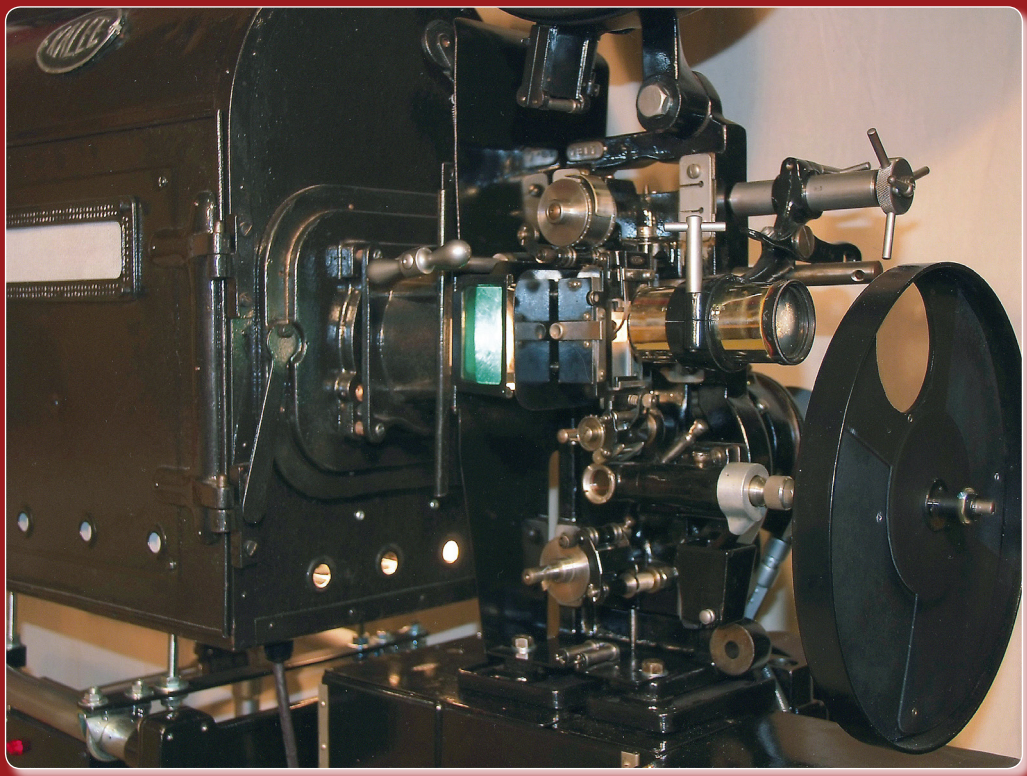
Rewind

Special edition

35mm projectors



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The Projected Picture Trust

Preserving the Magic of Cinema

Registered Educational Charity No: 288 239

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35mm projectors

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The Simplex projector

Researched by John Cannon

It is a little ironic that the first information sheet to be published by the Projected Picture Trust should be on the classic American projector, the Simplex. Patriots should be comforted however that the man most directly responsible for the quality of engineering in the Simplex was a Scot, Francis B Cannock, who had emigrated to America to work for the Singer Sewing Machine Company. Cannock's dictum on which the success of the Simplex was based, was that "the requirements of the machine fitting placed the thousandth of an inch as the limit of latitude; and on important parts ten thousandths is the requirement."

In so many ways the Simplex is an adroit choice since one of its creators was responsible for several major developments in motion pictures. This man was Edwin Stanton Porter, best known today perhaps as the creator of modern film editing with *The Life of an American Fireman* (1902) and for his immensely successful *The Great Train Robbery* (1903), which gave us the screen's first cowboy star, G M 'Brocho Billy' Anderson. The Simplex can be seen as the most productive branch of the American technology tree. Its own precursors are Cannock's Cinematograph and Edengraph, but the Century (Westar), the Motiograph AA and the Ballantyne can be recognised as remote descendants, while the Kaplan and Wenzel mechanisms were direct copies.

The Simplex projector range numbered a great many firsts in projector design among which should be included:

- Synchronous front and rear shutters
- A quickly interchangeable intermittent unit
- Removable film gate
- One-shot oiling system
- Spiral bevel gears
- Automatic fire shutter and trip mechanism
- Rotating sprocket framing device
- Shutter timing adjustment while machine running
- Shock proof gears
- Hardened and ground intermittent sprockets
- Adjustable control pressure pad springs
- Double bearing intermittent
- Slip in aperture plate.

As can easily be recognised by anyone who has ever worked on a Simplex, the basic 1909 design of the projection head changed little over the years – the formula was right. The fire trap gravity rollers; the four-picture upper feed sprocket; the sprung guide rollers immediately before the film enters the gate eliminating the side play caused by differences in width of early film; the intermittent unit, a maltese cross in an oil bath housing, easily detached complete within three minutes, without interfering with the rest of the mechanism, placed very close to the aperture leading, it was claimed, to give particularly steady projection since any shrinkage or alteration in the length of the film would have the smallest possible effect; the four picture sprocket immediately below the lens. The original hand-cranking arrangement was retained as a facility for many years to enable cold machines to be freed before turning on electric motors. All the gears of the projector head were totally enclosed, except for the later sound adaptation gear at the base of the mechanism. Unlike Gaumont Chrono, perhaps the most frequently found machine in Britain at the time, the Simplex framing adjustment did not require any re-centring of the arc, following a picture rack.

Framing was distinctively achieved on the Simplex by turning the intermittent sprocket on itself. The really unique feature on the early Simplex was that the adjustment of the front shutter to correct 'travel ghost' was possible while the machine was in motion. The aluminium shutter was adjusted by a racking movement, which also moved the intermittent sprocket so that once set correctly it was impossible for 'ghosting' to appear on the screen. Early users enthused about the heavy pedestal stand, which ensured such rock-steady projection from the quality engineering of the mechanism that by 1914 over 90% of film laboratories were using nothing but Simplex mechanisms. Simplex gears were cut from the solid and ample shafts running in the cast main frame, gave the Simplex an unequalled reputation for rugged precision.

Development on the Simplex was continuous throughout production and tooling from the original Precision Machine Company days was still very much in evidence on the last models of the Super Simplex some forty years later. The following chronology gives the significant dates and details of development of the Simplex from 1908 to the present day (1981).

Outline chronology of the Simplex projector

1896 Francis B Cannock is chief machinist and operator at Vitograph works where Mike Berkowitz is engaged as a foot power lathe operator.

1896, April 23rd. Edwin S Porter operated the Armat Vitascope at the first New York City screenings of projected motion pictures at Koster and Bial's music hall

1896, June. Cannock is chief operator at Eden Musee where he is joined by Berkowitz and the Cinematograph and Edengraph projectors are designed and built in rapid succession. These projectors were not commercially feasible because of the high manufacturing costs.

1898. The Beadnell projector developed by Edwin S Porter in partnership with William J Beadnell, the publicity director of the Eden Musee (Porter trained Nicholas Power, then an operator at the Novelty Theater, Brooklyn to operate this machine.) Manufacture of this machine ceased in 1900 after a fire at the factory.

1908. Edwin S Porter, Francis B Cannock and Mike Berkowitz meet regularly, designing the first Simplex projector in the back room of O'Keefe's saloon on 42nd Street and Vanderbilt Avenue, NYC. The first sketches being done on the back of menu cards. Edwin S Porter provided the money for a small machine shop, The Multi-Speed Shutter Company, to develop the first prototypes. The patents were in Porter's name, with a half interest assigned to Cannock. Porter enlisted the financial support of James A Stillman of the National City Bank who poured in $80,000 before the first Simplex came off the production line in 1909.

1909. Precision Machine Company, founded to manufacture the Simplex and taking over the inventions of Francis B Cannock. Porter was made president of this company. The first models of the production Simplex appeared in this year.

1910. The first year of full production of the regular Simplex.

1912, September. Kineto at 80-82 Wardour Street, London, cordially invite British exhibitors to call in and inspect 'this splendid machine.'

1913, February. Simplex mechanisms installed in the London Hippodrome; Standard Electric Theatres; Blue Hall, Hammersmith; Rink Kinema, North Finchley; Pyke's Circuit; BB Pictures, Glasgow; North British Film Bureau, Newcastle; Royal Bioscope, Liverpool; Gem Electric Theatre, Bristol; Victoria Hall, York; and Lizars, Edinburgh.

1913, 22-29 March. The Simplex was the most prominent newcomer to the British market and at the first International Kinematograph Exhibition held at Olympia, London.

1916, 11 July. The Simplex patented in New York

1919. Spring arrangement introduced to lens mount enabling it to be pushed forward for speedier threading of film in the gate.

1920. The speed control introduced allowing 40 to 140 feet minute by means of a variable disc clutch arrangement driven by a constant speed driving motor.

1925. International Projector Corporation founded merging Precision Machine Company, Nicholas Power Company and the Acme Motion Picture Projection Company, all actively being based at 90 Gold Street, New York City.

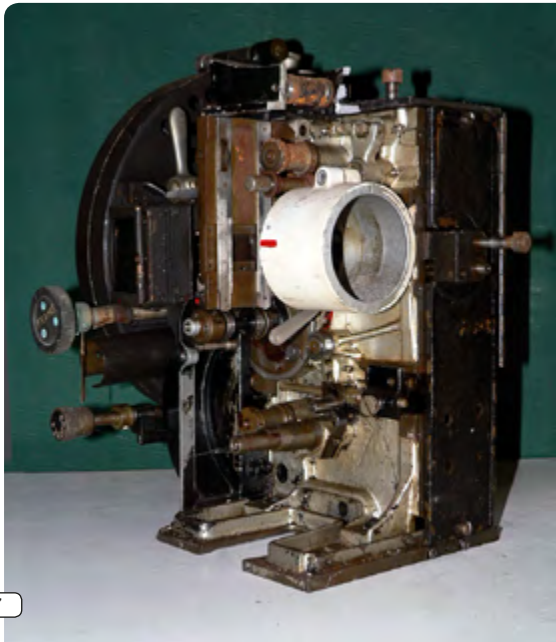
1925-26. New double-bearing intermittent assembly with rotary oil bath for the Maltese cross introduced.

1928. The Super Simplex first introduced in America with shutter removed to the rear of the projector (head), new design of pad roller arms, and threading lamp and further enclosures for the entire mechanism.

1929. The coming of sound virtually eliminates the Powers projector since RCA and Western Electric were in the beginning made for adaptation to the Simplex projector only. RCA Photophone refused to install sound equipment unless new Simplex projectors were also installed.

1930. Rear shutters available in Britain for fitting to existing mechanisms. 'The leading cinemas of the world's capitals are equipped with Simplex.'

1930-mid 31. Grandeur equipment developed by IPC for 'wide-film projection' in America. This was originally intended for 70mm presentation but was subsequently modified to SMPTE approved standard of 50mm. The mechanisms were really modified Super Simplex with a film gate slightly curved longitudinally, the convexity facing the lens. There were new design aspects to the Grandeur equipment: the mechanism ran entirely in an oil bath, both 50 and 35mm film could be shown, positive fire prevention devices and a triple lens turret rotatable with each lens having lateral, horizontal and vertical adjustment.



1932-33. The Acme-Simplex portable 35mm equipment was introduced to Britain.

1936. A new intermittent unit was introduced and an extra heavy film trap.

1937. The heavy duty Super Simplex pedestal was introduced to Britain.

1937, April. Simplex E-7 mechanisms installed for trials in Loew's Capitol Theater, New York City.

1938. Full production and introduction of the new E-7 projector in America with its unique shutter arrangement. Front and rear shutters were synchronised on the same shaft. Each shutter acting on a half beam giving a dissolving effect which it was claimed produced 12½% more light, a sharper picture and less eye strain for audiences. The E-7 brought in hunting tooth gearing and one-shot lubrication via an oil reservoir lever. In the E-7, gears revolve on shafts which are stationary and do not revolve on bushings in the main frame – the first major departure in design from the original Simplex model.

1940. Front shutters available for modifying British Simplex and Super Simplex mechanisms.

1945. September. Simplex High arc lamp in American production.

1946. January. Simplex plant moves to Broomfield, New Jersey.

1948. August. American introduction of Simplex type SP sound projector.

1949. January. The new X-L Simplex mechanisms installed for trials in Loew's State Theater, Broadway, New York City.

1952. Production of E-7 mechanism began to be wound down.

To date (1981). The X-L has undergone continuous adaptation and, called a Simplex 35, had a brief spell as a dual 70/35mm machine. In its latest form the Simplex is still being produced in Paramus, New Jersey by the Simplex Projector Company, NYC, a division of the National Theater Supply.

PPT Simplex holdings:

Our 'Grandad' Simplex machine is serial number 632 with its original Precision Machine Company plate and almost solid front door which can date it with some confidence to 1910. This machine, probably one of the very first introduced to Britain was found rusting away behind a radiator in the former Regal cinema, St. Agnes, Cornwall.

Examples of Simplex restored by Ted Butler of Witham:

31439 – A regular mechanism retaining its front shutter and single rear framing handle. Probably one of the last Precision Machine Company examples but sadly not retaining its single bearing intermittent. Owned by John Cannon and on loan to the PPT.

43001 – A Regular rear-shutter mechanism built by the International Projector Corporation. Owned by John Cannon and on loan to the PPT.

A late model Super Simplex mounted on an Audio Research Corporation Sound. Fully restored by Ted Butler and accompanied by a Peerless Magnarc.

Other holdings:

Some twenty Regular (IPC) mechanisms in various states of repair, two of which came from Sir Winston Churchill's residence at Chartwell via the Electric, Portobello Road, London. A wide range of spares, some in original packing!

One Regular Simplex complete with front and rear shutters.

The PPT has several RCA Photophone sound heads and five-point pedestals and some WE Universal bases.

Simplex information holdings:

The PPT has (archive) copies of parts lists; instruction manuals; sales leaflets and publicity material relating to Simplex and Super Simplex mechanisms.

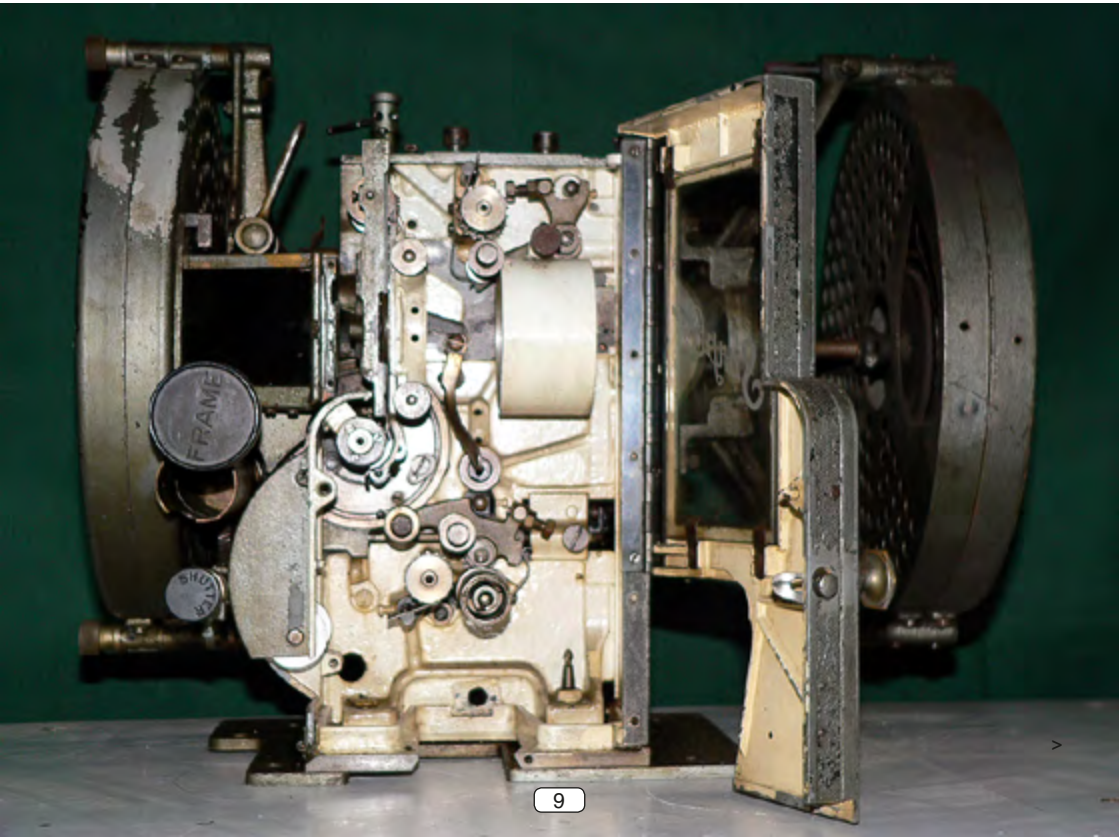
Simplex boxes of today (1981):

It was reckoned that by 1981, a dozen or so boxes were still operating on Simplex equipment, not to mention the greater part of the London preview theatres.

