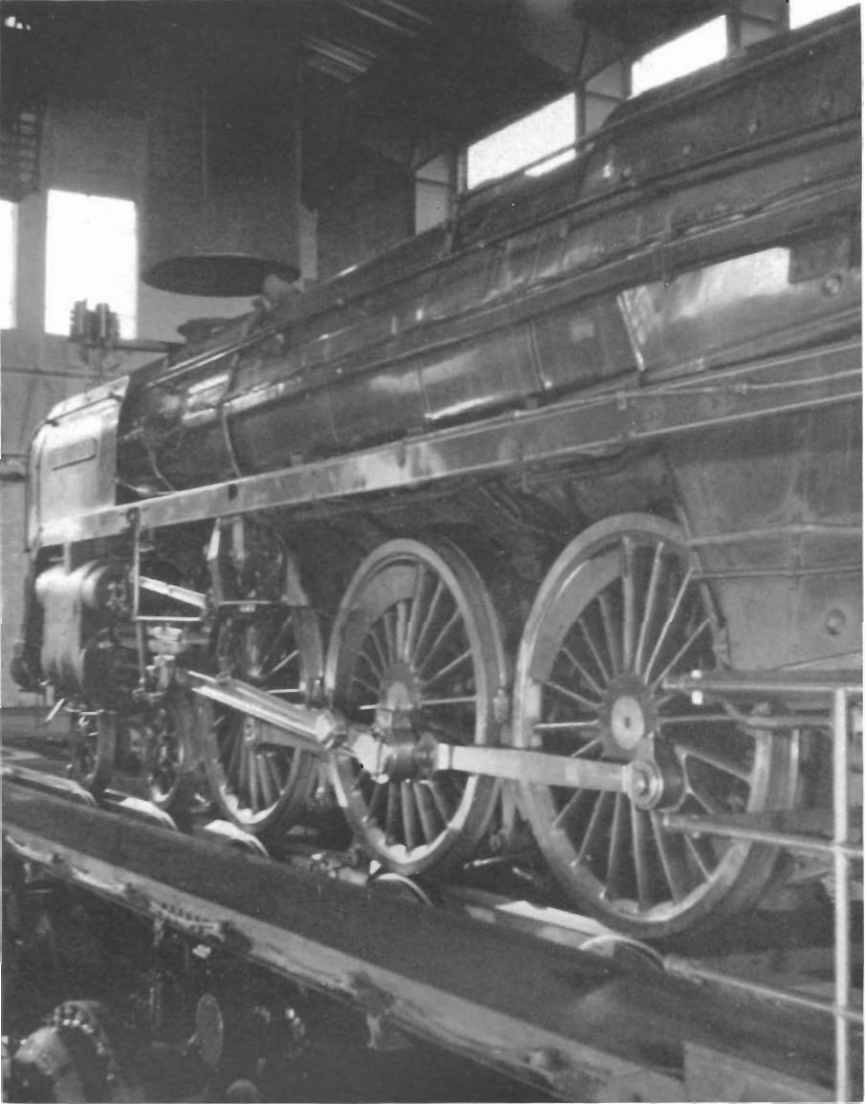


PLATE 12

ENGINE TESTING SHED, RUGBY

Here the lighting should have been more vigorous to balance engine highlights with those of the windows



