

**SEE INSIDE**

# A TELEVISION STUDIO

SERIES EDITOR

**R.J. UNSTEAD**







*Endpapers: Looking down into a television studio through a forest of lights slung from the ceiling. These lights, which include 'barndoors', 'floods' and 'spots', are mounted on tracks and can be moved by remote control from the studio floor to create different lighting effects.*

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**SERIES EDITOR  
R.J. UNSTEAD**

HUTCHINSON OF LONDON

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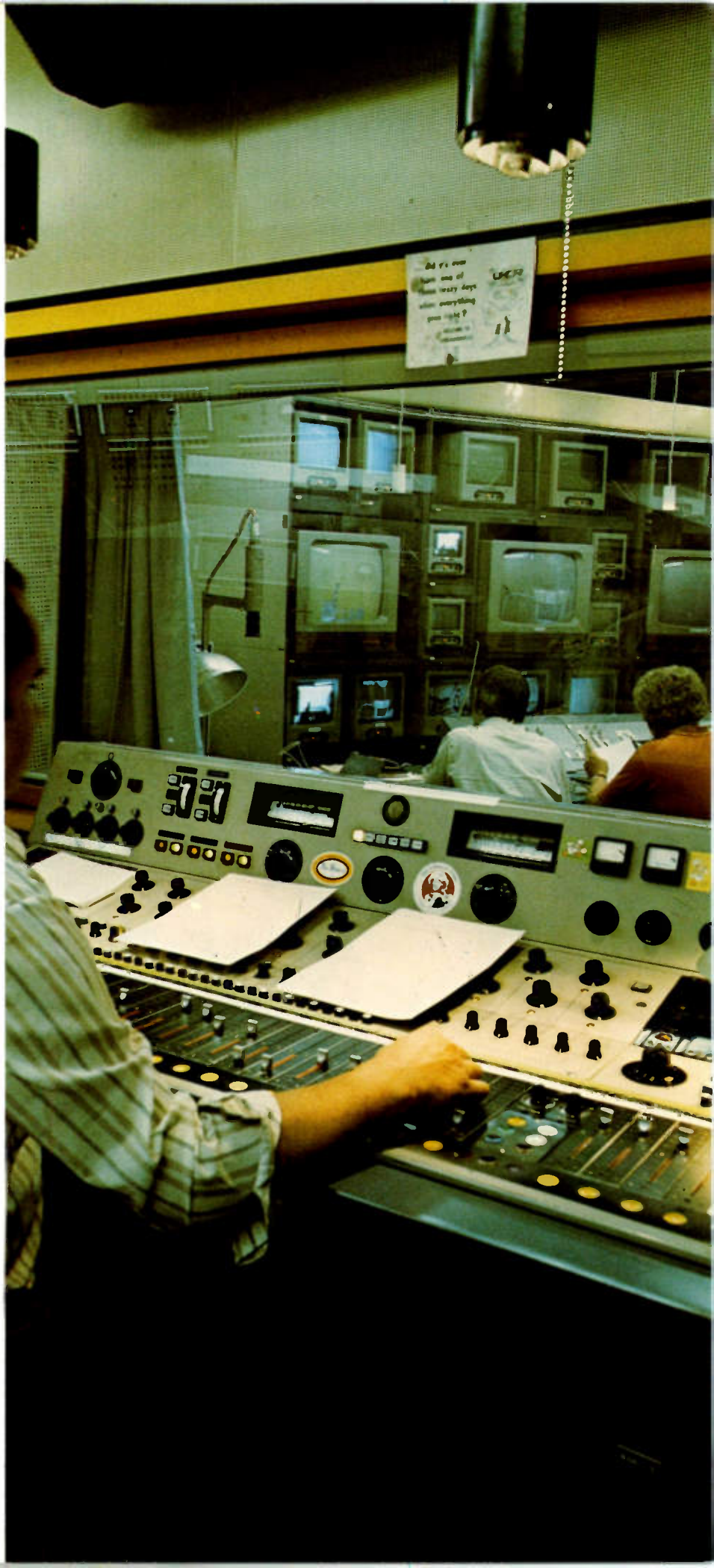
# Electronic Miracle

On 30 September, 1929, the world's first television broadcast took place. It was an experimental transmission by the BBC, and it lasted for only two minutes. There was no sound, which was broadcast later, but John Logie Baird, the inventor, was very pleased to know that at last, a real television transmission had taken place – even though only 29 television receivers were in existence. A crude, 30-line experimental system was used for tests three years later, but in 1936, television broadcasting began in earnest. The BBC, using a 405-line system, had begun regular transmissions. But there were still only about 400 receivers, and even they had to be used within 30 miles of the transmitter.

Today, television has become part of the lives of people the world over. In Britain alone, the average television set is turned on for more than five hours each day.

It is a miracle of electronic engineering, invented by a series of men over a period of almost a hundred years. A century ago, there was no television, no radio. Although the art of photography was in its early stages, there was no cinema, although the telephone and the talking machine had just appeared on the scene. The transformation of that scene in one hundred years has been truly miraculous. And what of the future? How will television develop? It seems likely that the television of the future will probably be piped by cable into our homes. It will probably have a very large screen, and we shall almost certainly possess our own video-tape machine for showing programmes at will.

*Left: 'On location'. A cameraman on camelback filming in the desert. Right: A studio's sound control room. Through the glass panel is the control room where the picture is monitored at the same time.*



# People behind the Camera

When we see the television screen showing a picture of just one person – say, someone reading the News – we tend to forget that a whole team of people is necessary, just to transmit that single person's image. Some of the members of the team are shown on this page, but there are plenty of others. For instance, there are the programme researchers, who make sure that the facts of the programme are correct; the graphics team, who provide the words, diagrams and models; the wardrobe department, which supplies all the costumes; and a floor manager, whose job it is to see that everyone knows just what is happening, and who keeps the whole range of activities working smoothly. Apart from these, there are carpenters, electricians, painters and others, whose jobs may not seem glamorous, but who are essential, all the same.

## MAKING UP FOR TV

For 'straight' parts, such as interviews, and so on, very little make-up is needed, if any. But for character roles, all kinds of materials are used. Faces are remodelled by using putty, wax or collodion. Sheets of plastic add bulk or folds to a face, while scars, cuts and bruises can be applied, cut-to-size and made-to-measure! Property 'hair' makes wigs, moustaches, beards, and so on.

### THE SET

*This is built from wood, hardboard and hessian, and then painted.*



### CAMERA

*Camera operators must position their cameras correctly, use the right lens, and keep the subject in focus.*



### SOUND CONTROL

*Microphones are placed so as to pick up sound clearly. Some are fixed, and some are on long movable rods or booms.*



### LIGHTING

*Much time is spent in getting the lighting correct, with the right power, and proper positioning.*



### VIDEO-TAPE

*Most programmes are recorded on tape, and can be edited.*



### MAKE-UP

*Make-up artists use all sorts of paints, powders and liquids; even special putties and plastics.*



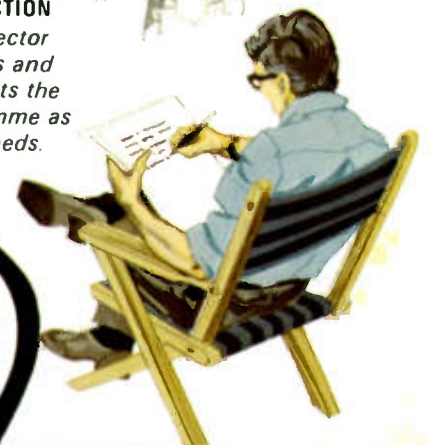
### PRODUCTION

*The producer of a programme is in overall charge.*



### DIRECTION

*The director controls and interprets the programme as it proceeds.*





# Studio Activities

In the course of a day's broadcasting, a busy television station sends out a large number of quite different types of programmes. Some are 'live': that is, they are produced in the studio, and televised as they happen; while others are recorded, either on film or on video-tape. Some programmes come from outside the studio, such as outside broadcasts of sports events or from theatres and concert-halls. Television stations are linked with others in the same country, so that programmes can be *networked*. This means



*Outside broadcasts for such events as sports, are linked to the studio by land line, or, for longer distances, by VHF radio.*



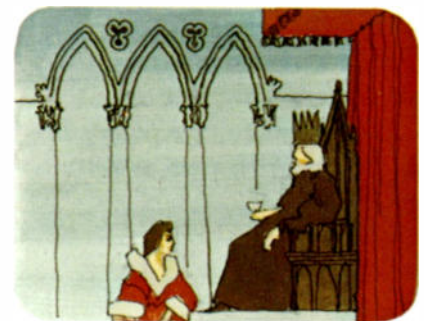
*News programmes are usually a mixture of live transmission from the studio, video-tape and film material, carefully edited together.*