The finest remaining example of an original Simplex box, at that time, was without doubt the State Grays, Essex UK. This had two E-7s and a Super Simplex on the front wall, beside Stelmars and a Brenograph.

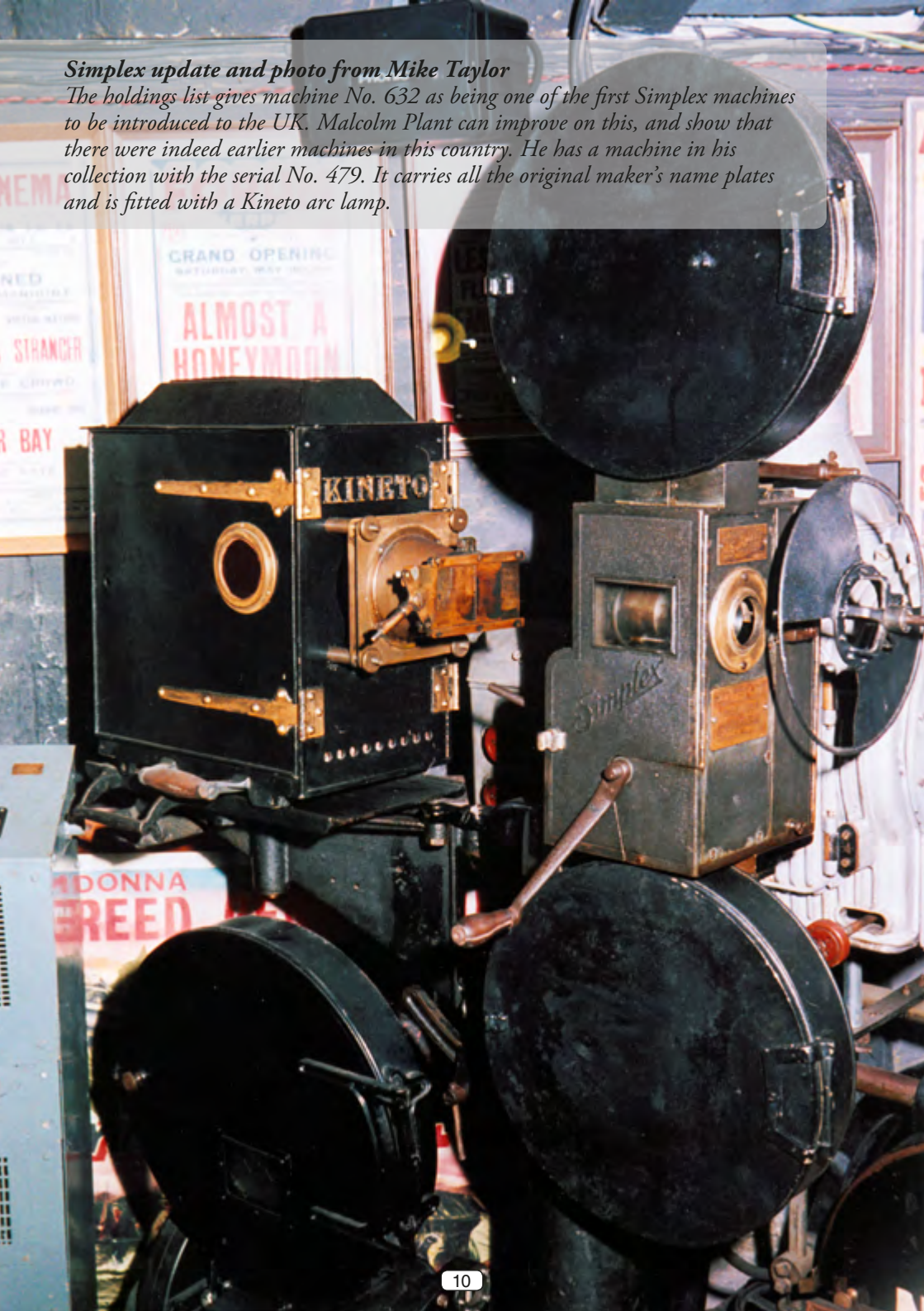
We are entirely indebted to a founder PPT member, John Cannon for allowing us to reproduce this information sheet, transcribed from the original 1981 copy. Any references to persons or equipment held by the trust refer to that time.

The three colour pictures are of Simplex machines held by the PPT.



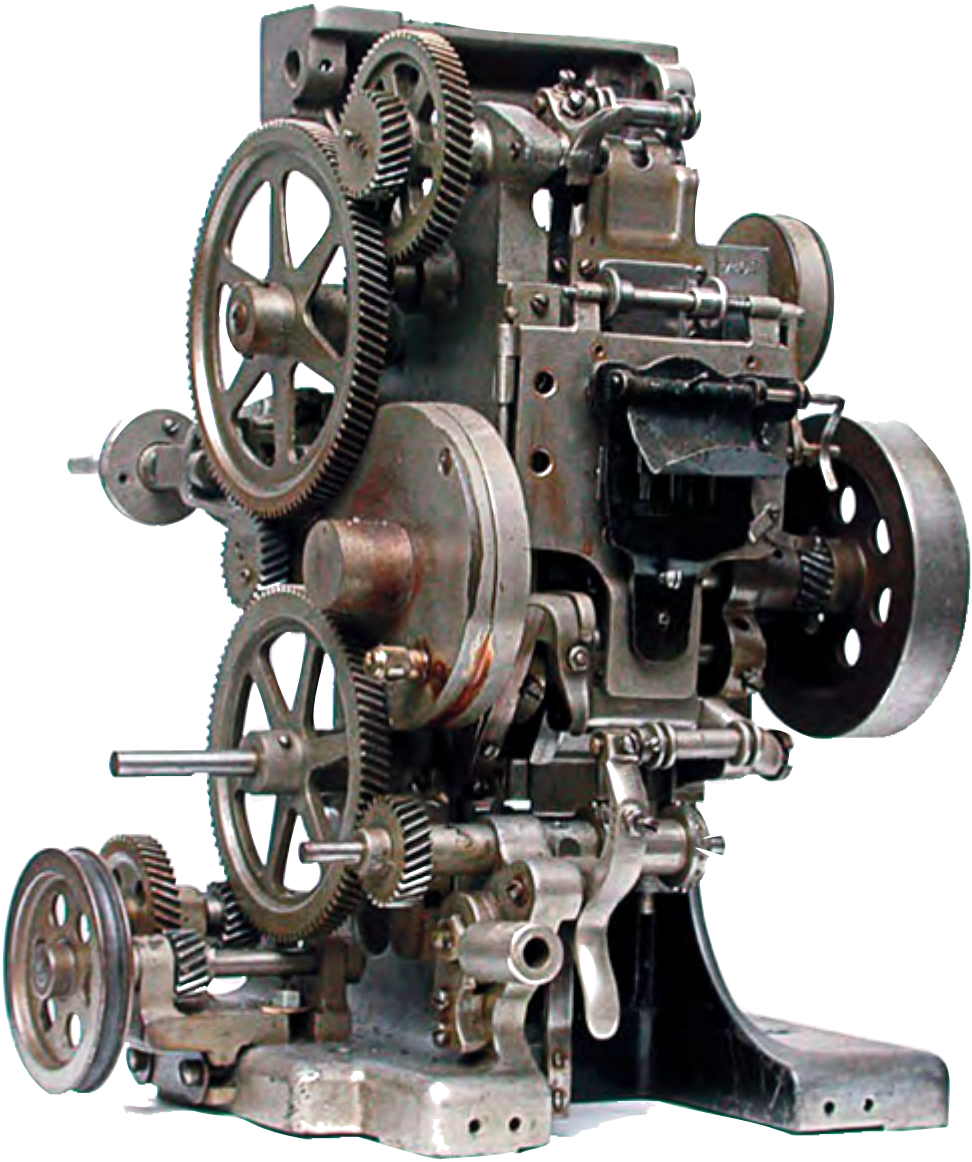
Simplex update and photo from Mike Taylor

The holdings list gives machine No. 632 as being one of the first Simplex machines to be introduced to the UK. Malcolm Plant can improve on this, and show that there were indeed earlier machines in this country. He has a machine in his collection with the serial No. 479. It carries all the original maker's name plates and is fitted with a Kineto arc lamp.



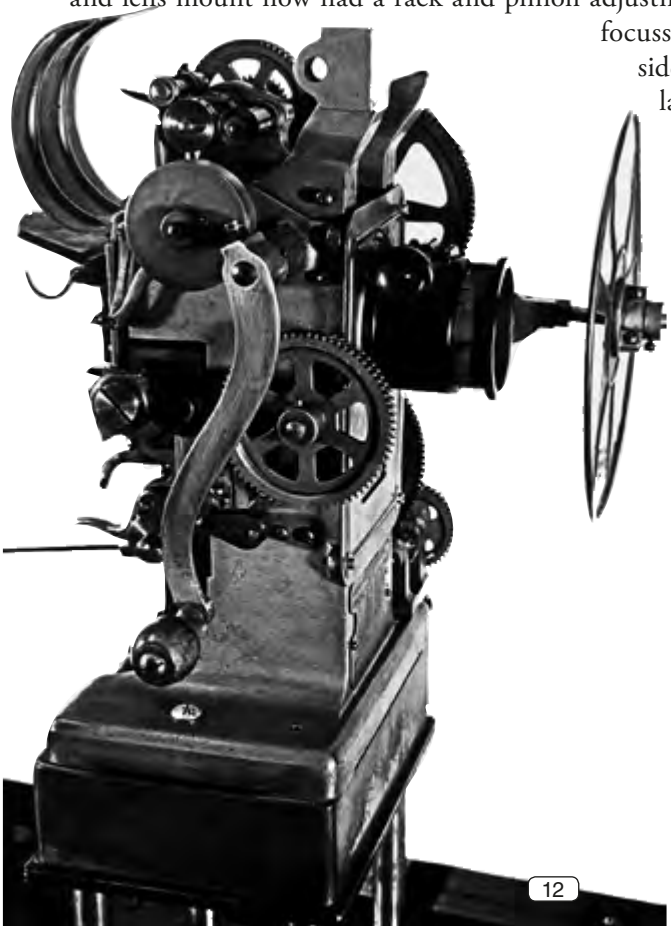
The Power's projector

Researched by John Cannon



Nicholas Power had the ability of a great engineer and inventor coupled with a very acute and far-sighted business sense. From the beginning, Nicholas Power built up a strong patent wall around his developments; between 1904 and 1922 he obtained 57 patents covering the design and construction of all his important innovations and improvements. He had a great flair for business and quickly introduced model after model – strikingly so when compared with the classic line of the Regular Simplex. His greatest achievement, the pin-cross movement, stands as a marvel of engineering ingenuity to this day with its highly desirable 5:1 pull-down ratio. It took the old rival Simplex until late 1957 to introduce such a ratio with its high speed Maltese cross movement available as an option for its X-L model.

The production range of the Power's projectors was No. 4 (c1904) the No. 5 (1905/7) – both standard Geneva/Maltese cross projectors – the No. 6 (1909), the No. 6A (1911), the No. 6B (1920) and the No. 6B improved of 1925, which like the No. 6A was a refined version of the previous model. In this case the new front plate and lens mount now had a rack and pinion adjustment with double knobs so that focussing could be done from either side of the machine; a framing lamp was mounted inside the mechanism and a two-sided ruby glass eye shield introduced.



The Power's pin-cross intermittent mechanism, patented 24 February 1914

Two parts are used, similar in relation to the pin-wheel and star of the Maltese cross, only reversing the roles since it is the part with the pin that is the intermittent. The driving element in the Power's motion is a revolving cam, virtually diamond shaped, upon the face of a heavy steel disc which carries a cam-ring as of a pin-wheel of a Maltese cross. The driven element is a cross on the end of the intermittent shaft. Cut from a single block

of steel in manufacture, a pin is integral with each arm of the cross. The parts of the intermittent are enclosed in an oil-tight casing with oil-feed cap and, when properly filled with oil, the drive is practically noiseless.

The four pins fit snugly over the cam-ring which holds the cross motionless for the 'at rest' period of the intermittent. The cam-ring however revolves at a constant speed, making one revolution for each pull-down of the pin-cross and attached sprocket shaft. The diamond shaped interruption of the cam-ring holds the 'secret' of the intermittent action. This diamond is of such a shape that it gives the pin-cross a 90 degree twist as it passes by. The moment the twist is accomplished, the perfectly circular part of the ring again engages the four pins, holding the cross and sprocket shaft perfectly stationary until the diamond comes around again to give another quarter turn to the pin-cross.

Power only had two or three master machinists who could satisfactorily turn out these tricky pieces of engineering. Any variation from exact of one ten-thousandth of an inch would lead to the pin-cross or driven element being discarded at the factory, since the smallest error in spacing would cause a six cycle disturbance about which the operator could do nothing.

The Power's projector

To modern eyes it is easily recognisable by the square spool boxes to make reel changing easier – not to mention manufacture. The machine is an open mechanism finished in bright nickel. All external main frame parts have this finish and are marked with N.P.Co. or N. Power Co. or even on the sprockets post 1925 a la Simplex with Power's in script form and I.P. Corporation. The mechanism serial number (very often with examples found different from the brass maker's plate) is to be found at the top of the main frame behind the lens mount plate. The intermittent, upper and lower feed sprocket are all four picture in American tradition. The antiquated and unsatisfactory gate of only three frames of film in length, which needed powerful pad tension, especially on new prints made the Power's prone to fits of violent picture jump as pad tension could only be increased so far. The front shutter was available with two or three blades; the latter for increased freedom from flicker at very high light levels. The quietness of the projector never fails to astonish operators meeting it for the first time, even when bearing in mind that open mechanisms are usually quieter than enclosed mechanisms where housing can actually act as a resonator.

Indubitably primitive by today's standard, with dust-catching open head, the toggle drive gearing of the intermittent (on the No. 5), the short film gate, the hinged gate door and the inability (at first) to accept short focus lenses, the Power's nevertheless worked well and was easy to service and repair, fully justifying the makers' slogan that 'Better Projection Pays.'

The automatic loop-setter, another unique Power's invention, deserves mention, even though it was in practice often removed in later years. It was designed to eliminate the loss of the lower loop caused by bad joins, torn film, excessive take-up tension or

other imperfection. Its construction is simple: it is directly connected with the take up by means of an automatic clutch arrangement. Passing the film under an extra roller primes the mechanism. When the lower loop is lessened or lost the roller is elevated so at to disengage the clutch on the lower feed sprocket from the take-up, allowing the lower feed sprocket to 'rest' during one revolution of the intermittent sprocket. The lower loop is thus re-formed, and automatically the lower feed sprocket is re-engaged with the take-up. The lower loop could in this way be re-set as often as 15 or 20 times within a minute where ordinary defects in the film would in any one instance have ripped it.

The Power's safety devices were similarly important inventions; the automatic fire shutter operated by a centrifugal clutch and the fire proof spool-boxes with patented take-up device available for either twelve of fourteen inch feels.

The cost in dollars to the American buyer of the Power's No. 6 in 1915 was as follows:

- Mechanism (without lens) $132.50
- Lamp-house $26.00
- 'Perfect' Arc $15.00
- Stand $14.50
- Top spool-box $10.00
- Bottom spool-box – with take-up $17.50

Chronology of the Power's projector

1898. Nicholas Power of the Novelty Theatre in Brooklyn is trained by Edwin S Porter to operate the Beadnell projector.

1902. Nicholas Power built his first projector, the Peerlescope, in a little shop in Nassau Street, New York City. This projector was equipped with a gas light-source and was belt-driven directly from the rim of the crank wheel. The film, upon passing through the projector, dropped into a cloth bag, which was soon replaced by a sheet metal box. As much as 3000 feet of film was run into this box in a loose heap, with the ends of each reel left hanging out of the opening to be retrieved later for rewinding.

1902-7. Contemporary machines were Edison Kinetoscope, the Lubin, the Dressler, the Vitascope (built by Thomas Armat and reputedly the first loop-forming mechanism), and the Motioscope, produced by Roebuck and later known as the Motiograph. Several other 'graphs and 'scopes were marketed during this time, among which was the Standard projector.

1904. Nicholas Power was the first to invent a satisfactory device for centring the picture in the aperture while the projector was running (eliminating the need to shut down and show the all to frequent slide :- One minute please, to frame the picture!