PLATE 13

INDIAN DANCERS AT ST MARTIN'S THEATRE

Here there is emphasis on the dancers without the use of an effects spot

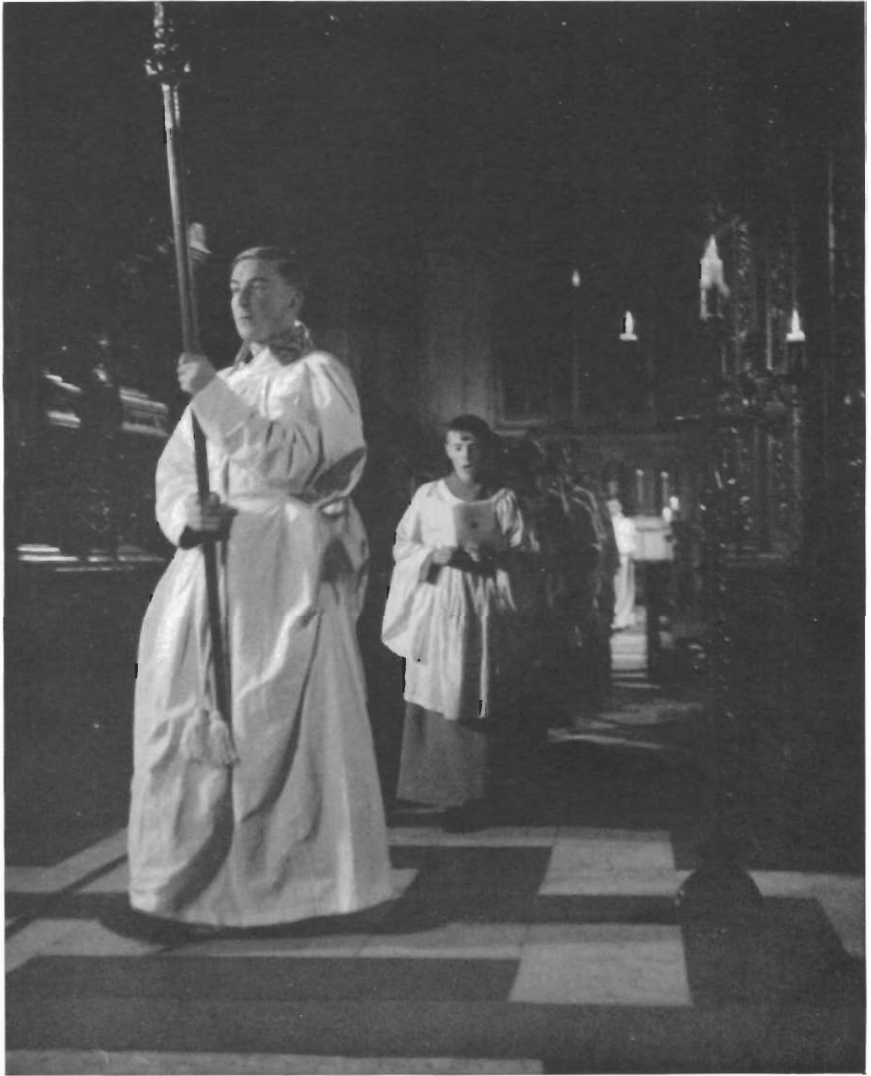


PLATE 14

RELIGIOUS CEREMONIAL

An effective low-key treatment which preserves delicacy of atmosphere without introducing theatrical emphasis



PLATE 15

POLITICAL PARTY CONFERENCE

Illustrating general overall coverage with minimum annoyance to platform

OPERA FOR EVERYONE
Note these effects:

- (a) Unbalanced shoulders
- (b) Distracting lead-in lines
- (c) Cross-eye effect

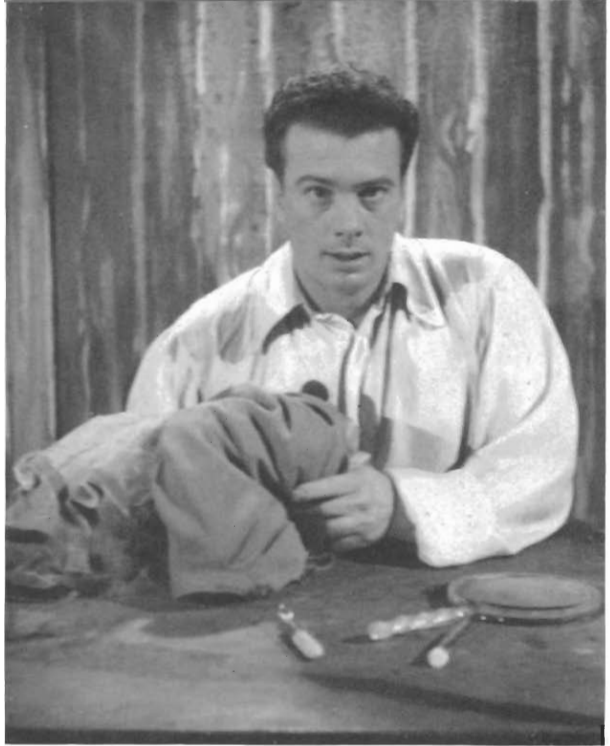


PLATE 16

PLATE 17



Here the shoulders are well balanced and lead-in lines harmonise with the hands and general pose. The eyes are now natural



PLATE 18

AN EXAMPLE OF GOOD FACE MODELLING

This illustrates the fact that in spite of overall stage lighting, reasonable modelling can be obtained by correct balancing of the sources

APPENDIX
STAGE AND LIGHTING TERMS
IN GENERAL USE

I. STAGE TERMS

Acting Area	That portion of stage on which action takes place. The limits of the acting area are of especial importance to the lighting supervisor.
Apron	The portion of the stage in front of the proscenium.
Backing	Any piece of scenery used behind windows and/or doors to give scenic effect and to prevent audience seeing through to stage walls.
Back-cloth	Cloth, plain or painted with design or landscape and dropped in from grid.
Batten (Lighting)	Row of lights supported behind a border. Batten No. 1 is down-stage nearest audience. When on the floor, known as ground batten or length.
Borders	Strips of canvas or other material suspended horizontally across the stage to conceal battens and grid.
Box Scene or Set	Flats joined together in box form to represent a room, etc.
Braces	Supports for flats or ground rows.
Bridge	Transverse section of the stage capable of sinking below or rising above stage level. A gallery spanning the stage above proscenium height for lighting purposes, etc.
Carpet Cut	Transverse slot or 'cut' down-stage which permits introduction of stage-cloth and which, when closed, holds it in position along the front of the stage.
Cuts	Any narrow transverse section of stage capable of being opened.
Cut Cloth	Used down-stage and cut to form trees, arches, etc. : used with or without ground-rows to give an illusion of depth.
Cyclorama (Artificial Horizon)	Back-cloth curved to hide side walls as well as the back wall of the stage.
Dip	Small opening in a stage covered by a metal flap and holding an electric socket for connecting lighting plugs.
Down-stage	That half of stage nearest audience.
Flats	Wooden frames covered with painted canvas, etc.
Flies	Gallery on side wall of stage from which ropes passing over pulleys in the grid are operated.
Floats	Another name for foot-lights.
Grid	Framework above the stage on which are mounted pulleys for raising and lowering scenery and lighting battens.
Ground Rows	Low pieces of scenery forming walls, hedges, etc.