*Ten seconds to transmission. In the semi-darkness of the control room a red light glows under the monitor screen linked to camera one in the studio. Another production is about to go out. The control room is the nerve centre of a television studio. Here the chaotic variety of activity is directed with split-second timing.*



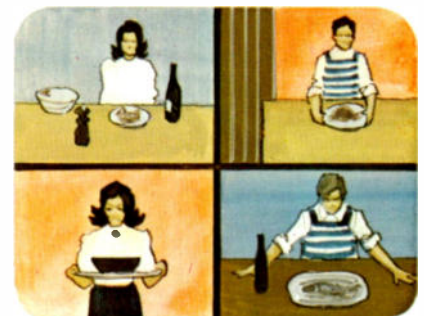
*Feature films form an important part of a studio's programme, and are televised by using a telecine machine, turning film into TV.*



*Plays are usually recorded on video-tape, which means that any mistakes or failures can be re-shot and edited in to the programme.*



*Many stations are supported by advertising. The advertisements are supplied to the station, which 'slots' them in at the agreed time.*



*Sometimes, a 'hook-up' is arranged with other studios, and combined programmes are made, showing several scenes all in one picture.*

that a popular programme can be seen by viewers everywhere. Of course, there are some programmes which are local only, such as weather reports. All these different productions need to be carefully planned and timed so that they fit neatly into the day's televising schedules. It is not simply a question of putting on one programme after another: the control room monitors the length of transmissions, while the next item is got ready. This may be an advertising, publicity or information 'slot', but split-second timing is essential. Programmes can also sometimes be interrupted for important news items which can be 'flashed' in.

## TELEVISION PROMPTER

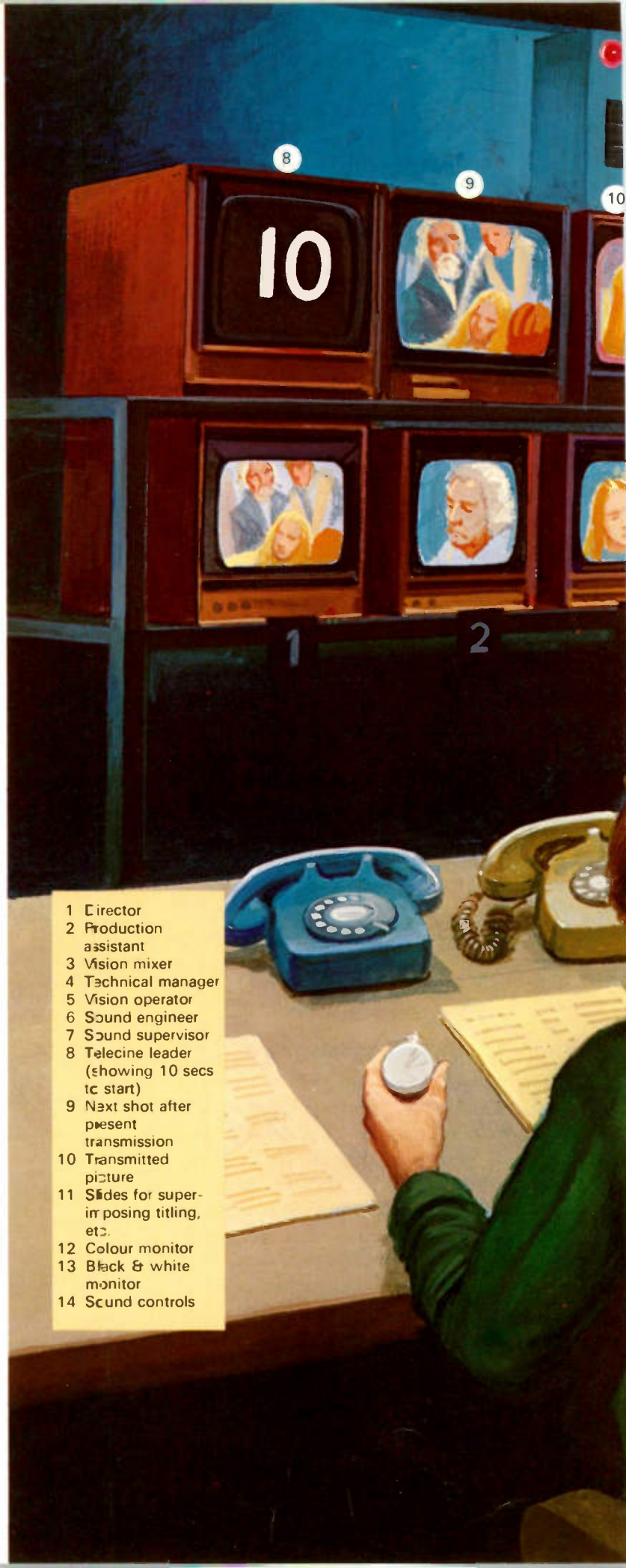
Have you ever wondered how people on television remember everything they have to say? Of course, actors and such performers learn a script in advance, but in news programmes and similar broadcasts, this is just not possible. The simplest answer is for someone to hold up a board (out of sight of the camera) with the words written on it. A better system uses an endless strip of wide paper which winds on to rollers. The words are printed on the roll. Another system has the message appearing on a small 'monitor' screen just below the camera.

# The Control Room

The control room is the hub of the television studio. In front of the control room staff are rows of monitor screens, which can be 40 or more – or fewer – according to the needs of the programme being transmitted. The staff of the control room consists of the director of the programme; the production assistant; the vision mixer; the technical liaison manager; and the vision operator. Behind a sound-proof glass panel is the sound control room, staffed by the sound supervisor and his engineers.

What we are seeing in this control room is the transmission of a television play (see pages 16–17), and each of the monitor screens is showing some part or viewpoint of the programme. In overall command is the director, seen in the foreground, with his production assistant and the vision mixer. All three are concerned with the bank of monitors on the left. The technical manager and the vision operator work from the screens at the far end. The production assistant works in advance of the director, calling the camera shots before they are due, and following the script carefully. As the director gives his orders, such as 'Cut to camera 3', the vision mixer operates her controls to change the shots. Meanwhile, the technical manager watches the next shot due to go up, to make sure that the circuits are working properly, while the vision operator is checking the colour and black and white electronic levels.

All the microphones are connected to the sound control room, where the engineers have their own monitor screens. Dozens of microphones are in use, and the sound can be adjusted very expertly, and special effects can be fed in, such as echoes or deadening of sounds. The vision controller can change the colour balance, and he can also transmit any shot to any one of the small monitors on the back of the television cameras. The lighting director is in control of all the lights in the studio, and has his own operator in the control room.



- 1 Director
- 2 Production assistant
- 3 Vision mixer
- 4 Technical manager
- 5 Vision operator
- 6 Sound engineer
- 7 Sound supervisor
- 8 Telecine leader (showing 10 secs to start)
- 9 Next shot after present transmission
- 10 Transmitted picture
- 11 Slides for superimposing titling, etc.
- 12 Colour monitor
- 13 Black & white monitor
- 14 Sound controls