1906. Power obtained patents on a take-up device, or method of rolling the film into a lower reel without tearing the film during the operation, and the basic patent covering upper and lower spool-boxes having fire prevention valves.

1907. Three foregoing patents were the basis of the success of Power. The Nicholas Power Company is formed. The tree patents, along with many others, apply to the Power's No. 4 and 5 projectors. With the exception of the Standard and the Motiograph mechanisms, the apparatus of the time is extremely crude and suitable only for the 'store-front' shows and Power rapidly eliminated the other manufacturers.

1909. A very significant year for the Nicholas Power Company and a major development in projector construction and design: the Power's No. 6 Cameragraph is introduced embodying the fundamentally new intermittent movement.

1927. The earlier Power's No. 6 mechanism is being sold at £8 50/- in the United Kingdom, being soley distributed by Power's Distributing Corporation, Polebrook House, Golden Square, London.

1928. The Power's and the Simplex are both distributed by J Frank Brockliss, Poland Street, London. The Power's No. 6B is installed in the Carlton, Haymarket and the Paramount, Paris.

1928-9. Now occurred one of those entirely unforeseen and wholly unpredictable situations, which virtually eliminated the Power's projector. Sound reproducing equipment made by Western Electric and later by RCA were in the beginning of being made for adaptation to the Simplex projector only because several of the large circuit early buyers of sound equipment were mostly equipped with Simplex mechanisms. The first wave of orders for the new sound equipment was so heavy that neither Western Electric nor RCA paid any attention to the development of a unit for the Power's projector. This was the death blow to the Power's.

Despite this untimely blow the Power's projectors were kept working and being introduced into cinemas not 'wired for sound.' Eventually, since there was obviously a great deal of life left in the later mechanisms, sound systems were introduced for the Power's mechanism, which, with it's awkward configuration of the film passing centrally through the mechanism was not perfectly straight forward.

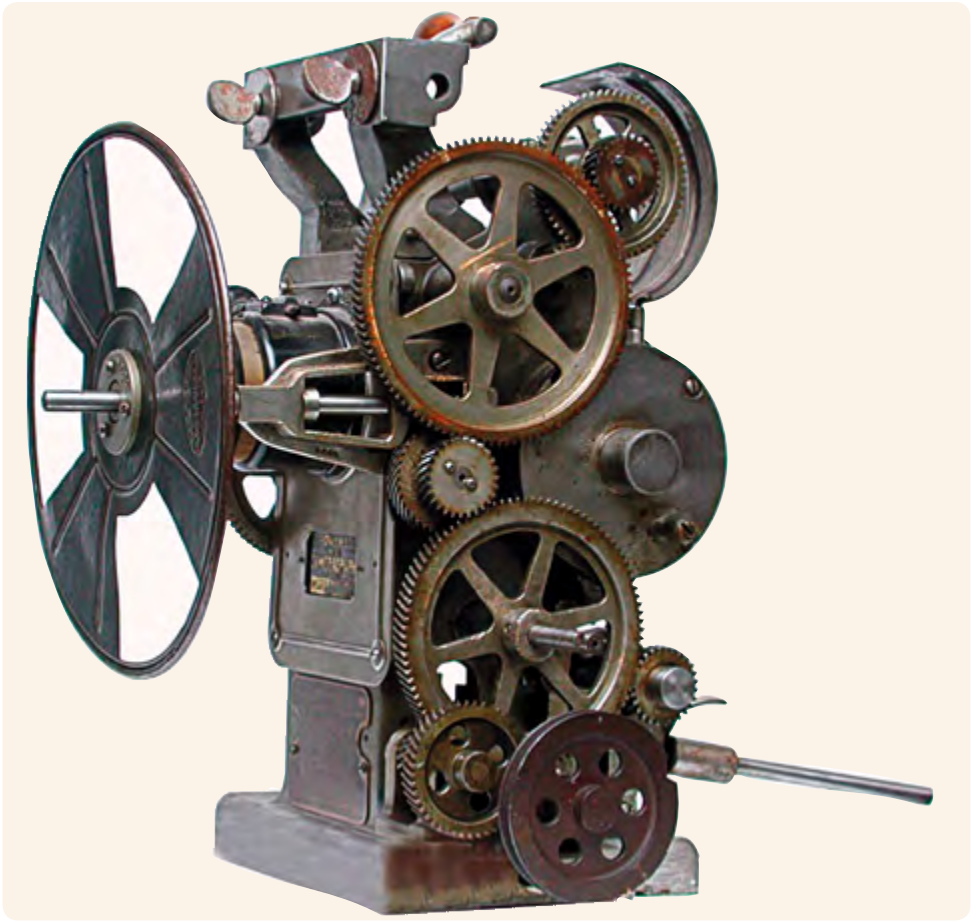
1930 – onwards. The Power's continued to be sold while stocks lasted with Brockliss and ample parts were available until WW2. The Peerless Magnarc, introduced to this country in 1935, had a special adapter carriage for the Power's projector, showing that the machine was not totally forgotten. Many Power's projectors continued to work well into the 1940s and indeed some lasted into the 1950s – an example being the Bijou cinema, Reddish, where Power's were in use for the life-time of the cinema itself. No Power's machine was ever adapted for 'scope in the commercial cinema in this country, but certainly some of the surviving mechanisms were adapted into one-off reduction printers in laboratories and archives.

PPT Power's holdings

In 1981 the PPT holdings consisted of two Power's stands; two sets of spool boxes, two adapted pull through sound heads, motors and attachments, rheostats and various spares. Only No. 2/ 453 has had the roller pins fitted and was complete with the film footage counter which engages directly with the crank shaft, allowing the operator to time the end of reel precisely.

We are indebted to a founder PPT member, John Cannon, for allowing us to reproduce this information sheet, transcribed from the original 1981 copy. Any references to persons or equipment held by the trust refer to that time.

Photos are of the Powers Cameragraph 6 presently held by the PPT.
Photos pages 10 and 15 Jon Smurthwaite. Photo page 11 Peter Hollingham.



Power's No 6 Cameragraph 35mm projector restoration

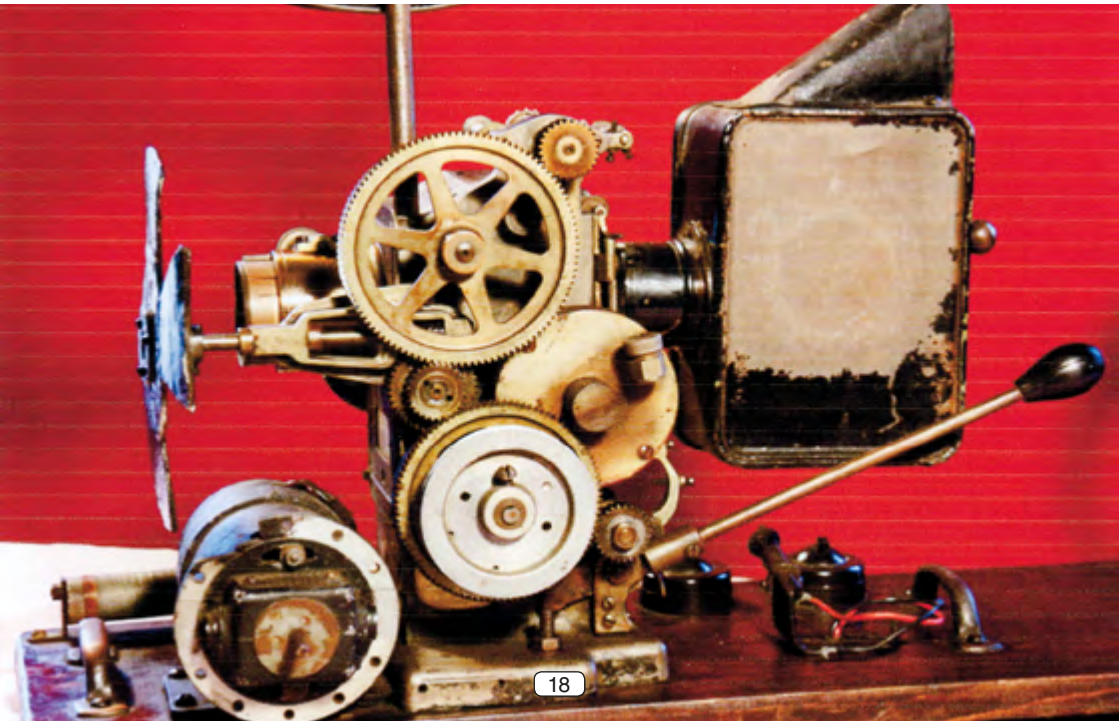
Maurice Thornton

I have at last begun work on the Powers - serial number 33861 20652 - donated to the Curzon Collection, which now appears on the PPT inventory of items on permanent loan to the Curzon Collection. First, however, I need to ascertain its pedigree and this is proving difficult. I have been in contact with Alan Smart and Mike Taylor as well as referring to a past feature on the Power's projectors in Rewind, and while there appears to be similar features, there are some anomalies. Therefore I write this report in the hope that more information might surface as well as allowing members to see this new acquisition, which has already been on display to the public and has raised considerable interest.

The projector, at first thought to be as old as 1909, appears now to be of around 1916 manufacture. Checking on the manufacturer's plate patents are recorded up to 1184126 May 1916 – which must date it. The plate also verifies the projector as being a Power's Cameragraph No. 6 and manufactured by Nicholas Power, New York. There does not seem to be any other identification number. 'Power's Cameragraph' also appears stamped out at the top of the front lens mount plate.

The lens sleeve is marked as being G Guilbert Paris-London and the lens Dallmeyer No. 231009 serial No. XlV. The front shutter is not original as it is a cardboard cut-out painted heavily in black and is a crude three-bladed substitute. Whether this projector had a three-bladed shutter or originally a two-bladed is of course unknown.

On the operating side there seems to be a hand turning spindle, so possibly it was a hand-turned shutter at one time. There is no handle though.

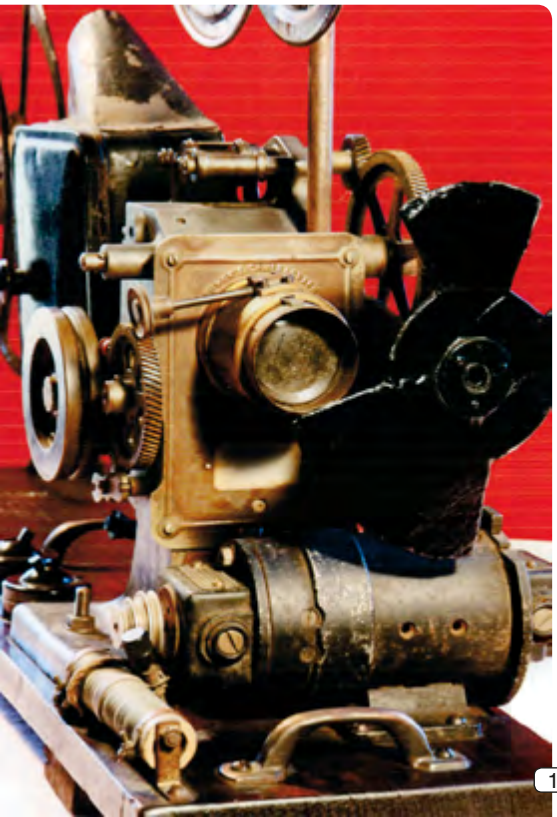


The projector is mounted on a baseboard which has two carrying handles and on which is also mounted a motor in front of the head. On the baseboard alongside the motor (and only a fraction of an inch away from the drive pulley) is a rheostat, or speed control perhaps, which is open and has a new tapping screw. If this is how it was operated it was lethal! The drive belt seems to have been directly to the flywheel. However, at the other end of the motor there is another drive spindle but no pulley.

Also on the baseboard are switches, obviously for start and lamp, and at the rear end a take-up arm, but there does not seem to be any drive for this. The feed arm is slotted into the projector main frame. On the non-operating side the projector looks like a typical Powers.

The lamphouse I would describe as a cocoa tin – and frankly that is what it looks like. I cannot imagine that it is original to the projector and is nothing like other Power's projector lamphouses I have seen. It has at some stage been modified to take a 230 volt 250 watt pre-focus lamp but the lamp holder has come away from its fixing. There are no optics, condensers or reflector in the lamphouse. It is secured to the film gate so that when you open the gate the lamphouse moves with it. There is no lamp cooling facility either so if this was operated in this mode it would have been equally fraught with danger. The film gate closure has also been altered, and this is poor. I think it has the Power's pin cross intermittent mechanism.

As to renovation, I will need to acquire a lot more about this particular machine before any attempt is made.



Kalee projectors

The following text appeared in Ideal Kinema of 1952!

In 1910 two film salesmen from New Century Pictures approached the legendary Cecil Kershaw with a view to making a projector for the company. The Kershaw brothers and their father had previously manufactured camera components and originated the Soho 'reflex.' The two salesmen, Reg Story and Fred Steele, gave Kershaw's a Gaumont Chrono as an example of what was needed. The machine which they had built, known for some reason as No. 3 was similar to its prototype except it was painted black instead of the green of the Chrono.

It contained one feature which was latterly revived in the GK21: a single blade shutter, placed inside the mechanism just in front of the gate, and revolving at two revolutions per picture. The idea was an obvious advantage in that the 'twilight' period, the effective angle moved by the shutter blade in travelling across the film frame is much reduced, but in this early machine this permitted the use of a smaller diameter metal shutter, whereas in the newer machine it serves to increase the light transmission. A year or so later the two models were built. The Kalee 4 was manufactured for New Century Pictures and was similar to the No.3 except that it had a large diameter front shutter, which was more efficient than the tiny shutter. It was in connection with this machine that the name Kalee was born. New Century refused to allow the name of Kershaw to appear on the machine but raised no objection to the newly coined word – a contraction, of course of Kershaw, Leeds.

A change in design

The No. 5 which became world famous as the Tyler Indomitable, was made for the Tyler Apparatus Company (whose premises in Gerrard Street, London were in the same building as those of Cricks and Martin) Tyler's was taken over by Jury's Imperial Pictures, the ancestors in the UK of MGM. The No. 5 was of totally different construction from previous models, following the lines of the newly introduced Ernemann; a good feature of this design was that the shutter was driven directly from a bevel gear on the camshaft. Manufacture was suspended from the years of the first world war, but resumed thereafter.

In 1916 the company moved to its renowned Hairhills Lane. In all these machines the gate aperture and lens moved vertically for racking. In the No. 6, designed in 1920 or 1921, for the first time the widely used principle of moving the whole mechanism

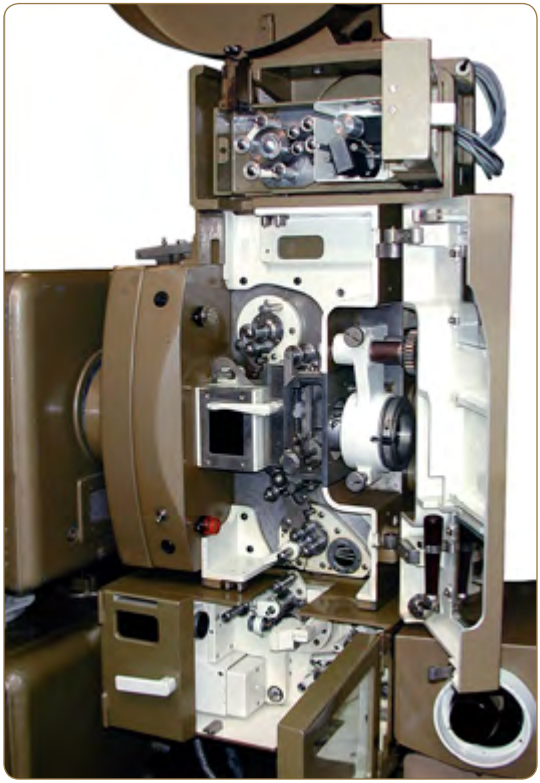
on some vertical slides was introduced. It had the advantage in that it was no longer necessary to re-centre the arc after racking.

Kalee as a trade name

New Century had by now given up the apparatus business, and with Story and Steele the firm of Kalee Limited was formed. It was for this company that the No. 7 was built in 1925 – a machine to be exported.

A modification of the No. 15 fitted with a rear shutter, became the GK18. All these less-costly machines were 'dry' machines in contrast to the oil bath construction of the 11 and 12.

After the war, and the incorporation into the Rank Organisation, it was decided to embark on perhaps the best known projector – the GK21. It was firstly designed to incorporate every refinement needed in the largest cinema, and also revert to the same principle in regard to the shutter as in the original No. 3 – a high-speed single blade shutter. From this machine the GK20 and 19 were developed by successively stripping the nonessentials.