LIGHTING FOR TELEVISION OUTSIDE BROADCASTS

Leg	A strip of canvas or other material suspended vertically from grid at sides of stage.
Prompt Side	Normally left-hand side of stage when standing on stage facing audience. Off prompt=Right-hand side. NOTE: the prompter is not necessarily to be found on the prompt side.
Return	Wing hinged to another wing.
Set-back	Edge-board round doorways and windows representing thickness of walls.
Tabs	Tableaux curtains. Main curtains.
Teaser	Border hung between the tormentor wings.
The Stage	Area behind the proscenium.
Tormentors	Borders or legs suspended at the sides of the stage just inside proscenium opening to prevent side walls being seen.
Tower	Steel gantry on castors for carrying lighting equipment.
Traps	Small bridges either on their own or situated in larger bridges.
Tumbling	Method of raising scenery with low grids by hauling up the bottom as well as the top of the cloth.
Up-stage	Back portion of stage.
Up on the long or Up on the short	Refers to the hems or lines on the battens. Up or down on the long refers to adjustment on the hemp farthest from the working side. The 'short' refers to the hemp nearest the working side.
Wings	Space at side of acting area.
Wings	Flats set at an angle down each side of stage screening side walls and having intervals between them for entrances.
Working Side	The side of the stage from which the lines are operated.

2. LIGHTING TERMS

Barn-door	Metal unit which fits in front of solar spot and which comprises four movable flaps for cutting the light beam.
Blade	Small rectangular gobo, which may be of translucent material.
Flag	Small gobo which can be mounted on a stand.
Gauze	Diffusing material.
Gimmick	Small light hidden in a confined area.
Gobo	Wooden-framed screen, usually painted black, and of various sizes. Used to cut light from lenses.
Jellies	Frosted or coloured gelatine or cinemoid sheets.
Kicker	Development of the three-quarter back principally used in portraiture. The incident angle is arranged so that the light 'kicks' off the side of the face direct into the camera lens.

Net-ring	Diffuser frame.
Nigger	See Gobo.
Pull	Term implying use of a focused source to emphasise a subject or to 'pull' it out of the background.
Scrim	Diffusing material.
Snoot	Conical metal extension for fitting in front of solar-spot to reduce area of spot.
Target	Small circular gobo for use on a stand.
Teaser	Horizontal rectangular gobo used for cutting strip back-light from lenses.

3. TERMS USED FOR SOURCES

Midget or Inkie-dink	100/200W spot-light	M.R. Type 404 (100/200)*
Pup or Baby	500W spot-light	M.R. Type 406 (500)
Junior Solarspot	2kW spot-light	M.R. Type 410 (2000)
Senior Solarspot	5kW spot-light	M.R. Type 414 (5000)
10k Solarspot	10kW spot-light	M.R. Type 416 (10 000)
Rifle	1000/1500W floodlight. Polished and rifled reflector	M.R. Type 45 (3)
Scoop	500/1000W floodlight (1)	
Double Broad or Double Can	1000/2000W broadside flood with ground-glass diffuser	M.R. Type 20 (5)
Single Broad or Single Can	500/1000W broadside flood with ground-glass diffuser	M.R. Type 21 (4)
Five-light strip (Q ins)	500/1000/1500W five-light trough, polished reflector	M.R. Type 305 (7)
Sky-pan or Back flood	2000/5000W flood in large, shallow, circular, matt reflector with open bulb for flooding sky-cloths, etc.	M.R. Type 240 (8)
Basher	500W soft-light in matt reflector	M.R. Type 316 (2)
Four-light (Quads)	100/500W four-light trough, matt reflector	M.R. Type 398 (6)
Fluorescent Fitting	6 80W 5 ft warm white fluorescent tubes in shallow matt reflector	M.R. Type 402 (20 T.V.)
Dumbo	5000W soft-light, ground-glass diffuser	M.R. Type 1461
Duarc	40A twin-arc soft-light, ground-glass diffusion. Same quality light as diffuse daylight	M.R. Type 40
Sixty-five	65A H.I. arc light	M.R. Type 65
Ninety	120A H.I. arc light	M.R. Type 90 (120)
One-seventy	150A H.I. arc light	M.R. Type 170 (150)
Brute	225A H.I. arc light	M.R. Type 1450 (225)
Particulars of these sources are contained in Engineering Training Supplement No. 7		

* Type numbers in new catalogue.

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