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Henrik Ibsen

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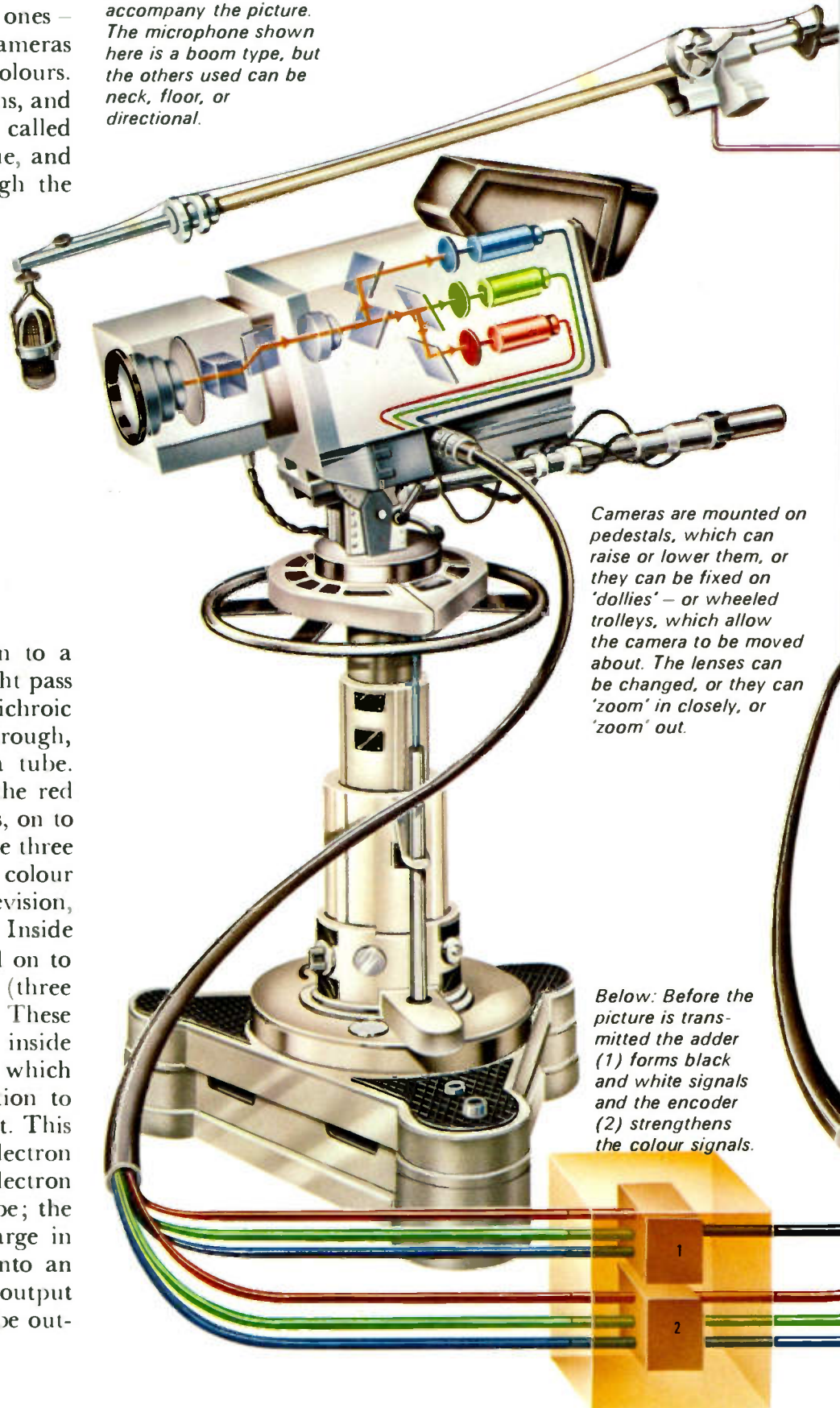
# How the Camera Works

What we think of as white light is made up of many colours, but we can think of them as three primary ones – red, green and blue. Colour cameras are made to distinguish these colours. The light passes through the lens, and first reaches a coloured mirror called a *dichroic mirror*. This one is blue, and it reflects the blue light through the

*The studio microphone picks up the sound to accompany the picture. The microphone shown here is a boom type, but the others used can be neck, floor, or directional.*



mirror on to a lens, and then to a camera tube. Red and green light pass through, and strike a red dichroic mirror. The green light passes through, and reaches a second camera tube. The red light is reflected by the red dichroic mirror, through a lens, on to a third camera tube. So we have three images focused, one on each colour tube. In black and white television, only one camera tube is used. Inside the camera, the light is focused on to the face of the camera tube (three tubes for a colour camera). These tube faces are coated on the inside with a light-sensitive material which charges electrically in proportion to the amount of light falling on it. This coating is 'scanned' by an electron beam focused on to it from an electron gun at the other end of the tube; the electron beam cancels the charge in the coating, and converts it into an electrical signal which is the output of the tube. It is these three tube out-

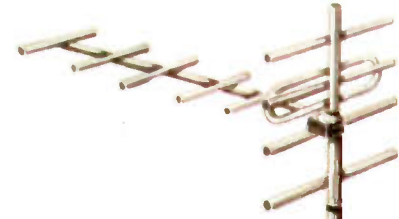


*Cameras are mounted on pedestals, which can raise or lower them, or they can be fixed on 'dollies' – or wheeled trolleys, which allow the camera to be moved about. The lenses can be changed, or they can 'zoom' in closely, or 'zoom' out.*

*Below: Before the picture is transmitted the adder (1) forms black and white signals and the encoder (2) strengthens the colour signals.*

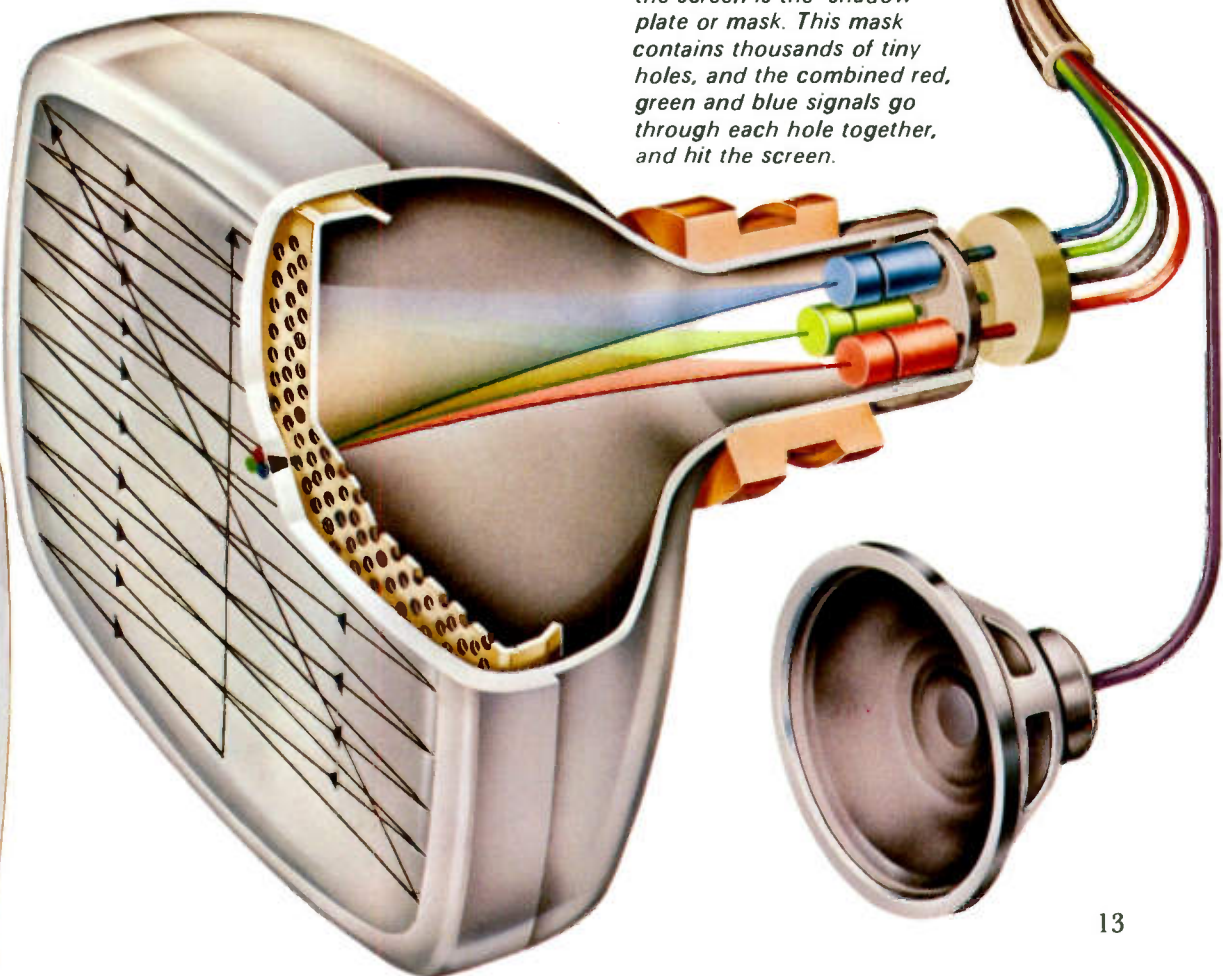
puts, combined together, that make up the colour picture.

Every colour receiver has three electron guns (one for each colour), and all fire their stream of electrons at the screen at the end of the tube. This screen is covered all over with tiny dots of phosphor, grouped in sets of three; one each for red, green and blue. As the 'guns' fire at the screen, the dots are 'lit up': the red dots by the red gun, the green dots by the green gun, and the blue dots by the blue gun. The electron beams 'scan' the tube sideways, and up and down, according to the line-standard used. For most of Europe, this is 625 lines. The signals from the TV cameras are relayed from the studio to the transmitter, together with the sound signals. These signals are picked up by viewers' aerials, and so on to the set.