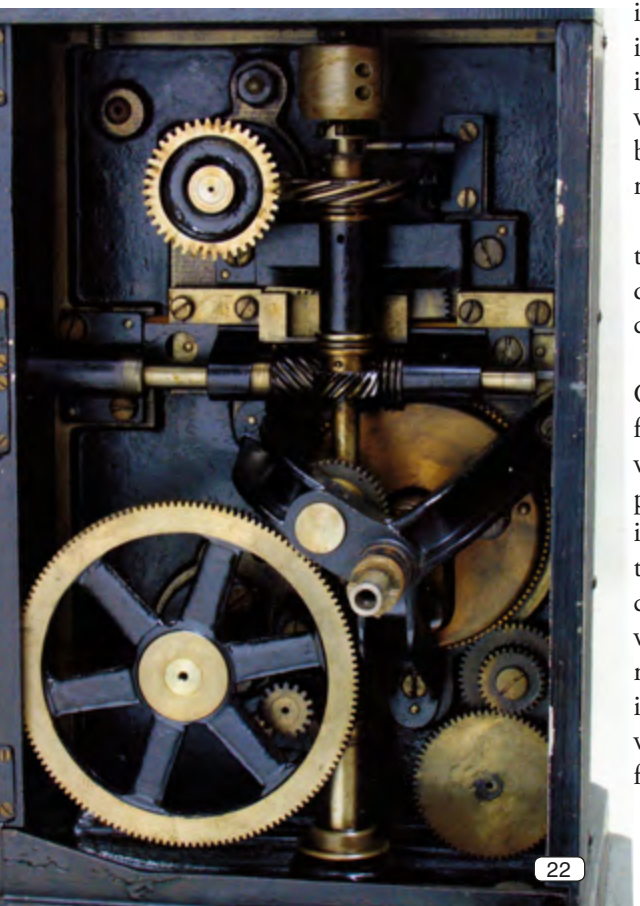
Cinechrome Cinchro

Alan Smart and Peter Allen

This item came up by accident, the details fell out from an old CPC catalogue, we don't know who the auctioneers were or when the item was offered for sale but it's interesting.

Lot Bid. Lot No: 211

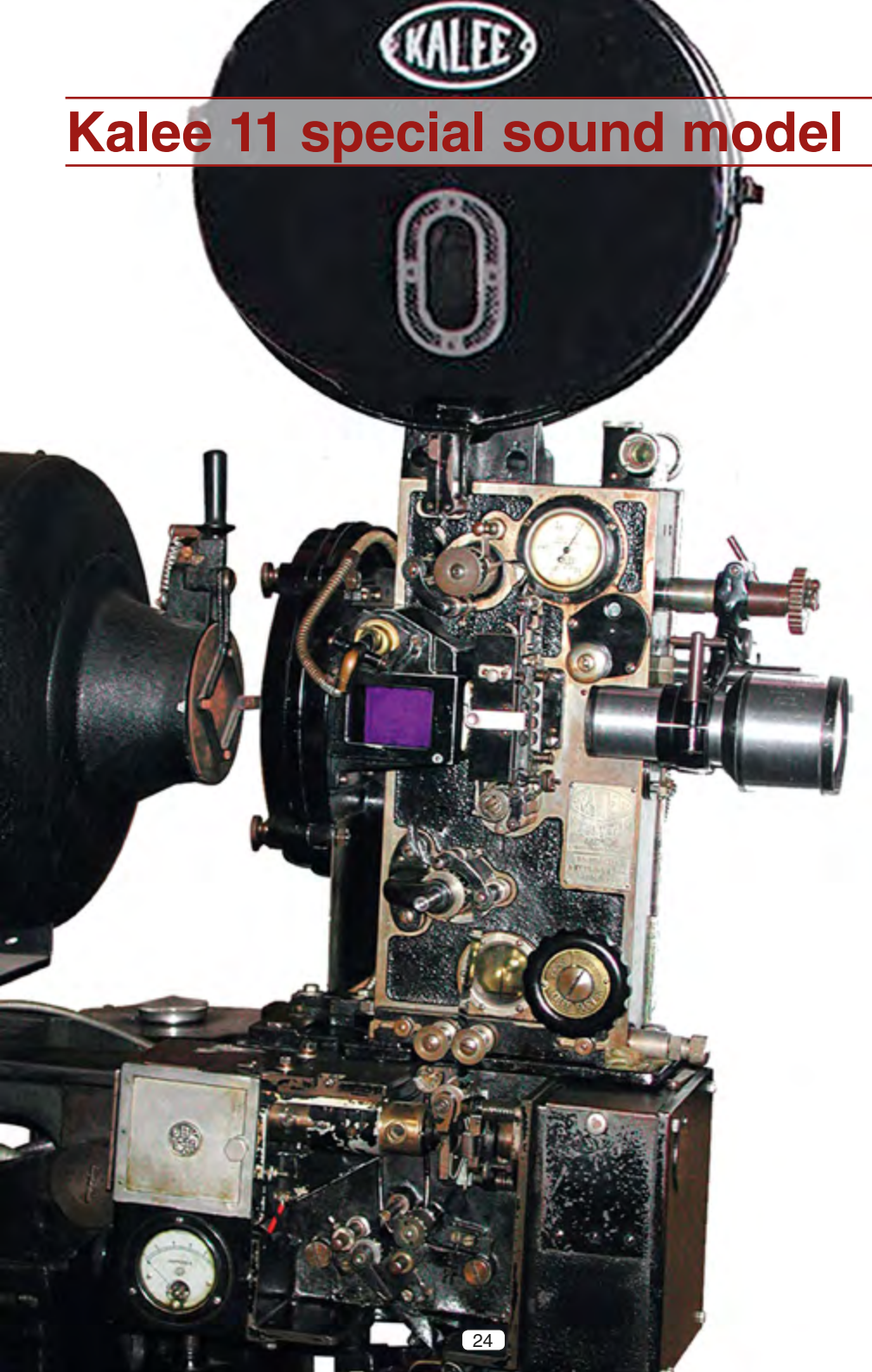
"Cinechrome Cinchro cinematograph projector by Cinchro Cinechrome Instruments Ltd. London for 35mm film. A rare early 1920s serial number 204 projector with mechanism similar to the Kershaw Kalee II with accelerated intermittent movement, patented in December 1920 (No. 165930), in a black finished cast iron body with two 1500 ft. film chambers, brass barrelled lens, electric motor, rheostat and drive belt."



According to information given to the vendor, the projector was used during early experiments in colour cinematography.

Cinechrome was devised by Colin Benett in 1914. It used 70mm film, triple perforated. The pictures were side by side. The body of the projector has a Kalee like finish as in the 8, suggesting it was built on that frame. Cinechrome was a two colour additive process. The film was used professionally from 1914 to mid 1920s and from 1923 onwards in 16mm form. It was later used with extra perforations for 8mm from 1932.

Kalee 11 special sound model



After its fiftieth anniversary in 1983, it may come as a surprise to those who regard the Kalee Model 11 as a 'modern' machine – as indeed it is compared to the ubiquitous Kalee Indomitable Model 8, which was first introduced around 1925. The Kalee 11 and the projection precision engineering of Kershaws generally cannot be seen as revolutionary in design practice but rather as typifying that which gave Kalee their name for a robust quality of reliable and dependable engineering. Kershaws adapted the best features from other designers' machines – to improve their own – they were certainly not the only British and European manufactures to owe much of their influential work to Heinrich Ernemann;: the vertical racking movement, the large Maltese cross and the front opening gate were recognisable features on the earlier Kalee models. That is not to say that Kalee projectors did not have any exclusive design features. Indeed their development of the rigid micrometer-like focussing system has never been bettered and they were responsible for other useful innovations like the split-line oil level sight glass. What must be said now is that their new Model 11 in 1933 was a consolidation rather than an advance in design and it solidly represents a peak in perfection in precision projection engineering for which it and the company are justly famous.

By the end of 1932 there were some 7000 Kalee mechanisms in active service in the UK. The advertisements in Ideal Kinema and the trade press generally boasted 'Three-quarters of British and Colonial cinemas are equipped with Kalee.' It would be quite proper to recognise the stress here on the British-built, all British product and the inherent patriotism of a marque that was to call itself the 'King of Projectors.'

Kershaws had developed over their twenty-five years of projector manufacturer to this position of dominance over the kinema market but in the few years of hectic 'wiring for sound' new and fierce competition entered the field as a lucrative market for re-equipment and new super cinema installations developed. So much so that in 1933 as a single year as many new models of machine came onto the market in one single year as in the preceding five years. The Kershaw's share of the market was dropping back to more like two thirds and the Kalee 8 desperately needed a successor to fight off the many challengers specifically designed for sound and the arrival of the new breed of high intensity arc lamps which created an inevitable higher temperature at the film gate unless cooling and/or rear shutter arrangement was introduced.

It was in mid summer of 1932 that Cecil Kershaw was 'forced' to start tests on his new model. He had as early as 1929 brought in a moveable mask to the Kalee 8 gate to allow projection of silent and sound formats; indeed a rear shutter version of the 8 complete with masking lamp had been introduced as well as such extras available as the double turret lens arm and the film speed indicator (measuring in minutes of thousand feet projection). Nonetheless, the fact could not be obscured from the exhibitors that, good as the Talkie 8 might be, it was quite definitely a hybrid compared to the new generations of machines that had recently come onto the market.

In the forefront of any designers mind was the need to provide simple and economical matching with the then independently designed soundheads. A minimum of adapter gearing was essential – the drive for the projector needed to be near the central base of the mechanism (as fortuitously had been the case with the Simplex, who were able to operate a policy of almost continuous development of the same basic frame from 1909 to 1937).

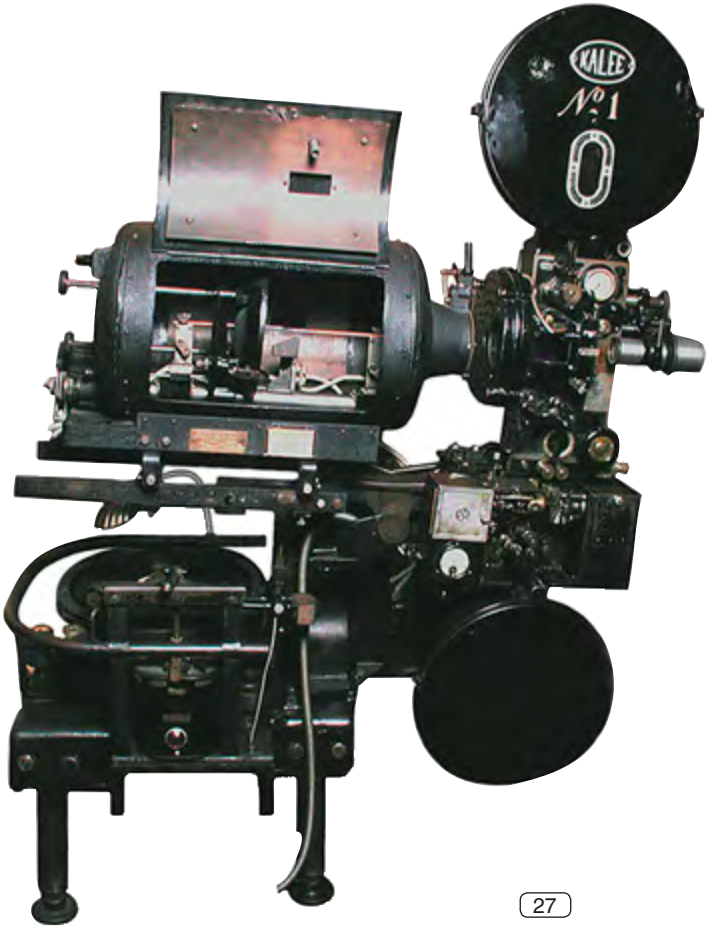
Cecil Kershaw and his team had therefore to come up with what the market wanted – a British 'super' 'sound' projector to meet the demands of the new super cinemas. The design requirements of the machine almost dictated themselves: the rear shutter was all but ubiquitous; an oil sump system had been proven desirable and highly effective in practice since the first Ernemann (Imperator) 2 had been sold on the British market by Walturdaw on 13 December 1936; the rapid interchange ability of the intermittent unit had proved immensely popular for the Simplex, as had the total enclosure of all working parts; the British operator favoured (and still it would seem from the number of 21s running in the early 1980s – minus doors) an open mechanism; the drive had to be low and at the base of the machine; the concerns of the operator needed to be catered for – so robust, reliable, and accessible controls were needed as well as 'useful' items like flicker-free shutter adjustment to hand. All these requirements were put into the 11, which began six months of tests.

Cynical exhibitors might have been surprised and sensed developments when the January 1933 cover of Ideal Kinema was given over to a full page of heavy selling of the Kalee Indomitable – the marque name of the earlier machines – which had not been necessary for some time as they were well established. They might have expected and 'caught wind,' therefore, of the February cover, which was to sell the new Kalee Model 11. The early reviews stressed the 'Britishness' of the machine, in view of the dominance of the sound market by the American Western Electric Company and RCA, as well as perfection of cinema engineering and the machine represented a fact attested to by the longevity in service subsequently by this and other Kalee models. 6s and 7s ran on in several locations until the mid to late fifties, for example at the Electric Palace, Harwich UK 8s ran on in many halls until the mid and late 1970s – as at Charles Ballands' Astoria, Ware; but for the unfortunate death of the proprietor they would have run until closure in 1979, as indeed they did at the North Star cinema, Lerwick in the Shetlands!

The 11 produced between 1933 and 1939, when the heavier 12 was introduced with its drum-shutter was still in the early 1980s in active service in many locations, not least the review room of Rank Film Laboratories, where a pair installed in 1936, complete with original arcs, were still having their quality attested for by running first-run prints to customers. There can be little dispute with the 1933 sentence expressing the centrality to British precision projection engineering of the Kalee 11: 'The Kalee 11 sets the standard by which all projectors will be judged.'

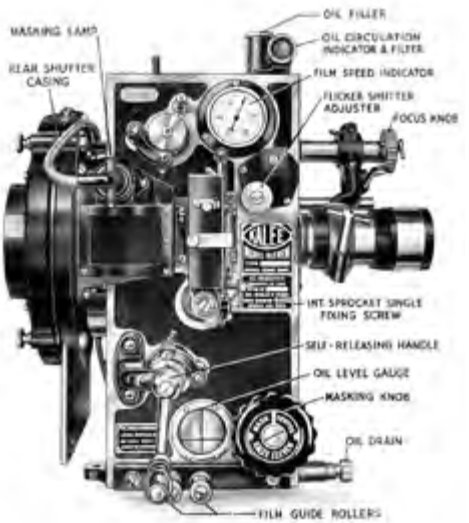
I am unable to state with certainty the first cinema to be equipped with the new Model 11 machines, but certainly among the first installations were those in the new Regal, Winchester and the Carlton, Liverpool (both to BTP soundheads). The first 11s to be installed in Wales were at the Park Hall, Cardiff, while the first pair in Cheshire were at the Rialto, Bebington. 11s found their way onto the export market – for example, eleven were sent to Argentina and a pair to the Royal Palace, Baghdad. Adaptions were provided for all the major sound systems and of course a special silent adaptation was supplied. There were probably some 500 pairs of 11s manufactured with serial numbers (to be found at the top left of the mechanism box on the operating side) between 15001 and 15999.

The PPT has a dozen or so examples of the 11 as well as pinion keys, parts lists, manuals and spares. Two of the early type 'T' machines Nos. 15081 and 15446, came out after regular service at the Classic Kilburn. Only one of the trust's 11s was not modified (a relatively simple operation) at some stage in its life for CinemaScope. Adaption plates and gears are to hand for Western electric 206 and Universal base operation, RCA 1041, BTP and BTH M type soundheads.



Every operator, no doubt has their favourite manufacturer and within these their favourite model. For many the Kalee 11, the first British sump-oiled projector, stands as a glowing testimony to the first rate quality of British precision cinema engineering at its peak.

We are entirely indebted to a founder PPT member, John Cannon for allowing us to reproduce this information sheet, transcribed from the original 1983 copy. Any references to persons or equipment held by the trust refer to that time.



Above: special sound model mechanism.
Below: with BTP sound-on-film system.

Above: silent projection with heavy pedestal stand.
Below: with Philips sound-on-film system.

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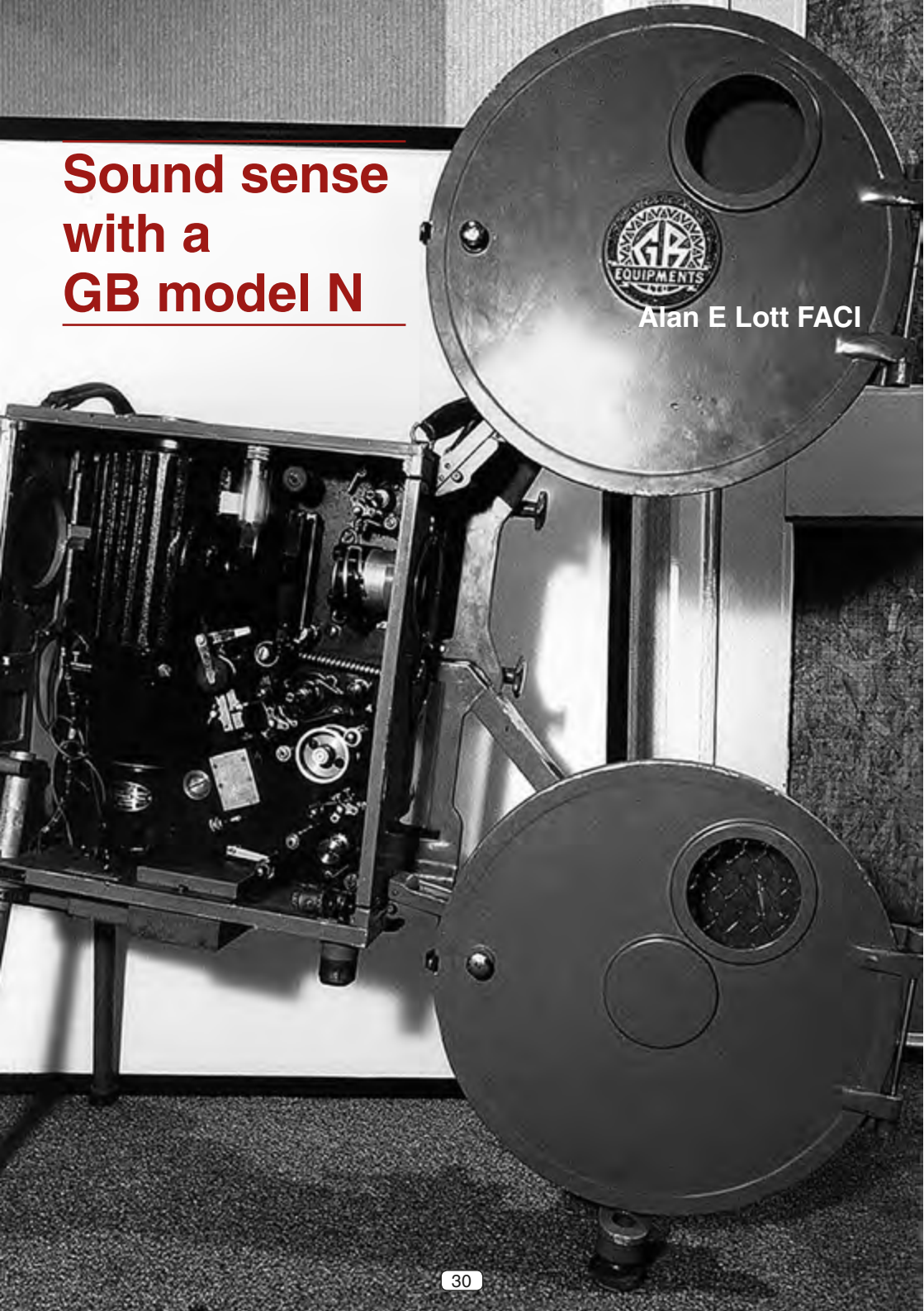
LONDON, W.1.

Telephone : Gerrard **2184** (2 lines).
Telegrams : "Noiram, Rath, London."

Illustrations must not be taken as binding; alterations and improvements are made as occasion arises. 7/32

Sound sense with a GB model N

Alan E Lott FACI



One does not often have the opportunity to inspect and operate a privately owned 35mm 'talkie' projector. When I received a phone call from my old friend, Brian, to say that he had purchased a portable 35mm projector but he could not get any sound output, would I please help, how could I refuse?

At his home I was confronted with a large machine, which was a GB model N of wartime antiquity, built like a battleship and weighing almost as much!

He had purchased it as a "35mm GBN portable all mains machine, later model, with light grey finish, all ready to go." He had travelled several hundred miles by car to collect this machine including an over night stop and, anxious to make the long return journey and allowing enthusiasm to overcome caution, he accepted the machine without any demonstration (big mistake) and hurriedly made the long journey home.

Fortunately the two spool boxes are mounted on a long metal frame which detaches as a complete assembly from the front of the machine, being held in place by three large bolts with thumb knobs. A rigid, detachable, hexagonal shaft provided the drive for the take-up spool only. It is really a two-man job to remove and re-fit the spool box assembly. It is a two-man job to handle the machine itself without the spool boxes in position. Transportable it may be, portable it is not!

It was designed to provide sound output via a separate amplifier, which had inadvertently been left behind in the haste to return home when the machine had hurriedly been collected. An amplifier had subsequently been delivered but without connecting leads or loudspeaker. It was obviously not the type of amplifier originally supplied with the machine.

It was obvious that an amateur modification had been made to the rear of the machine, very probably because the original connecting leads and plugs had been lost. The mains supply was now by means of a fixed three-pin socket on the replacement mains lead. These were originally known as Bulgin P-73. This is the type that was fitted to the Specto series of projectors and being of plastic certainly not sufficiently robust for service use.

Initial external examination revealed that the third (earth) pin on the fixed plug was very loose and inside the rear of the projector there was no lead to provide a connection from this all metal machine to this earth pin! An extremely dangerous situation. The operator was thus left with the integrity of 65 year insulation and other elderly components such as motor and lamp switches, motors, lamp holders, transformers and other items. Fortunately a check with a 250-volt megger revealed an insulation resistance of 50 megohms so an earth wire was quickly connected to render this heavy all metal machine safe.

The P-73 socket was correctly wired but without a cord-grip so that the terminals took any strain on the lead – not a happy situation.

There was no connection to the ¼ inch double insulated sound output jack but two twin leads were dangling loose behind the lamp house. Each pair terminated in

its own small white terminal block. There was no indication as to where they were supposed to be connected. Most of the wiring was in coloured fabric sleeving laced into the cable forms which made circuit tracing difficult, firstly because the coloured fabric was badly faded, secondly many of the end points of the cables were not visible. The last thing one wishes to do is to pull about old wiring of this sort.

Obviously one needed to gain access to the underside of the amplifier. Two metal plates under the base concealed the amplifier circuits, but removal of the top left and top centre bolts revealed a flexible plastic sheet of insulation, which concealed the circuits. However, after carefully removing the SP4 valve and third large bolt the amplifier came free and by very gentle easing all was exposed!

A very poor photocopy of an amplifier circuit had been supplied with the machine but was obviously for a later model; the pre-amplifier valve was given as Mullard EF36, KTZ63 or 6J7, whereas this machine had an earlier type Mullard SP4. However, with this as a rough guide and circuit tracing with an Avometer 8 the amplifier circuit was finally traced.

This machine had been designed and built decades before resistors had been invented so the original amplifier would have been all thermionic valves to give adequate output for an audience of about one hundred.

Perhaps PX4 or 6L6 valves were used and the power unit would have provided about 350 volts. This would also have provided about 330 volts to power the SP4 pre-amplifier. There was no connection between the negative rail and the chassis of the pre-amplifier to prevent any hum loop forming between the projector and its main amplifier. Hence the double insulated audio output jack.

It was obvious that the VOX amplifier Type PA50SS had no provision for supplying 330 volts to the projector so with Brian's agreement I made a small power unit from parts obtained from Maplin and mounted this permanently on the rear of the projector.

It was now clear that one pair of leads hanging loose was for this power input and the other pair connected to the secondary winding of the SP4 transformer went to the audio output jack. Not knowing what to expect as an output level, audio input was fed to the microphone input of Brian's Bell and Howell 603 16mm projector. Success! Plenty of sound and with careful adjustment of the sound scanning optic and exciter lamp good, clear sound was obtained.

But now other problems arose. There was an unacceptable high background hum – first thoughts were that the smoothing in my little power pack was inadequate, but a check with my oscilloscope revealed that it was 50 hertz hum! The exciter lamp supply was now suspected.

However, the hum now persisted with the photocell completely obscured. The exciter lamp was fed with direct current from the transformer, Westinghouse rectifier and a large smoothing capacitor. There was no 50 hertz ripple evident on this supply. It was noticed that there was a hum bucking potentiometer across the 4 volt 50 hertz

heater supply to the SP4 valve. It was found to have been turned hard over to one end of its travel. By monitoring the hum level with my oscilloscope and carefully turning the pre-set control to nearly central position the hum was virtually eliminated.

There was now a problem of loud crackling in the loudspeaker as soon as the main lamp was switched on. This was coming from the blower motor at the bottom of the lamp house, which unlike the main drive brushless induction motor had a commutator and brushes. Fitting a twin line interference suppressor of the type found in vacuum cleaners eliminated the interference.

The use of the B and H 603 projector to play the sound was rather inconvenient. Fortunately the output of the Vox PA50SS amplifier had external adjustment on its back panel to allow the connection of loud speakers of either eight or 16 ohms impedance, so by buying suitable connectors I was able to arrange the leads so that the B and H speaker (16 ohms) could be changed over for use with either equipment.

I have described this restoration/repair in some detail to illustrate the problems that an enthusiastic but non-technical person can encounter with very old equipment. The lessons to be learned are that when purchasing equipment of whatever age one should always let caution take precedent over enthusiasm – insist on a demonstration before purchasing. Also, insist on a certificate of electrical safety signed by a qualified electrician or Chartered Electrical Engineer. You know it is sound sense. This machine would have failed miserably on both counts. Subsequently, at Brian's request, I supplied him with a formal report in my capacity as a Chartered Electrical Engineer (retired) for him to seek redress from the vendor.

Surprisingly, the lamp house did not have a reflector or signs of provision for one. The projection lens on this machine is a Taylor-Taylor Hobson Unifit, Series M, focal length 75mm, aperture f/1.8 uncoated.

The picture gate was rather ingenious. If back-projection was required the film would be laced 'the wrong way round' giving the correct picture on the rear projection screen. The complete gate assembly with exciter lamp could be withdrawn and inserted so that the photo cell and exciter lamp read the sound track in its new lateral position; very convenient for projection in restricted spaces such as a ship, mess or crowded on-shore billets.

Being somewhat concerned that such equipment was being sold in a somewhat unsafe condition, I visited my local Council Consumer Advice Centre to enquire what the present legislation required in respect of the safety of electrical goods.

Without mentioning names I explained the situation and was told that the current legislation did not cover such old equipment since they would be classified as antiques. Nevertheless any vendor has to observe a common duty of care and should this not happen the injured party would be able to take action via the Courts. In the case of serious injury or death the damages could arise to tens of thousands of pounds – or even more!

It is for this reason that charities and a lot of second-hand goods shops will no longer accept second-hand electrical items for re-sale. Therefore one needs to be especially careful if selling second-hand goods, and not just electrical items to third parties.

GB model N 35mm projector supplementary information:

Lamp: type A1/57 250 volts 1,000 watts. Still available.

Exciter Lamp: no type number. 6 volts 1 amp. Single pole base. Type used in early cars. Still available.

Photo cell: GEC/ OSRAM gas filled type CMG 22 (CV 1473) B4 base. Caesium type, voltage 80 – 100 (availability?)

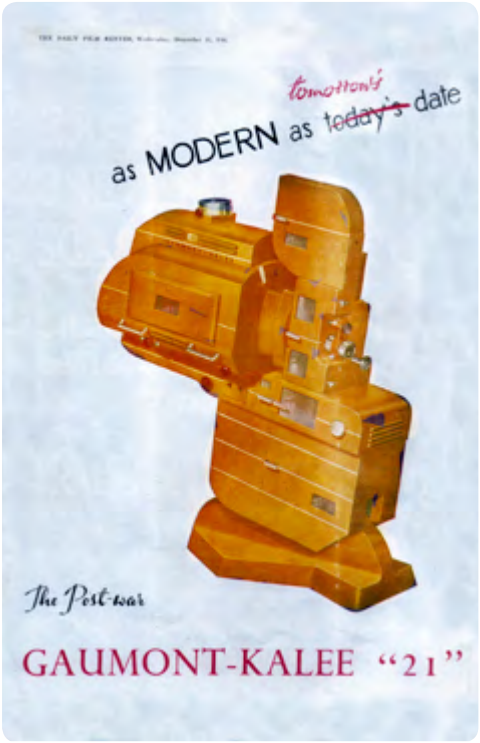
Pre-amplifier valve: Mullard SP4 heater 4 volts 1 amp B5 base, anode top cap. Still available, privately.

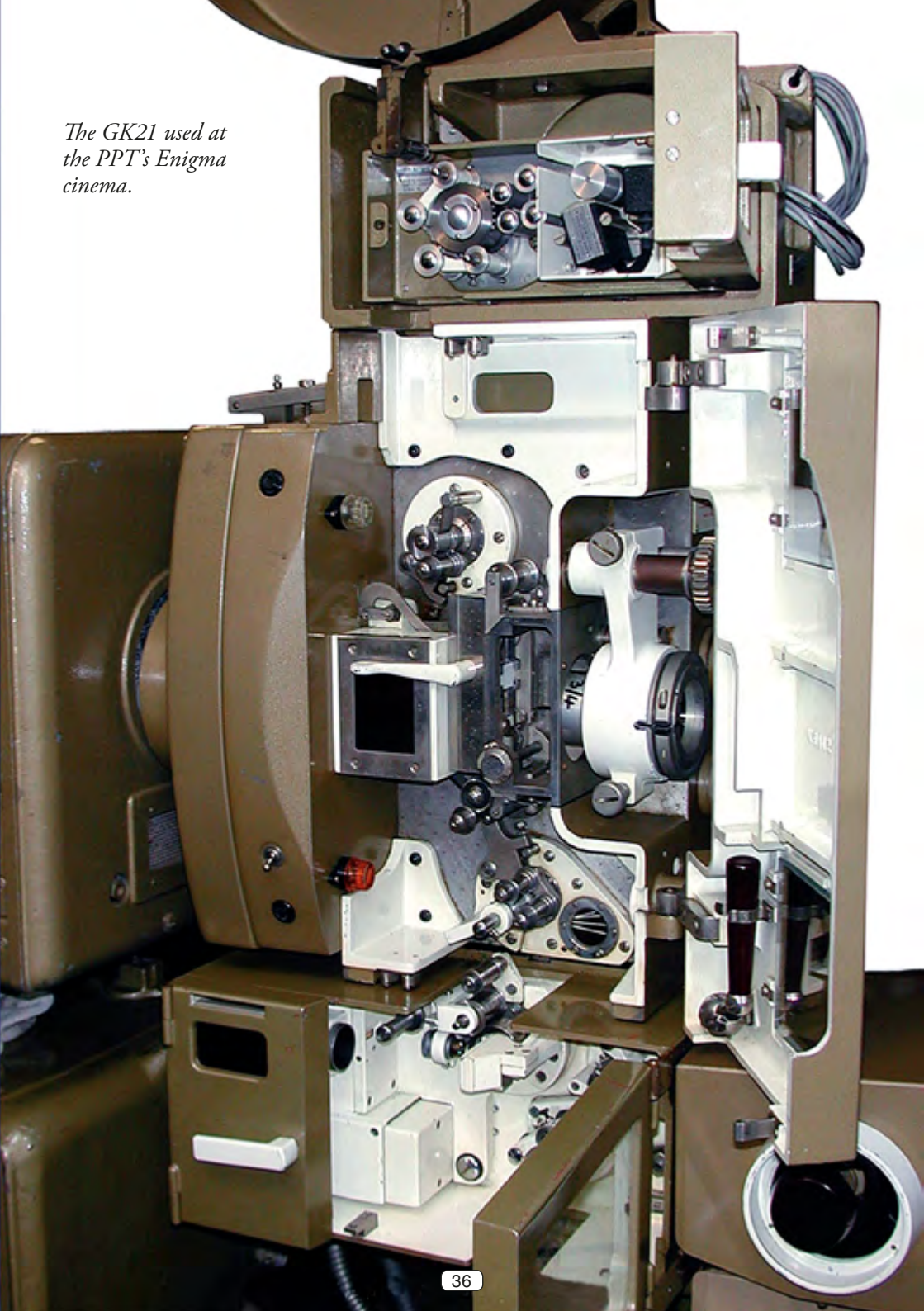
Gaumont Kalee 21

The Projector Man

During the last days of the war Kershaw and British Acoustic engineers began designs for a composite equipment which would be post-war manufactured and would rate among the worlds best. It would comply with certain American requirements, but still have the separate picture head facility which was favoured by many British cinema exhibitors.