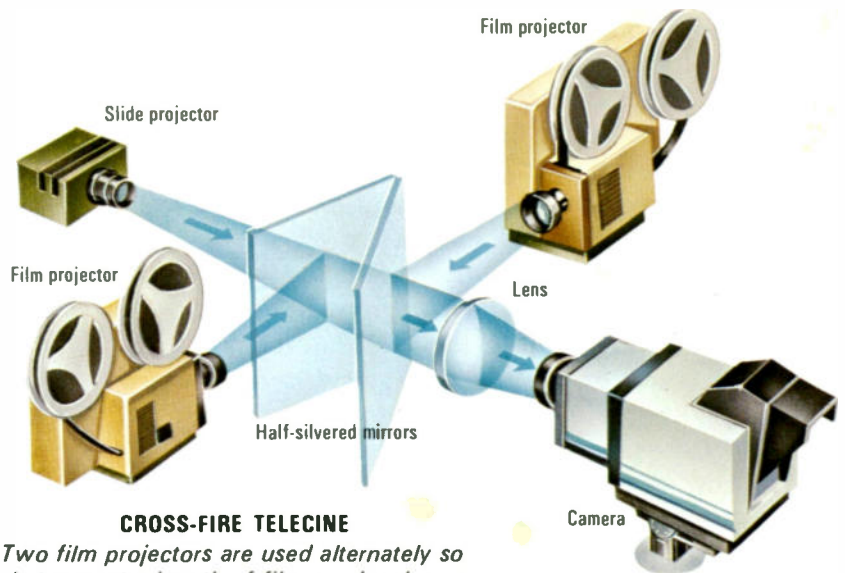
*Transmitters send out the signals for television on two carrier waves. The length of each 'wave' is called a wavelength, and the number of waves sent out per second is called the frequency. These are measured in Hertz.*

*Between the electron gun and the screen is the 'shadow' plate or mask. This mask contains thousands of tiny holes, and the combined red, green and blue signals go through each hole together, and hit the screen.*



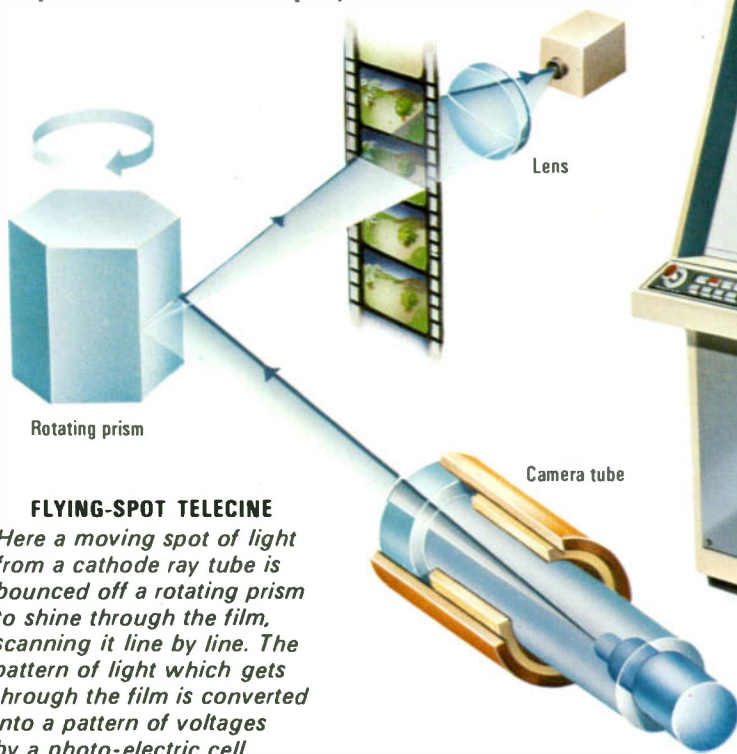
# Recording Equipment

A great many programmes seen on television are from films or recordings. In fact, about half is film. This has to be converted into TV signals, and to do this, a *telecine* machine is used. The simplest one is called a vidicon cross-fire machine, and is shown in the top diagram. Another system, which is less wearing on film, is called the flying-spot telecine, and this is shown below. One of the technical problems which is overcome is that ordinary film is shown at a rate of 24 frames a second, while TV uses 25. The sound track of film is either *optical* – looking like an irregular strip alongside the picture – or *striped*. This means that it has a track down the side of the film something like the tape of a tape recorder. In either case, the telecine machine has to pick up the sound, either by shining a lamp through the track on to a photo-electric cell, or by picking up the striped track with a playback head.



## CROSS-FIRE TELECINE

Two film projectors are used alternately so that a greater length of film can be shown without interruption. Two half-silvered mirrors are placed in position. At this angle these reflect the projected film, like ordinary mirrors, at 90° into the camera. At the same time, slides of captions etc., can be projected through the mirrors at a non-reflective angle directly into the camera.



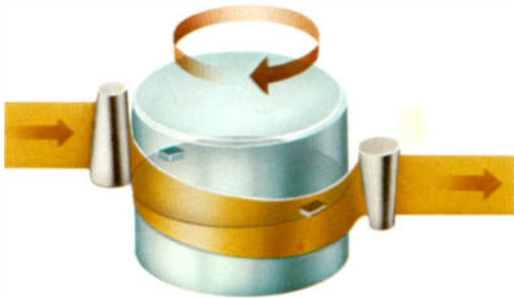
## FLYING-SPOT TELECINE

Here a moving spot of light from a cathode ray tube is bounced off a rotating prism to shine through the film, scanning it line by line. The pattern of light which gets through the film is converted into a pattern of voltages by a photo-electric cell.



Flying-spot machine

Television pictures can be recorded on magnetic tape. The machine used to do this is called a video-tape recorder (VTR). Variations in brightness along each line of a picture are changed into a varying electric current. This passes through a special rotating electromagnet called the recording head. It produces a magnetic pattern on a tape, which is drawn past



*Above: Rotating head disc showing tape feeding through at an angle to make diagonal recording.*

the head. Because the head rotates, it records the vision signal in a series of narrow strips, diagonally across the tape. The total length of these strips is much longer than the tape itself. This arrangement is necessary in order to record faithfully the numerous brightness variations contained in a typical picture – if a video-tape recorder were made like an ordinary sound tape

*Below: Diagram of video-tape showing recording angle.*



recorder, the tape would have to pass the fixed recording head at about 30 metres a second in order to make a high quality recording. When the tape is played back, the rotating head picks up the recorded signal. This is used to make up the television picture. The recording can be erased when it is no longer required. The tape can then be used for another recording.



**PORTABLE VIDEO-TAPE MACHINE**

*This looks very much like an ordinary tape-recorder, except that it uses wider tape and records both sound and vision.*

*A hand-held video camera, like the one in the picture, is used with the portable video-tape machine. The tape is coated with iron oxide, which is magnetized, according to the strength of the signal. When it is played back, the recorder picks up the varying magnetism on the tape, turns it into an electric signal, which is passed to a television tube, (the receiver). This reproduces the original programme exactly.*



*For immediate playback of a scene a recording is usually made on a special magnetic video disc – similar to a gramophone record. On the screen above viewers can take a second look at a chick cracking open its egg while watching the same chick taking notice of its new world.*



## Televising a Play

Dramatic presentations on television can be films, they can be live plays, or video-taped beforehand. This last way is by far the most common, since there is little point in doing a play 'live'. Television films, of course, are more related to the cinema. A true television play is part and parcel of television, and is usually produced in the studio. A play starts with an idea. It may be specially written, or it may be adapted from a book or stage play. In any case, the first thing that must be done is to write a script.

Once the script is done, a conference is held to decide how the play is to be produced. Some rewriting will need to be done. There will be an editor, a producer, and a director. Perhaps there will be a casting director, too, who will be responsible for choosing and finding the right actors to play the parts. While this is going on, a designer will be working on ideas for the sets. He will make sketches and models, while the wardrobe department will be working on the costumes required. Once all these different departments have got to work, the actors will be called in, and rehearsals will start.