The composite projector and picture head were designated Gaumont Kalee 21, GK21, and the initial equipment was basically for theatres over 2000 seats. The massive pedestal assembly incorporated the bottom spool box, mains input terminations, arc -beam and sound head platform and would require the efforts of five or six men to lift





The GK21 used at the PPT's Enigma cinema.

or move it. To distinguish it from later pedestal systems, it earned the unofficial name of Queen Mary assembly and became disliked for both its size and weight. A powerful arc lamp was built for the assembly and named Lightmaster, but due to its critical 16-inch mirror and inconvenient means of adjustment, its life was somewhat short but nonetheless two could still be seen at work in Scotland in the mid 1980s. It was probably the largest lamp house assembly ever built in the UK and some who worked on it would add that it could be among the least liked.

To further the success of the GK21 the Rank Organisation had engaged the services of various advisers including stylists and psychologists one of whom had previously worked on the design of the popular Triumph Mayflower car. Known as the Razor Edge style, the resemblance could easily be seen in the full GK21 assembly.

Because of the claustrophobic environment of the projection room, these advisers suggested the use of lighter colours for the machines final finish and advised the use of 'mid stone' paint. A high quality light 'stone' was originally chosen, but because of the cost was soon changed to a hammer 'mid stone' finish. The trim, control knobs and writing was in magenta with some Chinese influence in the lettering! Six white tracer lines gave a rakish appearance and completed the styling.

Although even heavier in build than the previous Kalee 12, the machine was reasonably conventional except for the double speeded, single blade flicker shutter which was claimed to pass about 4½% extra light. Also, contrary to Kershaw's normal policy, the mechanism was totally enclosed by a massive cast aluminium door, which it was said, would widen the potential sales to those areas where these were either mandatory or preferred. To satisfy those who did not like them, the doors could be immediately 'un-hung' from their hinges.

Kalee's distinctive optical arm and focusing method was retained almost intact, but would not now lift out of the gate area. To promote projectionists' care for cleanliness, the mechanisms interior was painted white, as was the sound head.

With the exception of the lesser well known Dragon and Invictor projectors, Kershaws had invariably used six picture feed sprockets, but in the GK21 and all other derivatives they reverted to the American preferred four picture sprocket. Dragon sprockets were therefore interchangeable with the GK21, but intermittent sprockets remained the same as had been used on all their machines from the Kalee 6 onward. The sprocket had interesting origins as the first Kershaw projectors had been made from 1910 and the company did not at the time have the accurate indexing machinery to cut such precise components. To circumvent this they imported both Ernemann maltese crosses and intermittent sprockets from Germany and with the outbreak of the First World War found themselves with several hundred machines in use and an on-going requirement for new ones. On acquiring the required machinery they not only made for themselves, but also for various other British projector manufacturers and in so doing continued to perpetuate a German standard.

For the British and overseas market 3/8 inch spool boxes were used, but where US influence dictated they would supply 5/16 inch American spindles. The spool boxes themselves were very substantial cast aluminium and some times spoken of as 'tulip shaped' due to two corners only being squared.

The original and preferred sound head was the 83 which featured the well-established British Acoustic fluid flywheel and a variation on their projected image of the soundtrack. A sound sprocket followed by the holdback sprocket provided a film traction with the minimum of gearing to include chain drive to the take-up spool. It is a matter of some interest that the Rank Organisation of the period never received reports of an optical, mechanical, or electrical failure in this unit. Its simplicity and reliability must rate among the best ever made and compare favourably with the Westrex 2003.

In common with all British Acoustic sound heads, the photo electric cells were coupled by cathode to the first stage valves. GK21 Duosonic amplifiers were supplied in two options, the lower cost one with only one pre-amplifier for both projectors and only one 30 watt power amplifier for the stage speakers. The second option featured two pre-amplifiers and two power amplifiers with emergency switching in the event of failure. All valves were mounted in the horizontal and underside of each chassis had components laid out such that the circuit could be read without a diagram. To ensure reliable service, the company avoided electrolytic capacitors to the point of only using them for cathode de-coupling. Incidents of failure were so few as to be negligible.

Basically built for the flagship theatre, the GK21 was first installed in 1947 and was followed in 1948 by the lower costing GK20. Principle differences in the assembly were the use of a lighter pedestal; a new carbon arc lamp and the use of pressed steel round the spool boxes. Detail differences in the mechanism were confined to the use of conventional shutter blade and in the sound head, to the use of projected slit optics and the omission of the hold back sprocket, this being substituted by an ingenious jockey roller assembly.

GK 20 systems employed exciter lamp sound change-over and an amplifier similar to the pre war '20, but its reliability was not the equal of the GK21 systems. The sound head designated 378 was directly interchangeable with the 83 type and was curiously more adaptable to the later use with spool towers if only due to the jockey rollers anti-snatch properties.

The arc lamp, named President, was somewhat smaller than the Lightmaster, and featured two feed motors, one for the negative carbon and one for the positive, a simplicity that is surprising if only because nobody appears to have previously thought of it. With a 14" mirror it rapidly established a high reputation and became thought of as second only to the Peerless Magnarc. Many were sold for use on all sorts of other equipment and its carbon economy earned it many adherents.

During 1949 the company issued further equipment designed for the smallest cinema, designated the GK18 the mechanism was no longer a derivative of the GK21 picture head. Instead, they had taken the mechanism previously used with the low cost GK40 equipment modified the gate assembly and painted it in the customary mid stone colour.

The GK40 had been made for a number of years and was basically made for the Indian continent. Finished in a low cost black and minimum chrome its simplicity made it suitable for use in hospitals and institutions in the UK and it was therefore rarely seen in commercial cinemas. It was nonetheless reliable, but as the GK18, sales were small indeed. Despite this the pedestal assembly, but with the GK21 mechanisms and 83 sound heads, sold exceedingly well and became the form that most people think of as the real GK21. The sound head, designated 543, resembled the 378 except that the operating interior was no longer painted white and the take up spool was driven by belt rather than chain.

A new and smaller arc lamp was made and called the Universal. With only a 12" mirror, it gave a good account of itself and was generally liked by most who used it. In later years it would more readily convert to Xenon than most other lamp houses. A later, even lower cost, lamp house named the Commander was also offered. This lamp was a derivative of the Kalee Vulcan, but owed much of its shape to the GK40 lamp house.

In some way the GK18 mechanism had broken the interchangeable continuity of the GK equipments and would be followed in the future by only one other design, the GK37.

Between all of the derivatives, the company had issued a further equipment and designated it the GK19. This was basically a hybridised stand using the GK18 pedestal but with the GK20 arc beam. The sound head remained as the 378, white operating interior, but with a belt take-up drive. Detail change in the mechanism was confined to omission of the electric solenoid changeover system common to both the GK20 and GK21.

Many variants and derivatives could be seen and 543 sound heads with GK21s on top was not unusual and an 83 sound head with only one sprocket could be ordered, designated the 678, it was most unusual. The special order smooth-black versions could be supplied and these were occasionally shipped to France.

The GK37 owed little influence to the GK21 and was distinguished by being the first Kalee to feature combined mechanism and sound head. Although resembling the GK18 pedestal slightly, the stand was new, as was the lamp house. This was the last lamp house made by the Kershaw Company and the only one to be issued in both carbon and Xenon versions.

Because of its excellence, perhaps a special note should be made of the small and unpretentious amplifier that was originally dedicated to the GK18 equipment.

Designated the 522, it housed in one small case all the sound amplification system including the exciter lamp supply circuit and the projectionists' monitor speaker. Its size and transportability was such that when the GB Kalee engineers were faced with a major sound failure they would ship this unit to the theatre and haywire or lash it in for the emergency. Not counting the Western Electric service emergency amplifier, no competitor's amplifier came near to this convenience.

The most common and typical version of the GK21 variants therefore became a hybrid of the GK18 pedestal, 83 sound head, GK21 picture head, President arc lamp and the ubiquitous 522 amplifier.

Despite the GK21's birthplace being the highly respected Kershaw factory in Leeds, the machine was not without its early teething troubles and not the least of these were the seizures encountered in the first few weeks of installation. With 14 gears, seven shafts and two idling posts, the machine was the only one of the four main projectors, Ross, Westar, BTH SUPA and the GK21 which featured sump and pumped oil lubrication. Circulation of the oil was not only to all moving parts, but was also counted as an efficient coolant especially as the shaft near the arc heat was the flicker shutter and rotated at 2880 rpm. After analysis it was discovered that the machine was so precise as to need a very special oil and once this was supplied no further trouble was encountered until some years later when failure of the shutter drive gear was reported. Kershaw's immediately responded with a nylon substitute for this decaying Tufnol component, and at no cost, GB Kalee engineers doing the modification.

Only shortly after this, failures of the barrel shaped intermittent drive gear were noted and a steel replacement was rapidly produced. Because of the large bearing area, this itself began to give problems and a second perforated version was issued. Other than some minor problems with the line shaft the machine then ran for many years without undue trouble, but further modifications included an adjustable film tension gate top roller to assist film entry into the gate channel.

In theatres adapted for very large screen projection, water cooling was added to the gate block area. The machine readily adapted to CinemaScope and four track magnetic sound heads, but the fitting of the anamorphic lens bracket compromised the frame adjustment convenience, a criticism corrected in the very last of the bracket types.

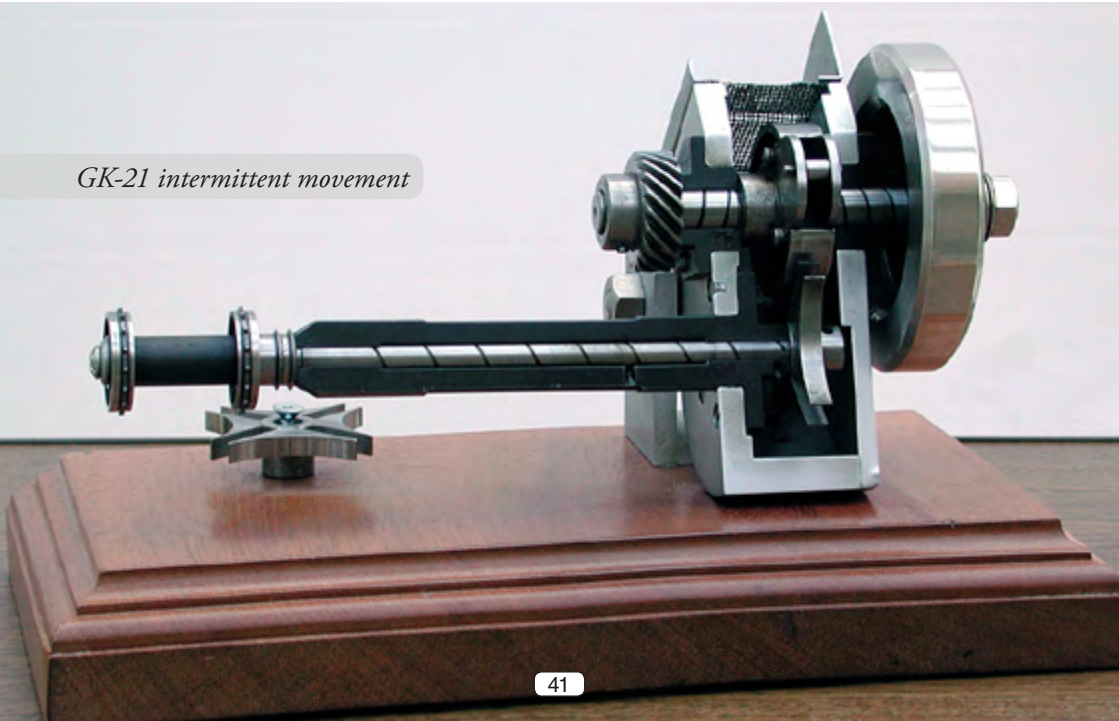
Two other versions of the GK21 are worth a mention, the 70mm prototype, which was never demonstrated and the VistaVision models that were. The Rank Organisation had accepted the Paramount Pictures wide screen systems with some enthusiasm and had produced a number of films in the process. Four GK21 projectors were modified for horizontal film traction and eight perforation frame shift and two West End theatres had a pair each.

VistaVision in its showcase exhibition required the horizontal film transport to the total exclusion of conventional projection and a cinema therefore required two sets of projectors. It is argued that if the VistaVision machines had featured a compatibility

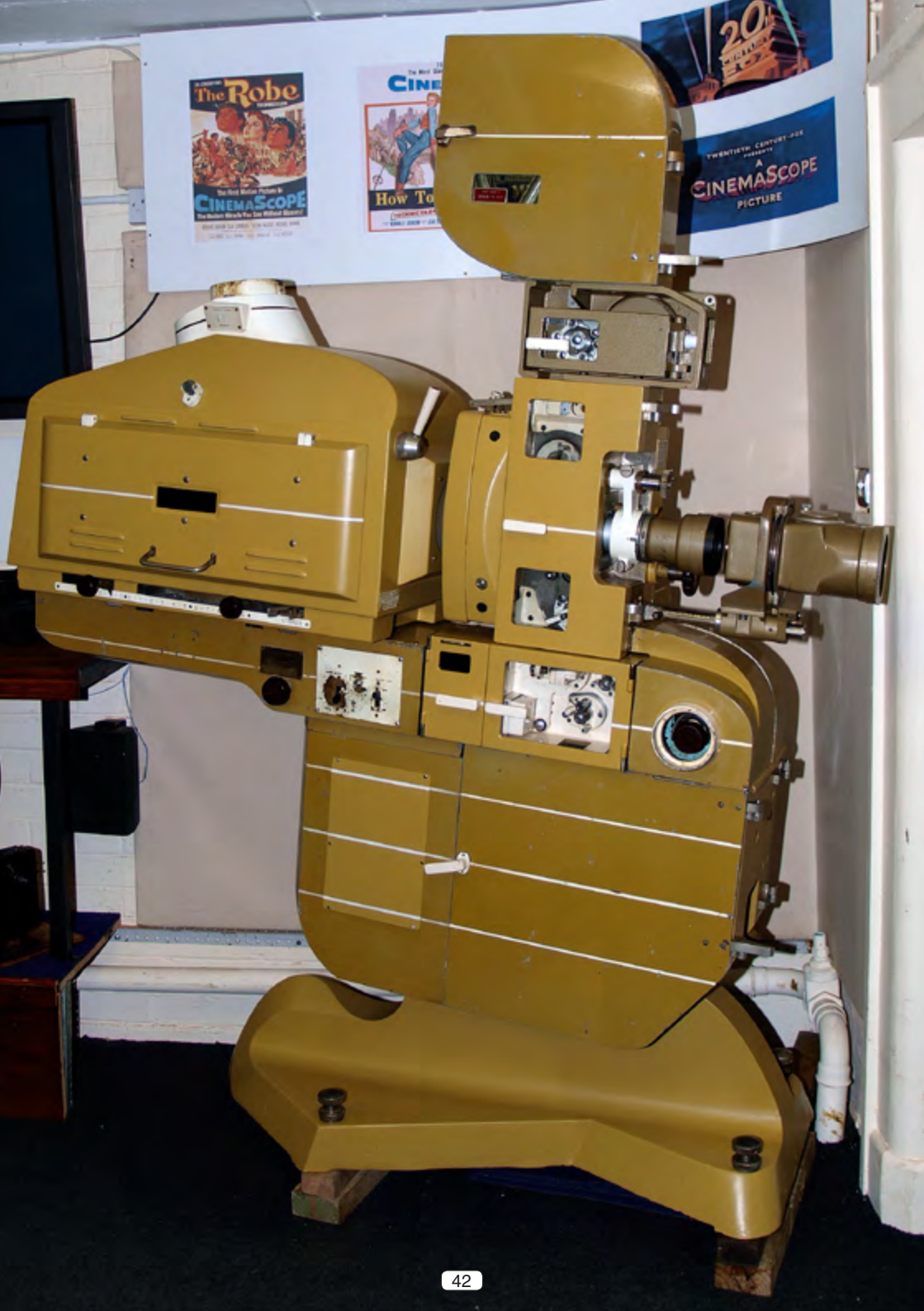
feature with standard film the process would have stood more chance of success. Some engineers claimed that the projectors could have been designed to accept the film in the normal top to bottom spool configuration and the image be turned to horizontal by optical means and in so doing this would have left the machines available for conversion kits to project standard four perforation films. The company's venture into this wide screen system was said to have been the reason for the final closure of the Kershaw projector manufacturing facility and their decision to import all future projectors from Italy.

The factory was closed in the early 1980s after some years operation as an optical fibre manufacturer, but not in the Rank Organisation and in 1988 it was demolished. The highly skilled fitters and engineers are now mostly retired, but some surface occasionally at Leeds University or the Medical School, one or two engaged in the machining of hip joints and so on.

An 'oddball' and interesting footnote to the long history of the GK21 is that in the early 1950s the producer and showman, Mike Todd (of Todd AO fame) brought his roadshow *Around the World in Eighty Days* to London for a potential two year run. To circumvent the British Board of Trade quota regulations for 35mm exhibition he reduced the width of his film copy to 34mm. Willy Fozzard, Kershaw's excellent foreman fitter prepared and fitted the parts to enable the machine to accept this size and in so doing produced the only two projectors in Great Britain to ever show 34mm film.



GK-21 intermittent movement


The Robe
CinemaScope
A
CinemaScope
Picture

Extract from The Ideal Kinema, 6 February 1947 by R Howard Cricks FBKS FRPS

GK21 is all enclosed model with many new features

The first projector of post war design has arrived. A week ago the Gaumont Kalee 21 made its debut at the Wardour Street showrooms of GB Kalee, where it was demonstrated. The first installations have been made at the Ritz, Birkenhead.

For the first time the British exhibitor is able to consider the installation of a British-made sound projector, built as a coordinated unit, and included in the same one piece of equipment all the many components, which in the past have been built as separate fittings.

A handsome machine

It has a dynamic appearance…as though it might at the last provocation sail off to distant parts, as indeed it will, since, naturally a large proportion of the first batches are destined to bring added fame to British products in other countries. A proportion will, of course, be available for installation in the UK.

Sturdiness is indeed the outstanding feature of the machine. Instead of sheet metal spool boxes, doors and lamp house, all are made of sturdy aluminium castings. The stand comprises of a massive base, upon which the body of the machine tilts to provide a projection rake of 5 degrees positive to 30 degrees negative. Adjustment is effected by a hand wheel concealed behind the take-up box.

Cleanly and simply designed

The gate is of the parallel opening type, and is so designed that a wide aperture lens can be brought to within a fraction of an inch of the film. Both the aperture plate and the front portion of the gate with the tension skates can be very simply removed. Also, a duplicate aperture above the projection aperture for framing, with a portion cut away to show the mask line.

The lens focusing is of the type long familiar on the Kalee projectors. Twin shutters are provided, which exceed expectations with regard to increased efficiency; instead of the 3 or ten percent extra light, which had been expected, an increase of 18 percent had been found.

On the gear side the design is equally straightforward; a Perspex window allows the gears to be examined while the machine is running. Lubrication is by a pump, providing a continuous stream of filtered oil over the gears on to the cross-

box. The latter is, of course, detachable as a unit. Shutter phasing compensation is effected by means of a sliding spiral gear.

Changeover operation

The built in changeover system operates in conjunction with the safety shutter. The latter consists of a substantial steel shutter lifting behind the gate. When the machine is running a conveniently placed switch opens the shutter on one machine and simultaneously closes that on the other. In the event of a current failure to the system it was assured that in such a case a hand-operated changeover could easily be effected.

The changeover of picture and sound is synchronised by controls mounted on the front wall of the projection room, provision being made for either two or three machines. A point upon which there was some controversy as to whether picture and sound should be changed over simultaneously. Certain projectionists preferred them to be separately controlled..

An inching knob is conveniently placed near the projectionist's right hand. Among the many details which have been so carefully studied, one worthy of mention is that while the doors latch merely by shutting them, a handle has to be operated to open them. The projector door will not shut if the gate is left open.

Specially designed safety system

Safety has been a primary consideration in design. A specially designed Pyrene fire control system is built into the head; in the event of a fire, a jet of CO2 would extinguish it, while the arc and motor would be switched off immediately. The spool-box fire traps are unusually long. Yet another factor making for greater safety is the manner in which the light beam is masked, ensuring a cool gate.

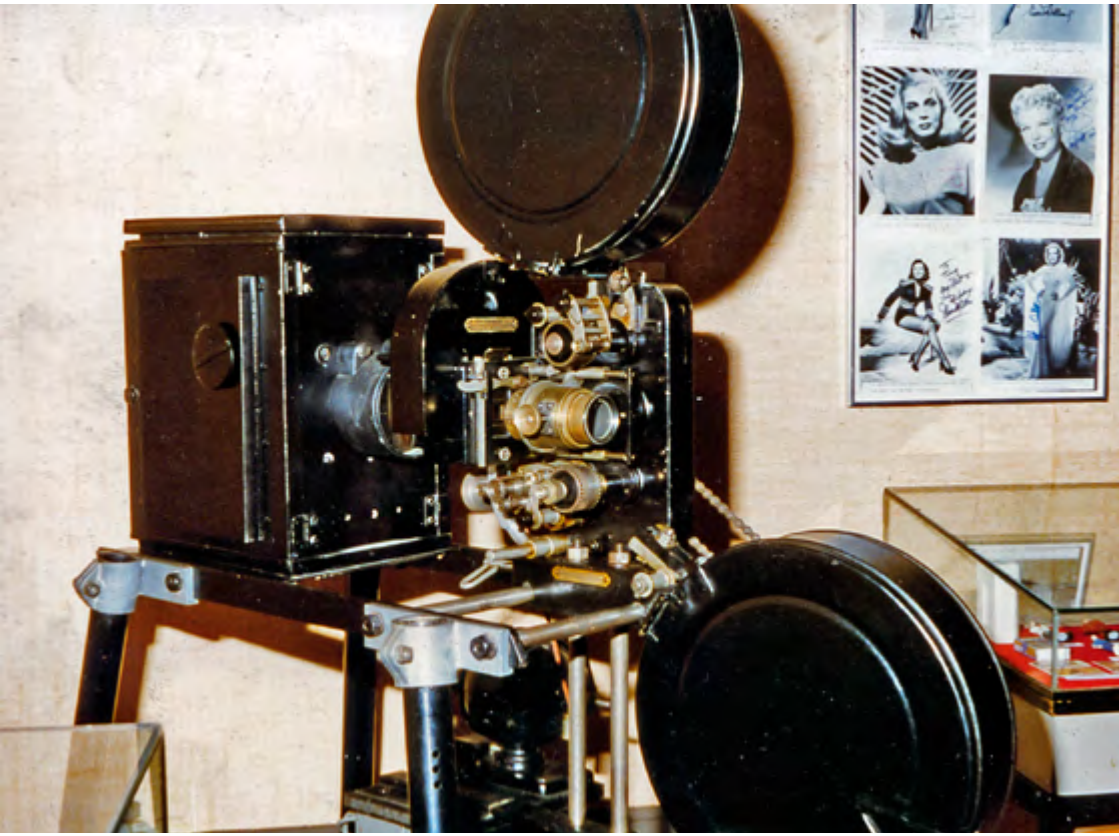
Sound head re-designed Duosonic

The sound head is a re-designed version of the BA Duosonic head. The chief point of difference is that the light path, instead of being vertical, is now horizontal, the exciter lamp being mounted along side the photocell to which light is conveyed by means of two prisms. Micrometer adjustment of the film tracking is effected by a graduated knob.

Both mute and sound heads are built on the unit principle, and any unit can be replaced by the use of only a screwdriver. All sprocket rollers lock in the off position. Both heads are painted internally in glossy white, making for cleanliness. On the off- side of the machine a cover can be removed by a single screw, giving access to the motor and adaptor gearing.

Kamm

The Projector Man

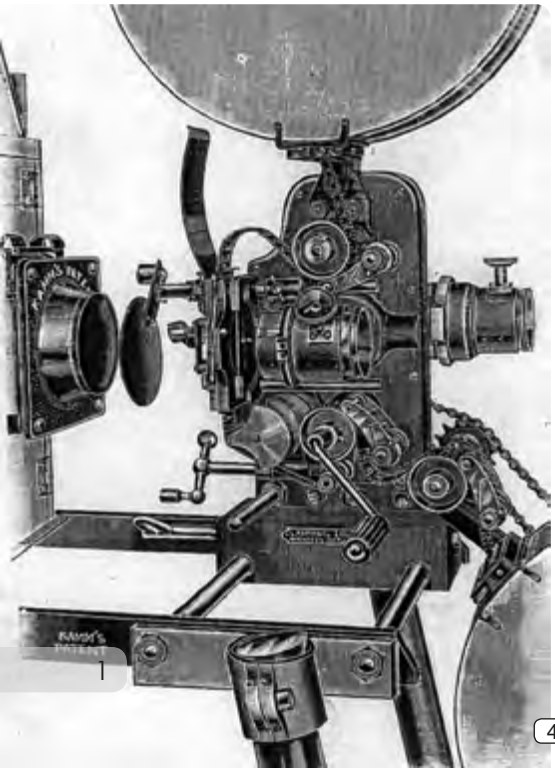


From the earliest days of the industry until about the mid-1940s, the name of Kamm had been familiar to most UK projectionists, but by the end of WW2, it was remembered by only a few and of these even less had ever actually seen a Kamm projector – let alone operated one! Despite the company making and distributing many models over many years, there is a peculiar rarity of specimens in museums or private collections yet, in their 1947 advertisements, they were quick to point out that one of their original mechanisms had for many years been on display

in the Science Museum. Known as the Kammatograph, the machine was made in 1897 and it was many years before a second exhibit, a 1930s specimen, found its way into the Museum of the Moving Image (MOMI). A third machine, a full pedestal assembly, was said to be included in Peter Hollingham's private collection and other than these three, no other examples are known of.

Perhaps the scarcity could be explained by the company's preference for leasing rather than outright sale and during the 1970s Mr L Kamm, son of the original owner, explained that most of their machines had been used in the London area from where end of lease recovery was both easy and quick. He went on to explain that recovered equipment was stored in various rented premises including one which was a basement in a north London working convent!

The company was said to have been established by Anglicised Germans who manufactured, among other instruments, large-format photographic enlargers, and professional slide lanterns and, for the growing cinema industry, 35mm projection equipment! The engineering was of a particularly high standard, and while a few competitors could match the quality not many could improve on the innovative details that so often featured in Kamm designs. These could be ideas so different from the normal as to be considered by some to be quirky, and perhaps a typical example was the unusual method by which they chose to drive one of their 1930s projection systems. The motors, mounted side by side on a low stand, and up to three metres away from the pedestal assemblies, drove the projectors through flexible cables of a heavier, but similar type, to those used for vehicle speedometers and so on. It was said that the factory designs favoured this layout in order to minimise soundhead vibration while at the same time eliminating the possibility of seeping projector oil contaminating the motor windings and centrifugal switchgear. Figure 1, illustrates one of their 'dog and beater' silent projectors and one which they claimed projected the steadiest pictures yet seen on machines using movements of this type. Built on the same mainframe as their Maltese cross version, shown in figure 2, it was modified by simply changing the movements and without any drilling or alteration of the projector itself.

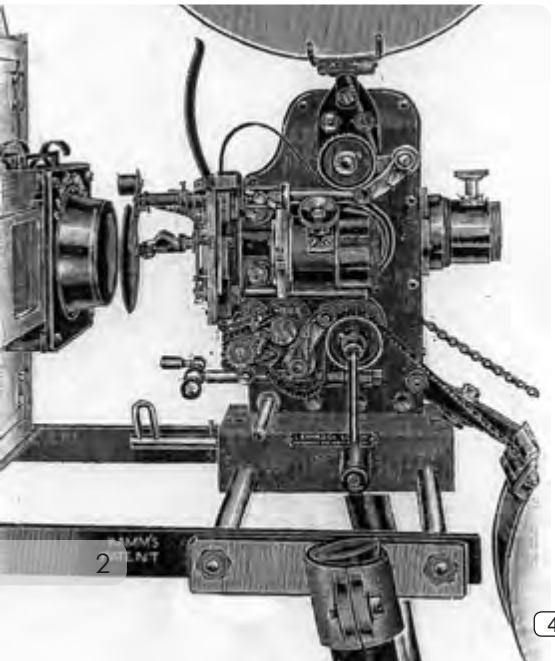


1

Beater movements, at that time, were often preferred by exhibitors who had no choice other than to accept well-worn, brittle and perforation strained films that tended to be a fire hazard when projected with intermittent sprocket movements. Even with good prints, beater movement projection could hardly be described as rock-steady if only because the take-up spool pulled the film against the hold-back sprocket teeth one way, and the beater pulled it the other! In effect the hold-back was performing two opposing functions and to overcome this shortcoming, Kamm introduced a second sprocket sub-assembly by which means it accomplished what was considered, by many to be ingenious. A small sprocket, spindle and chain wheel assembly were mounted on a bracket which was simply bolted onto an unused section of the spool-arm and there aligned with, and driven by, the take-up chain.

Figure 3 illustrates the 1930s mechanism that became part of the former MOMI collection and one on which the circular L Kamm London name plate can be seen to have been tampered with. This was the 'blacking out' of the initial 'L' and was said by Mr Kamm to be a legal requirement brought on by a change of policy within the company. As usual, the machine carried a number of unusual design features and foremost among these was probably the operating side door which with two hinges exposed the film path with the first pull and the front of the gate, lens holder and focussing system with the second. With both door sections fully opened, the parallel opening picture gate could now be opened as wide as 10cm in order to allow easy access for cleaning.

Like many European projector manufacturers, the mechanism used slow turning eight picture feed sprockets and was one of the very few film path enclosed projectors



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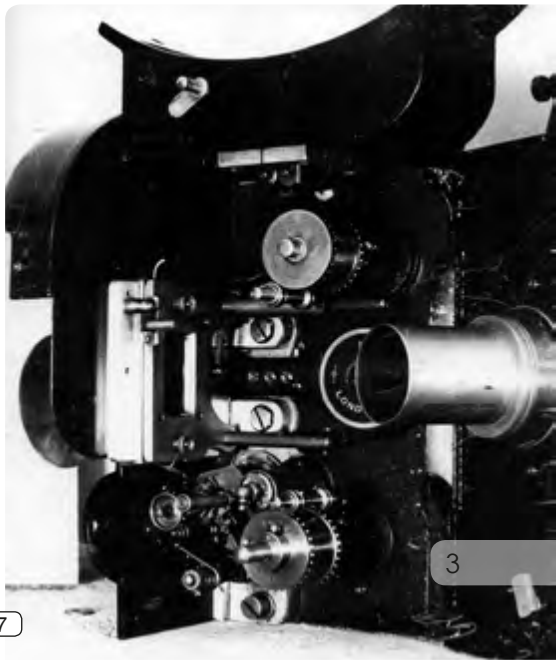

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not to use the four picture type that was so common in the US machines. Framing in the mechanism was by rotation of the cross box around a planet gearing system. While not dissimilar to many European projectors, it differed in not using either racks, gears or push rods and was instead operated by a lockable lever with which the projectionist simply tilted the box to the required mask centre. It could be operated from a slow, almost imperceptible slight rack adjustment to a rapid re-frame that could then be positively locked against creeping by a simple twist of a knob on the lever end.

Although the company was making projectors up until the outbreak of WW2, their share of the marked had become so slow by 1945 that, outside older projectionists and a few technical members of the industry, they were all but unknown. It was a surprise, therefore, that a trade press advertisement in 1949 announced that Kamm intended to introduce a revolutionary new combined projection and sound system that, housed in a pair of large steel cabinets, would bear the resounding name of Vanguard. An illustration, figure 4, showed an impressive seven feet high or more cabinet in which were housed the combined projection and soundhead assembly and such units as amplifiers, power packs, and surprisingly, arc rectifiers. Its design brought some similarity behind the ideas behind the soon to appear BTH SUPA, but differed in having a totally enclosed film-path together with more than a few unconventional features. One of these, a built-in 'projectionists screen viewing telescope,' was similar to that incorporated in the US-made Simplex E-7 projector and, it was claimed, would make focussing easier and more precise, yet despite this, there was little enthusiasm by either projectionists or manufacturers and they were not incorporated in any subsequent UK projector.