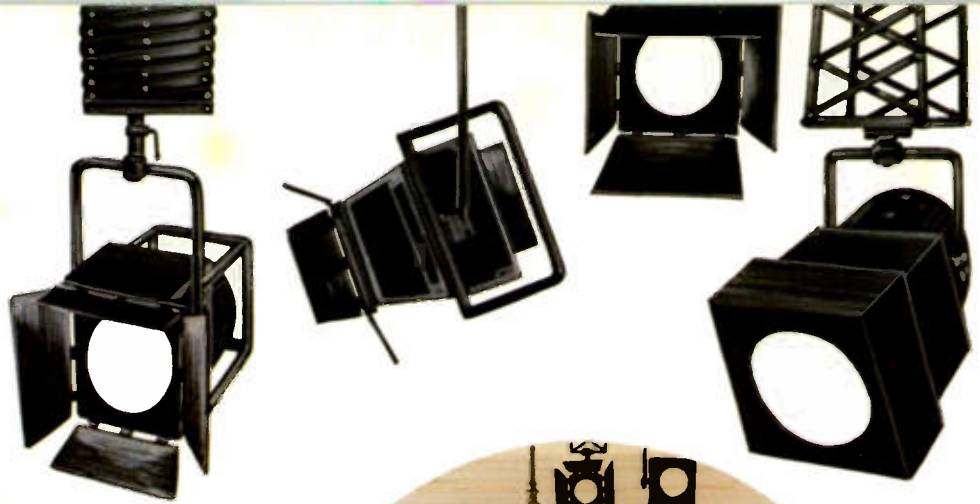




*In this scene from a play, three cameras are being used. Each will 'see' a different view of the scene. The director, in the control room, will be able to choose which of the three shots he wishes. The floor manager, standing in front, has a monitor screen, which shows which shot is being televised.*

*In this 'period-piece' play, every detail must be carefully watched and checked – for instance, the furniture and costumes must be of the right period. The director in the control room can speak directly to the crew in the studio through their headsets.*

# How a Show is Produced



**SCRIPT CONFERENCE**  
*The writer, the editor and the producer meet to discuss the play.*



**BUILDING THE SET**  
*From the designer's plans, the carpenters and painters set to work.*

**FINAL PRODUCTION**  
*After much preparation, the play is performed before the cameras.*



**CASTING**  
*The director and the casting director choose actors for the parts.*



**WARDROBE**  
*The studio wardrobe supplies costumes or has them made to fit.*



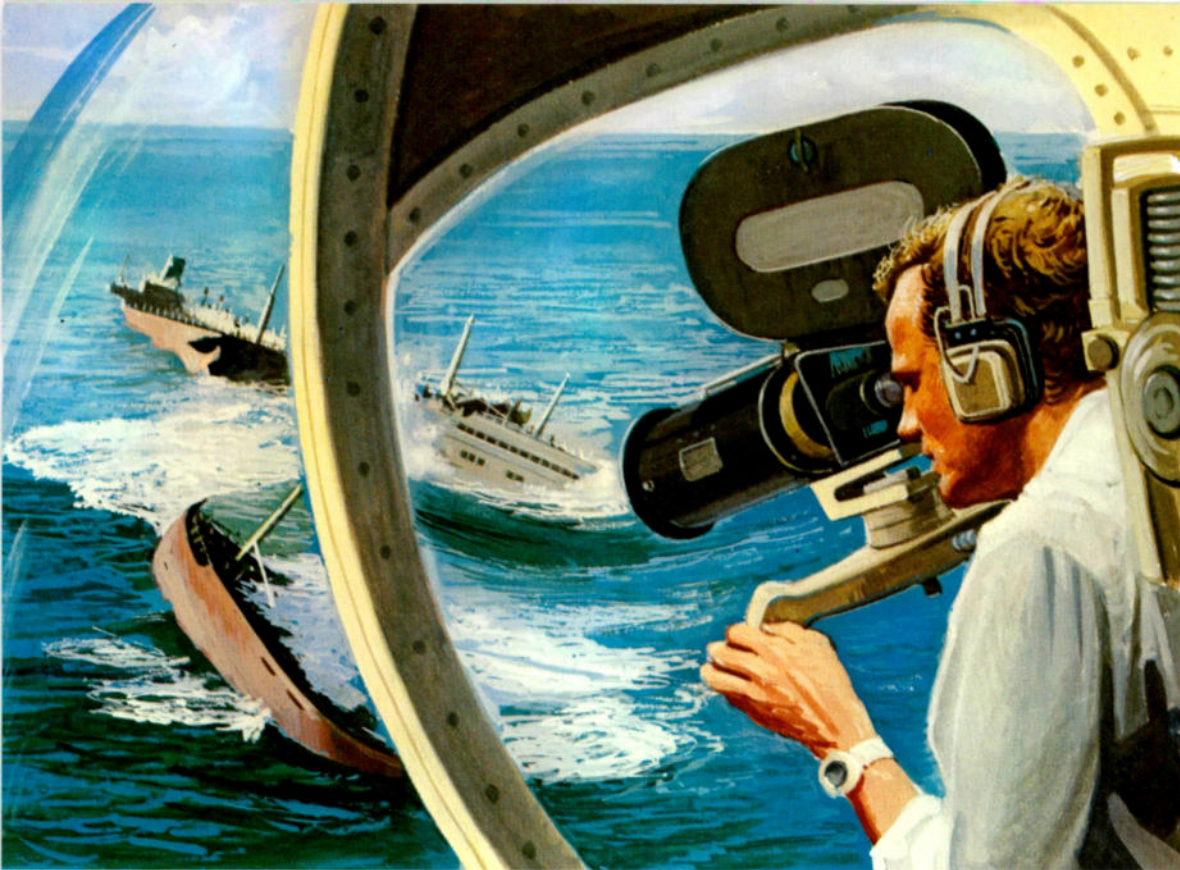
Although most of the action in a television play is staged in the studio, outdoor scenes have to be done on location, perhaps using film. Location scenes are expensive, so all the outdoor work is done at the same time. Later, these scenes will be edited into the main play in the correct sequence. When all the studio work has been finished, the director runs the whole play through to see that the video-taping has been done correctly. At this stage he may decide to edit out, or change some scenes. The same kind of care is taken with all television productions, whether they are plays, comedy shows, light entertainment, or documentaries. Commercials are produced outside the studios, but the same standards are employed. Complicated sets are not absolutely necessary, for it is possible to obtain many effects quite simply.

### CHILDREN'S TELEVISION

Most countries now produce special television programmes for children. In fact, some of the most popular programmes of all have been made for children, but adults have shown equal interest! Television is particularly suitable for puppet shows or cartoons, but some of the best drama has first been shown on children's television. Apart from purely entertainment programmes, television has been used widely for educational purposes.

*A dusty street flanked by a few wooden buildings. Down the street, gun slung at the waist, stalks a tall man. Approaching him is another figure, dark, evil-eyed, disdainful. Guns roar; a body hits the ground, blood seeping from a wound. The director shouts 'cut'. Another location scene for a television Western film is in the can. The gun-fire, of course, is not real. It is produced by blanks. The 'blood', too, can be fired from the gun, or a bag of blood hidden under the victim's clothes can be burst open as he clasps his 'wound'.*





Reporting teams use any possible means to get their story and pictures. The crew on the left is shooting a scene with a 16 mm film camera from a helicopter flying over the sea where an oil tanker has been involved in a collision.

Right: A typical scene in a television news studio. The newscasters sit at their desk with their scripts in front of them. Beyond is the battery of cameras and other equipment. Special cameras are used so that the newscasters' heads can be shown superimposed on the picture itself. A news sequence might contain sections of film, video-tape, captions or still photographs.

## 'Here is the News'

All television transmissions are the result of team effort, none more so than television news. The faces we see most on the television news programmes are the newscasters, who very often, have a background of newspaper-reporting. They need to be confident, friendly and fluent readers. Backing them up in the studio is a team of professional newsmen and women, much as one would find on a newspaper.

Outside the studio, are the television reporters, who cover the world to supply an up-to-the minute service to the news broadcasts. A reporting team needs at least one cameraman, a sound recordist and a lighting engineer, apart from the reporter. Film is normally used; and once the spools have been exposed, the cans are rushed back to the studio by a dispatch rider, to be processed immediately. Overseas assignments mean getting the film to some convenient place where, once processed, it can be transmitted via satellite to the home studio. Television

news studios have staff men stationed all over the country, and at important places abroad, and it is these men who help the editor decide what events shall be covered during a day. Other news comes in from agencies and freelance newsmen, and there is constant interchange of information between the television news services of the various countries across the world.

Every day, as on a newspaper, television news services hold a morning conference, which is attended by the news editor, the foreign editor, the chief sub-editor and other executives, under the leadership of the editor. Decisions are made, the conference breaks up, and camera teams and reporting crews are sent out on their assignments.

Later on, when the news bulletin goes on the air, the director works out how the various items shall appear. A newsreader reads out a section, the director cuts to a piece of film or a live report from an outside broadcast.

Each of the newscasters has his own small monitor in front of him, so that he can see which picture is being transmitted. In the scene on the right, camera one has a red light, which shows that it is transmitting, while the newscaster has his own personal red light just below his monitor. A digital clock helps him time his reading accurately. The scripts are read partly from an autocue, which means that the newscaster can look at the camera as he speaks. We can see the girl operator on the right, rolling the script through the autocue machine by hand. This is picked up by the autocue camera placed above it, and the signal is carried by cable to the front of the cameras, where the script is reflected into a mirror.



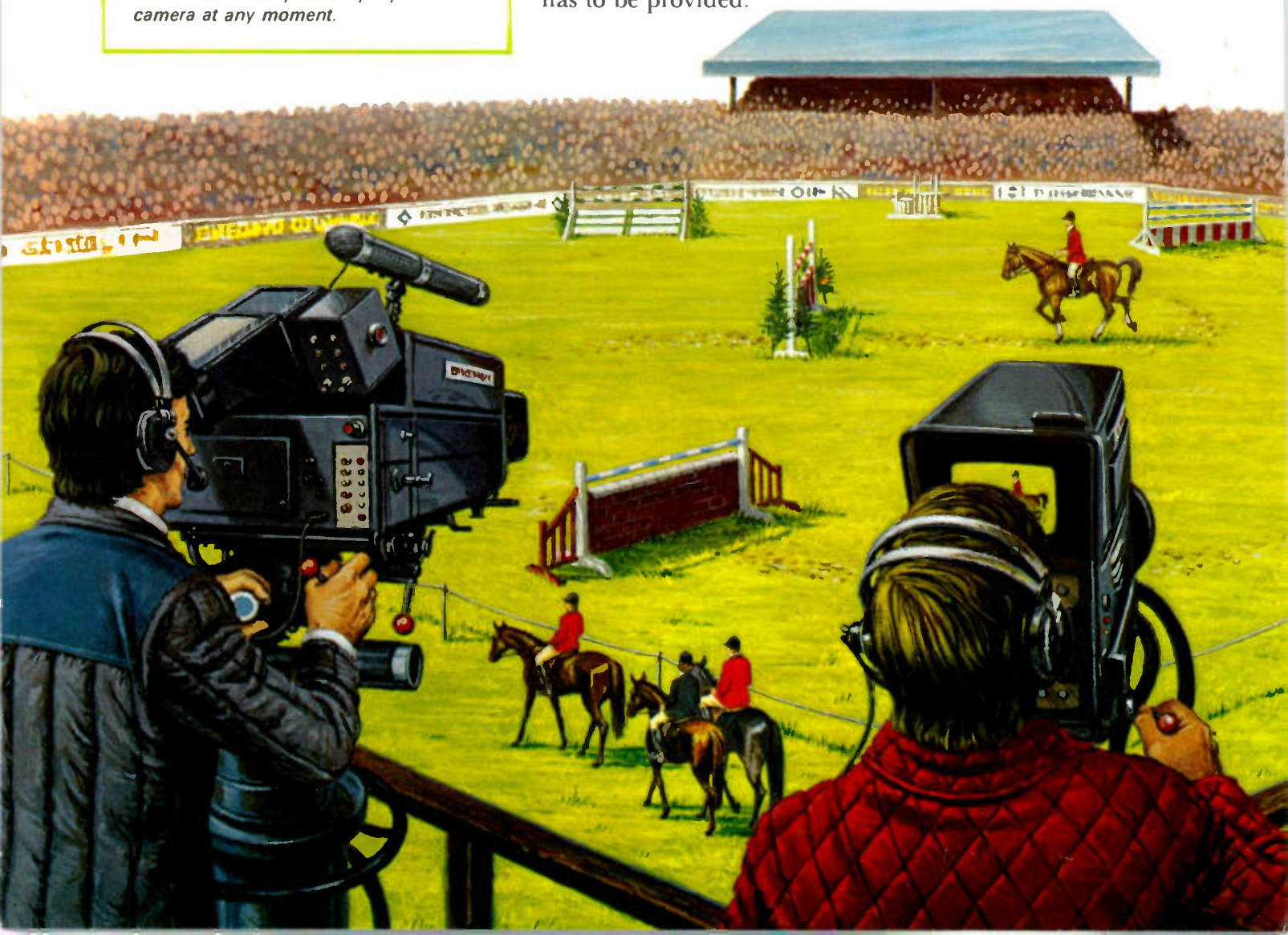
# Travelling Studio



*An outside broadcast commentator usually has a specially equipped position, such as a 'box' at a football match, placed in a good vantage point in the stand. Here, he will have his own monitor screens, so that he can watch the scene as it is picked up by each camera at any moment.*

Although most of the programmes seen on television are produced, or are televised from the studio, there are many important events or spectacles which can only be broadcast by sending teams out of the studio, to work on the spot. Sporting events are the most usual, but such occasions of world wide interest as the Silver Jubilee of Queen Elizabeth II in 1977 can obviously only be shot on the spot. It can, of course, be filmed, but this is not normally the function of a TV team which specializes in outside broadcasts. Special mobile cameras and mobile studios are used, and programmes are transmitted back to the main studio by cables, or by microwave radio links.

The mobile studio is housed in a specially equipped van, which is truly a miniature studio and control room. It is from this centre that the various cameras and sound units on the outside broadcast scene are controlled. The producer, sound engineers and vision controllers work inside the van very much as they would do back in the studio, but on a smaller scale, of course. Not all outside broadcasts are televised in the open air. It may be necessary to work inside a building, such as a church or a theatre; in which case special studio lighting has to be provided.





*Above is the large van housing the control centre. Such vans are referred to as 'scanners', and this one is shown cut-away to reveal the operations centre inside.*



*Outside broadcast units carry their own captioning machines (above), so that the scores can be superimposed on the picture.*



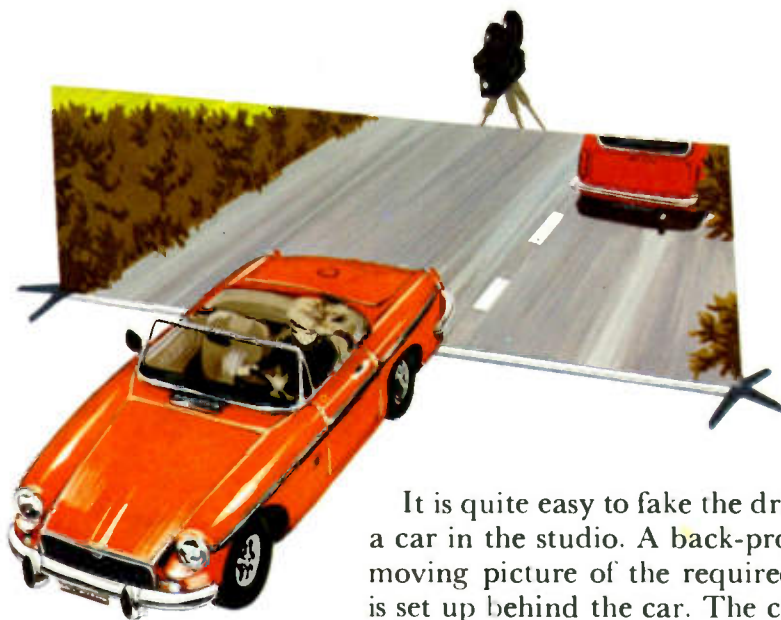
*Left: A typical outside broadcast – a show-jumping event. Three cameras are trained on the arena, each able to transmit a picture from a different viewpoint. A zoom lens can be used to bring a distant scene into close-up, without the necessity for changing lenses or refocusing. The cameras are linked by cable to the commentator, who has monitor screens, a prompt book for following the events, and a hand microphone. He is also connected to the mobile control centre, from which the producer can speak to him, over the earphones.*



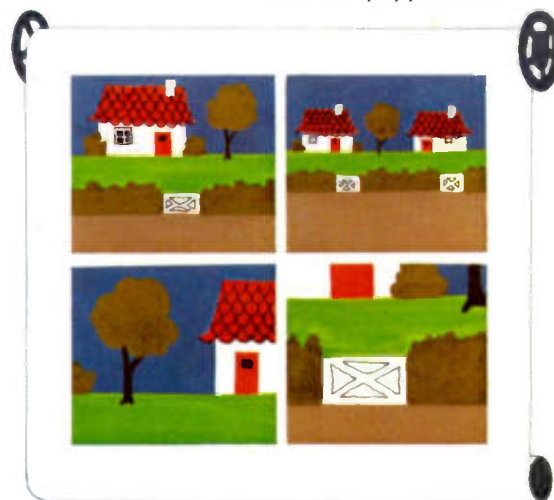
*Below: The same scene may be drawn from different distances and angles, and used as a background in a series such as a puppet show.*

## Special Effects and Props

Have you ever wondered why, when a television actor falls through a window, he doesn't cut himself? It's because the 'glass' isn't real glass, but a plastic called C-2. Flames are produced by a special chemical; while 'blood' is a mixture of glycerine and colour produced by the make-up department. Those heavy-looking brick walls which collapse are usually made of painted plastic foam, while chairs smashed in television fights are really made of light balsa-wood.



It is quite easy to fake the driving of a car in the studio. A back-projection moving picture of the required scene is set up behind the car. The car itself is placed on a movable platform so that the vehicle can be rocked slightly.



The driver moves the steering wheel, a wind is added by means of a fan, and the whole scene is filmed or video-taped. The result is what appears to be a car driving along a country road.

'Fog' is produced by mixing a chemical with water and heating it, or by heating solid frozen carbon dioxide. 'Snow' is light flakes of plastic, or even soap flakes, blown through a wind machine – something like a giant electric fan.





Opposite page (top):  
A city blazes. Not a real one, of course, but a life-like miniature made by the studio's model-makers. The simple raw materials they use include cardboard, cotton wool, putty and paint. Just in case the fire gets out of control there is a one-man fire brigade at the ready with an extinguisher.

### THE 'PROPS' PEOPLE

Properties or 'props' are all the hundreds of items needed on the set of a television show, ranging from a cigarette lighter to a double-decker bus. It is the job of the property department – the 'props' people – to find and supply such things. If it is a period play, the plot may need an old newspaper – or an unusual animal; maybe a camel or an armadillo. Telephones, toys, cars or cameras; these are all 'props'.



Scenery is made from 'flats' for backgrounds, box-shapes for platforms and stairs, together with cylinders and other geometrical shapes. These, with sculptured pieces, are painted.

## 10                      26                      40



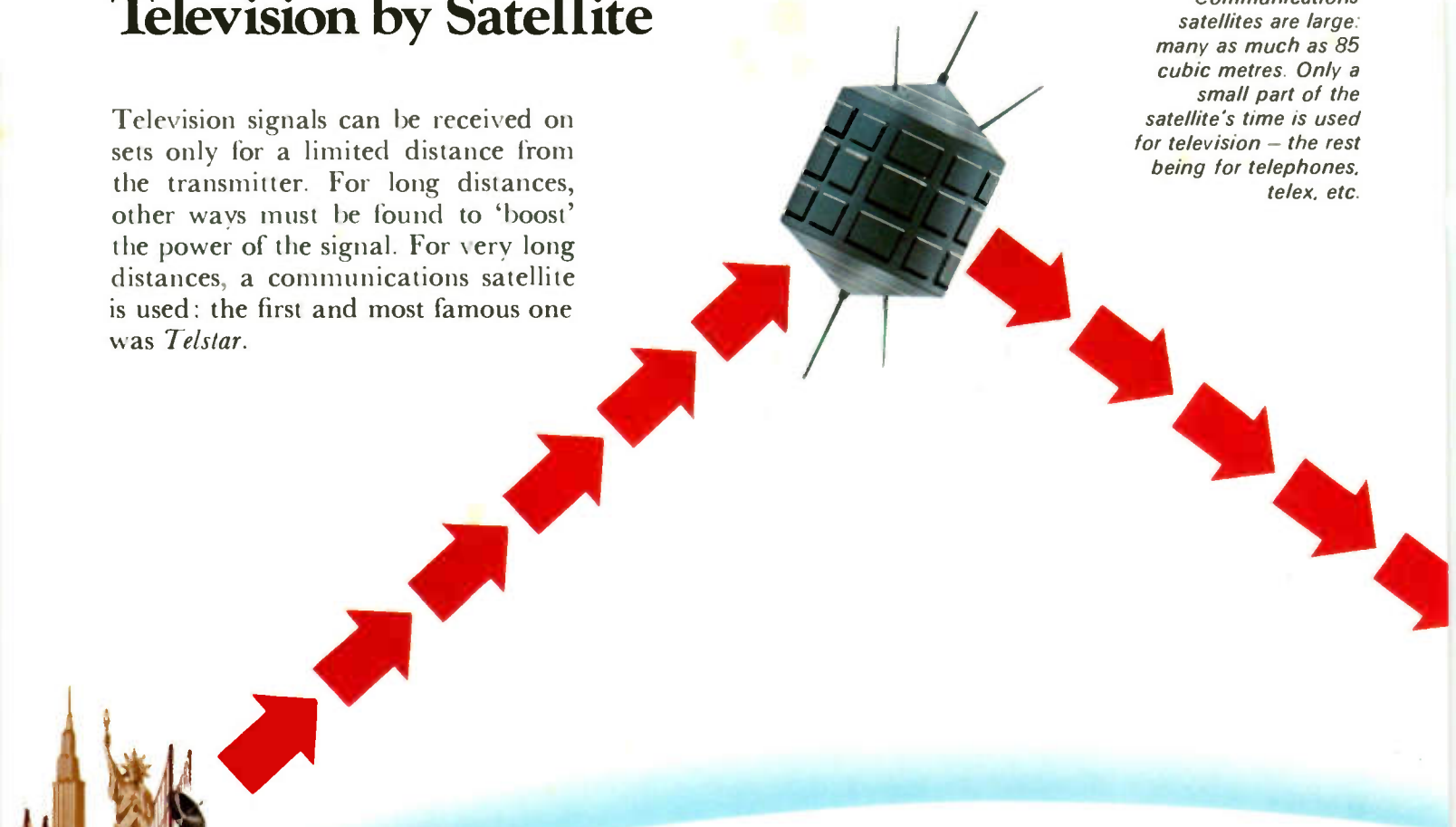
Title captions are done in a number of ways. One caption machine has long wooden blocks which can be rotated, another is simply a rotating drum, and another is a wide moving belt. For quick captions, a special typewriter is used, with the words coming up electrically, and superimposed on the screen.

Various types of lamps are used to light the scene. Spotlights are for lighting small areas, floods for big ones. 'Barn-door' lights have flaps which can be adjusted. The lamps are up to 10 kilowatts in power, and are suspended from above, either from cables or rods. The amount of power used for big scenes is tremendous, and we can imagine the heat when as many as a thousand lights are all in use.

# Television by Satellite

Television signals can be received on sets only for a limited distance from the transmitter. For long distances, other ways must be found to 'boost' the power of the signal. For very long distances, a communications satellite is used: the first and most famous one was *Telstar*.

*Communications satellites are large: many as much as 85 cubic metres. Only a small part of the satellite's time is used for television – the rest being for telephones, telex, etc.*



A whole range of very large communications satellites now orbit the earth, which make it possible for television pictures to be sent and received from many parts of the earth. Satellites take their power from the sun, storing the power in batteries aboard. If a programme is to be sent from, say, the U.S.A. to Europe, the signals are 'beamed up' to the satellite, which in turn, transmits the signals back to earth at an angle which hits the receiving station in Europe. The signals received do not have much power, so a large, dish-shaped aerial is necessary at the receiving end. From here, the signals are sent out to the television studio.



# The Story of Television



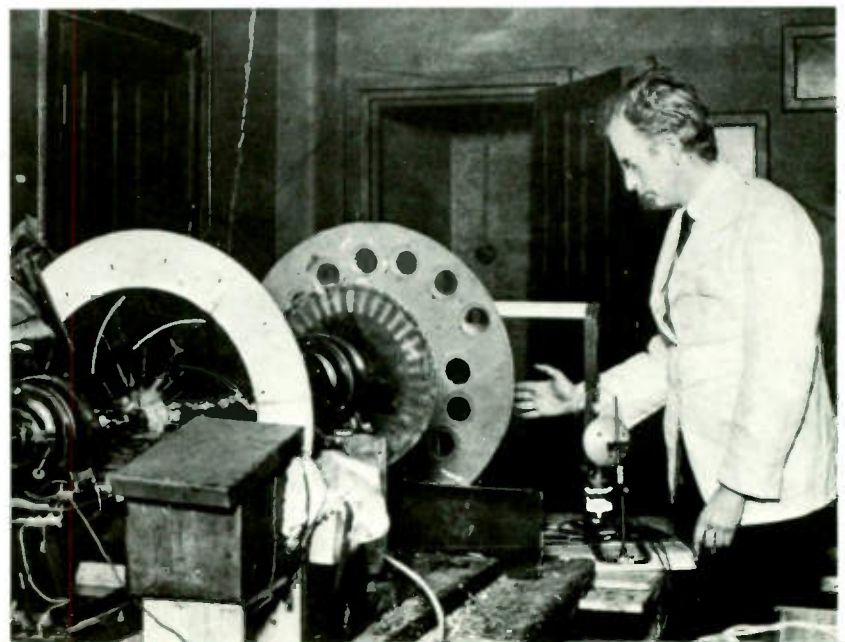
One of the problems of sending a television programme by satellite is that different TV systems are used in the various countries. Most European countries use the 625-line standard, but North America and Japan use 525 lines. Apart from this, the 625 standard transmits 25 pictures per second, while the 525 system sends 30. This means that, before the pictures can be screened, the picture must be converted from one line-standard to the other electronically.

Who invented television? As with so many other modern discoveries, television is the result of the work of a number of people. Perhaps the first step was the 'writing telegraph' invented by Bakewell in the middle of the 19th century. The beginning of the photo-electric cell came with the work of Louis May and Willoughby Smith in 1873, and the discovery of the cathode-ray tube by Sir William Crookes in 1878. A year earlier, the French inventor Senlecq produced his 'Telectroscope', which 'drew' a picture electrically on to a glass screen. A nearer approach to television was the 'electric vision' system invented in 1880 by the Englishmen Ayrton and Perry. This converted a picture, by means of photo-electric cells, into electricity. One very important step was the mechanical scanning disc invented in 1884 by the Polish scientist, Paul Nipkow. Such a disc was used by John Logie Baird, the British inventor, when he made his first experimental transmission in 1926. His system was taken up by the BBC, and was used by them in the first regular television programme in the world in 1932. The BBC later adopted an electronic scanning system invented by Vladimir Zworykin in the United States.



*Above: The first transatlantic television. Mrs Howe, in London, was seen on a TV screen in New York.*

*Below: John Logie Baird with an early transmitting system based on the Nipkow Disc. The disc is punched with a spiral of holes and is scanned by a light which shines through the revolving holes of the disc. The apparatus is made of an amazing jumble of cardboard, string and second-hand bits and pieces, but it worked, and was to become the first successful television transmitter.*



## GLOSSARY OF TERMS

**AERIAL** a metal rod or wire used for picking up a radio signal

**AMPLIFIER** an apparatus for strengthening an electric signal

**AUDIO** used to describe sound in connection with electronic apparatus

**CAMERA TUBE** found in a television camera, and on which the visual image forms

**CATHODE RAY TUBE** a kind of valve used in a television set on the end of which the picture appears

**CHANNEL** a band of radio frequencies

**ELECTRON** a very small particle in the atom, charged negatively

**ELECTRON GUN** the part of a cathode-ray tube which fires a stream of electrons

**FREQUENCY** The number of radio waves per second

**IMAGE ORTHICON TUBE** television camera tube which converts an optical image into a varying electric current

**MAGNETIC TAPE** a length of tape, made of plastic, and coated with particles. When magnetized, these make a record of the signal sent, and the tape reproduces the signal when played back

**MONITOR** picture tube used for checking the vision signal

**PHOTO-ELECTRIC CELL** device that converts light into electrical impulses



*The greatest feat ever performed by television satellite was when the American space team Armstrong and Aldrin walked on the moon, and the event was televised worldwide.*

**PHOSPHOR** used to coat the inside of a television tube

**RADIO WAVE** radiated waves of electromagnetic energy

**SCANNING** movement of a light beam or beam of electrons across a picture in a series of lines

**SHADOW SCREEN** perforated metal plate used for aligning the colour electron beams in a cathode-ray tube

**TELECINE** machine for showing cinema films on television

**VIDEO-TAPE RECORDER** machine for recording television pictures on magnetic tape

**WAVELENGTH** the length of one complete radio wave

**ZOOM LENS** a camera lens which can take long-shots or close-ups on the same camera

## KEY DATES

**1847** 'Facsimile transmitter' invented by Bakewell.

**1873** Photo-electric effect on selenium discovered by May.

**1877** 'Telectroscope' invented by Senlec.

**1884** Rotating disc scanner invented by Nipkow.

**1897** First cathode-ray tube invented by Karl Ferdinand Braun.

**1901** Guglielmo Marconi, inventor of wireless telegraphy, sends the letter "S" across the Atlantic.

**1907** Rotating mirror scanner invented by Boris Rosing.

**1908** A. A. Campbell-Swinton experiments with cathode-ray tubes as television receivers.

**1923** John Logie Baird's first television experiments.

**1923** 'Iconoscope' television camera tube invented by Zworykin.

**1929** First all-electric television produced in U.S.A.

**1930** First simultaneous sound-and-vision transmission by BBC.

**1930** Radio Corporation of America make experimental transmissions.

**1932** BBC begin regular transmissions.

**1932** Germany begins television transmissions (mechanical scanning).

**1936** All-electric television transmissions begun by BBC.

**1936** EMI introduce their 'Emiscope' electronic television tube.

**1939** Electronic television transmissions start in U.S.A.

**1940** Mechanical colour television demonstrated by Goldmark.

**1956** First all-colour television station opens in Chicago, U.S.A.

**1957** British colour television system demonstrated.

**1960** Colour television transmissions begin in Japan.

**1962** First television transmission by satellite via Telstar.

**1967** Colour television transmissions begin in Britain, France, West Germany and U.S.S.R.

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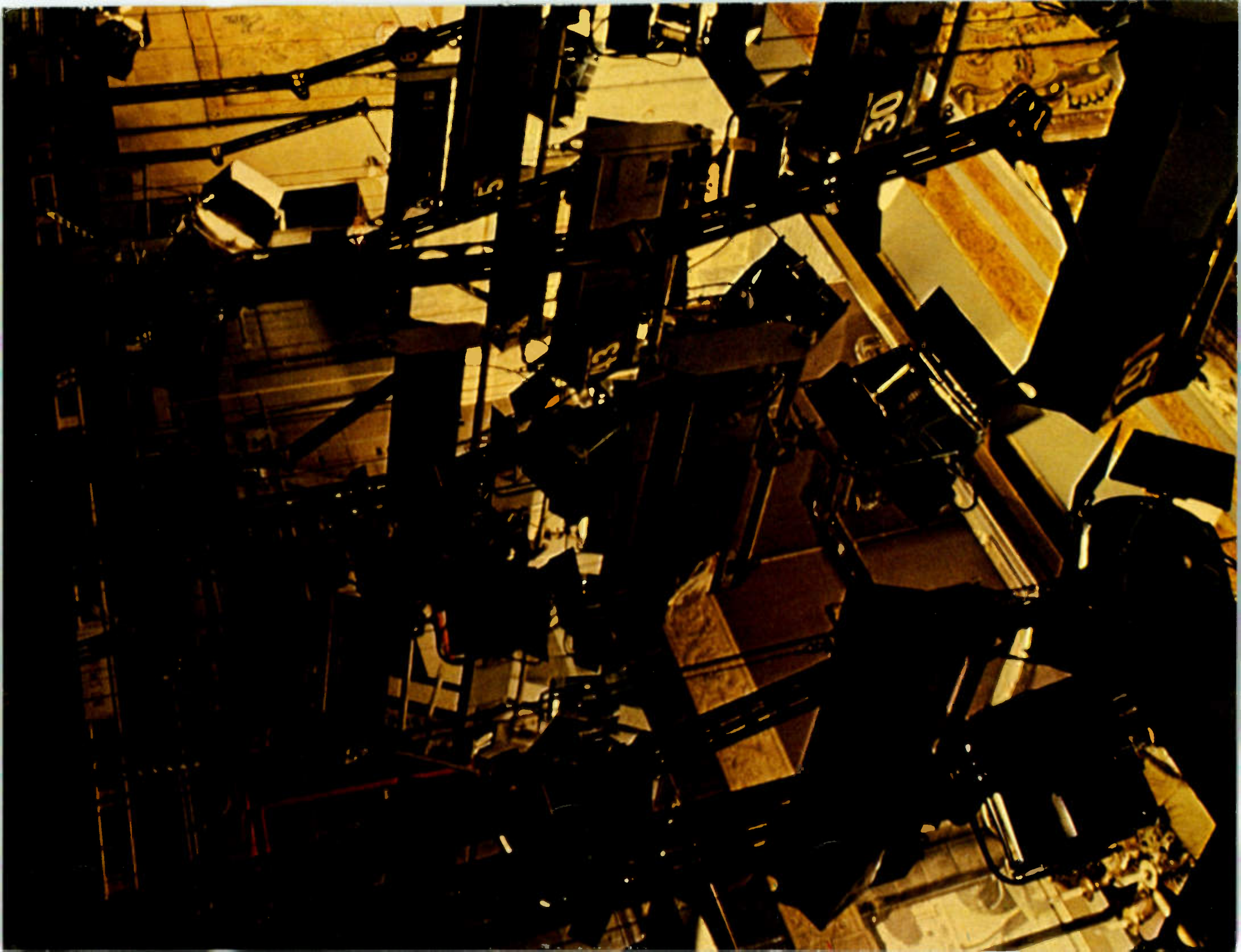
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