4

Later publicity illustrations pictured two other versions of cabinets that differed in several

details of the original picture in the advertisement. Ongoing information also revealed that the arc lamp would use a mirror of an unprecedented 18 inches in diameter – almost 4 inches greater than that of the most respected of all arc lamps of the period, the Peerless Magnarc, and 2 inches greater than that used in the recently introduced GB Kalee Lightmaster, a lamp that the foremost trade writer of the time had correctly predicted would, with a 16 inch mirror, be too optically critical to be practical. Other interesting details included the fact that the Maltese cross and cam would be of unique design and be made from special steels. The cross was said to be about half the thickness of most in use at the time but would be about 3 inches across the legs, twice the size of the average European projectors then made. On none of the cabinet illustrations was the word Vanguard visible and despite the obviously high investment costs, over the following months news of only one installation in the Kent area was heard of. No further information was forthcoming and while news of the company's enlargers occasionally filtered through, the name Kamm was rarely heard of in cinemas again.

Compared to the price of today's equipment, the cost for the complete outfit as described in this article was as follows:

- Ready for projection £40
- Steel stand – telescopic £3
- Projector £30
- Arc lamp (100 amp) £4
- Two spool boxes (18 inch) £3

A special thanks to Charles Morris for the supply of photographs – especially the Kamm Vanguard - used to illustrate this article

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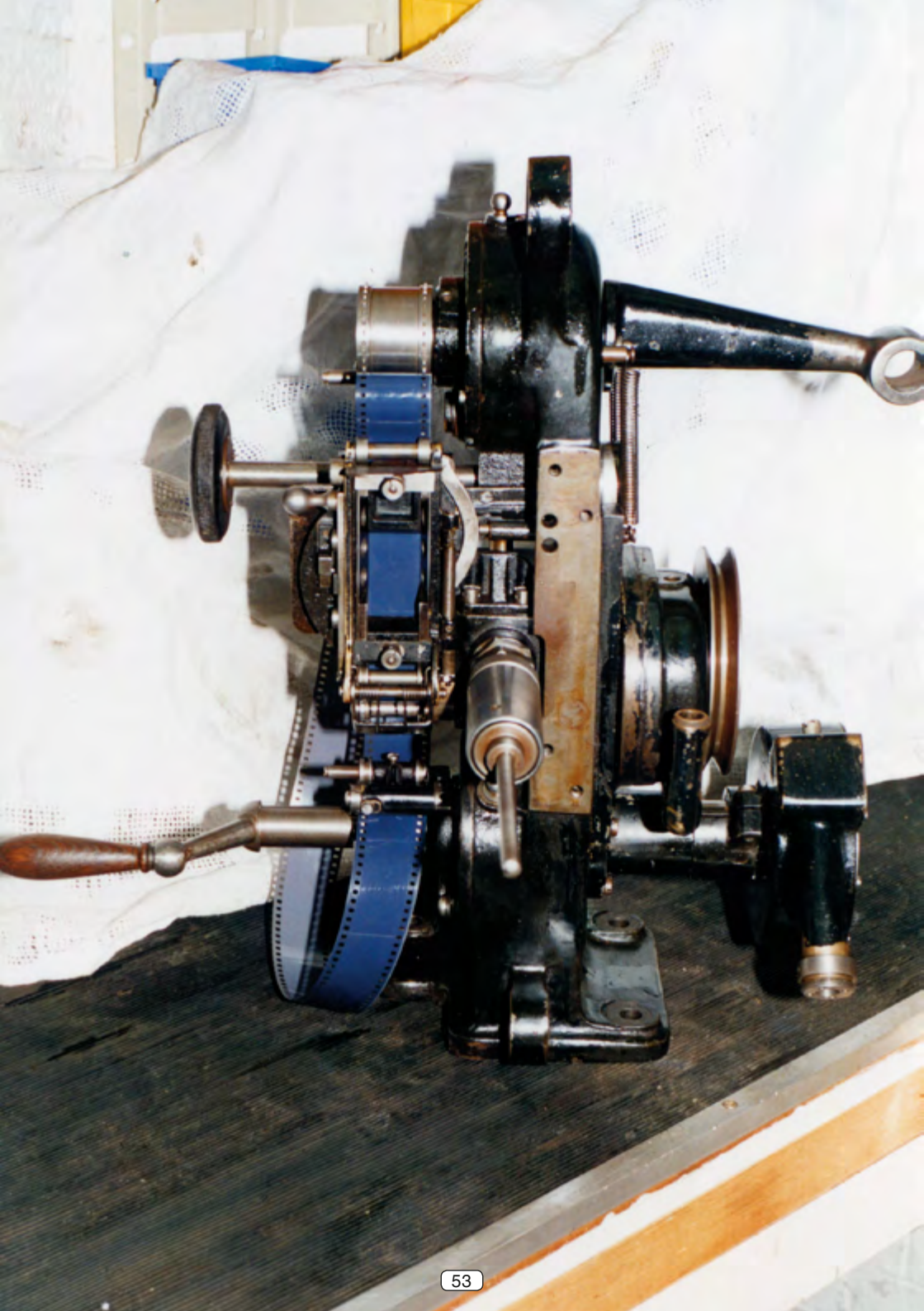
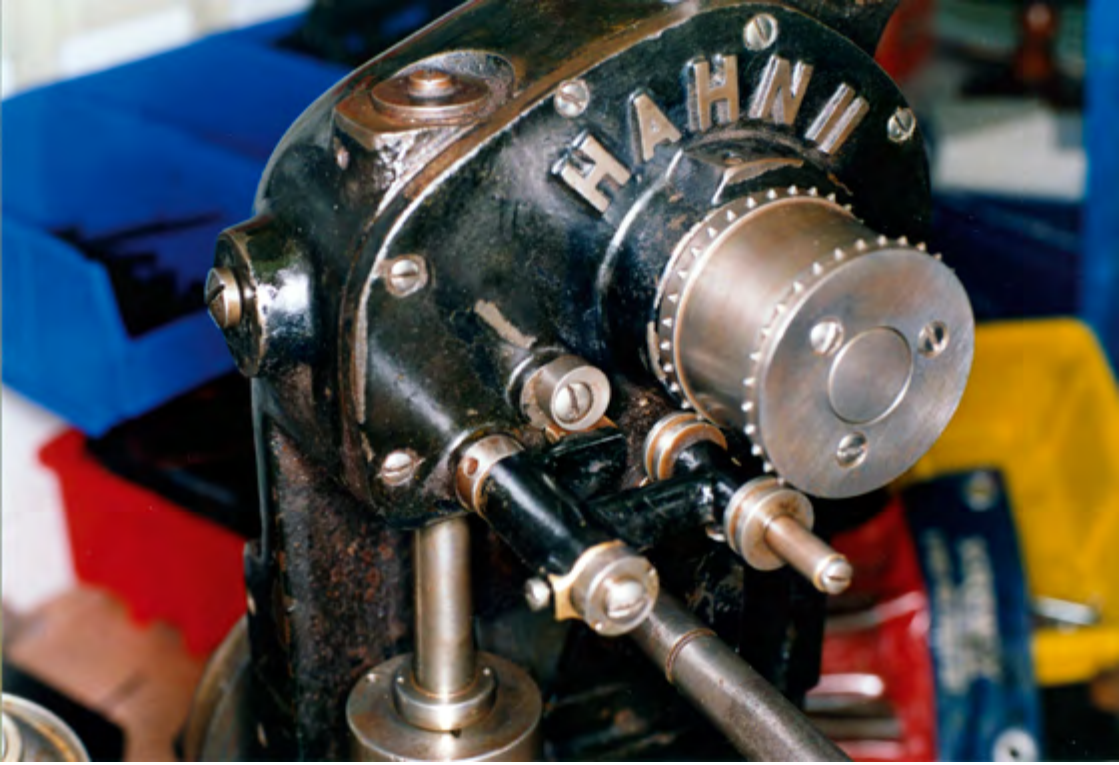
HAHN II

Alan Smart lives in Canada and is a member of the PPT. When visiting the UK he spent some time renovating and restoring a HAHN II projector. He took these photos showing the progress from start to finish.
The close-up shows the eccentric pad roller adjustment.

HAHN II




HAHN

Mystery machine in Spain

Chris Woodcock of Leicester wrote to Rewind back in 2009:

"On a recent holiday in Spain one of the places I visited was Gaudalest up in the mountains. There I came across a motorcycle museum with bikes of all ages.

"In the far corner I found this projector and lamphouse. It is mostly intact, but I could find no maker's name on it. I wondered if any of our 'eagle-eyed' members could identify it? The only clue, if any, was the brass plate on the stand just under the douser OSSA N4 and a serial number.

"How the projector came to be in a motorcycle museum, I could not find out, as there was nobody to ask. Perhaps the owners were once cinema proprietors. The building was big enough for such use".

Andrew Ward of MontePego, Sunny Spain replied:

"Chris Woodcock referred to his visit to the Museo de Vehiculos Historicos in the Vall de Guadalest, Spain, and wondered how an OSSA projector had found its way into a collection of motorcycles. Well, the answer is that the projector was the forebear of some of the motorcycles on display - although whether they had any parts in common I know not!

"Orpheo Sincronic Sociedad Anónima (OSSA) began life in 1924 making projectors. After World War II the company diversified into motorcycles, reaching its highest production levels in the motorcycle boom of the 1960s. Large numbers were exported all over Europe and to North America, where the marque still has a big following. The museum has six OSSAs in its collection of over 100 motorcycles, along with other 'motos' from all over Europe including eight from the UK.

"OSSA projectors, along with those of other Spanish makes such as Wachsmann, Proyecson and SuperSond are still in use in a few cinemas and municipal 'Casas de Cultura' (Houses of Culture) and others are living out their retirement as display items, sometimes in restaurants, hotels and shops. The Spanish people like cinema and they also like old machinery, so the two go well together.

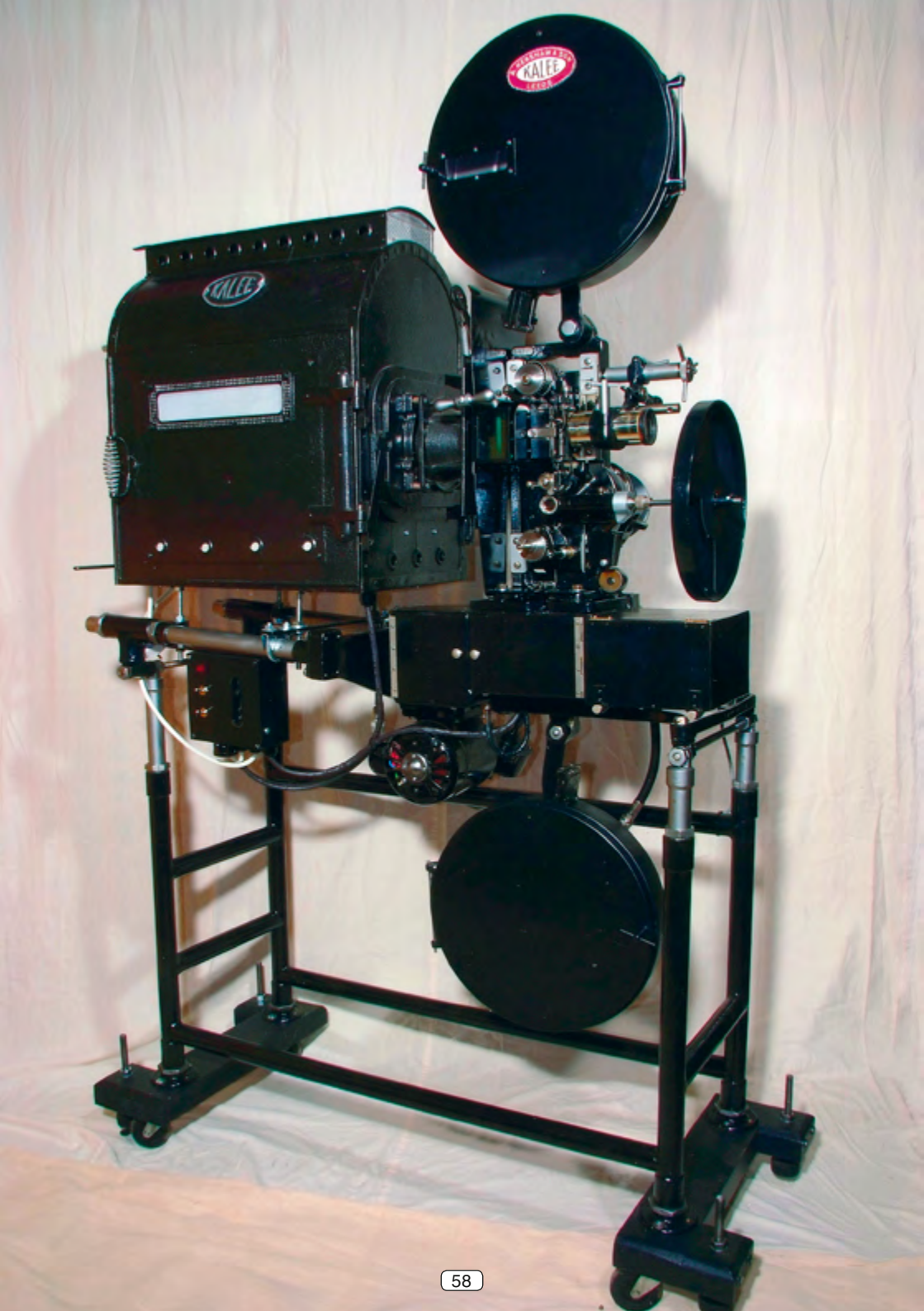
"The picture shows one of these, a splendidly preserved OSSA VI enjoying life in the upstairs window of the Casa de Cultura at Beniarbeig, fifteen minutes away from where I now live.

"Incidentally, of the makes detailed above, only Proyecson of Valencia are still in 'the business' and recently supplied and installed Kinoton equipment in our new local multiplex."

Restoring a Kalee 7 Indomitable

We have been restoring a Kalee 7 Indomitable circa 1925 serial No. 7817, well at long last we are finished! Derek James our restoration engineer, and Ken Draper our curator have passed her ready for use by the trust as our oldest fully working 35mm sound projector, hopefully she will be used as an extra for film work and an ambassador for the work we do here.

The pictures show before and after.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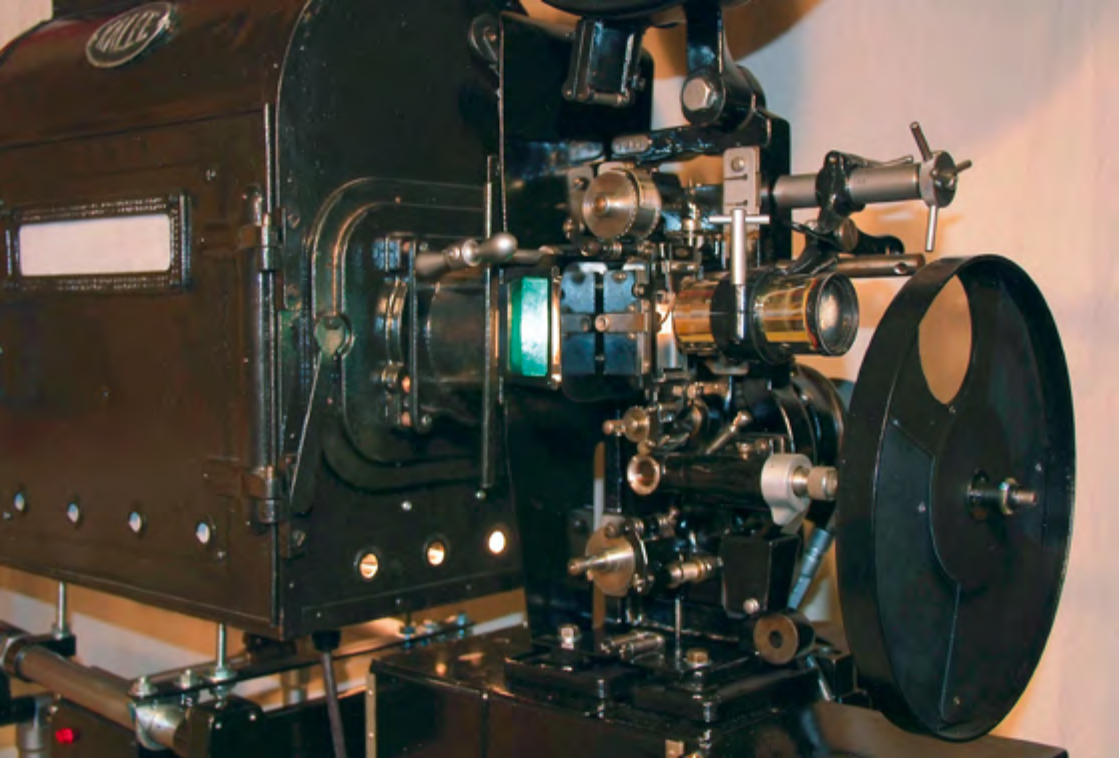
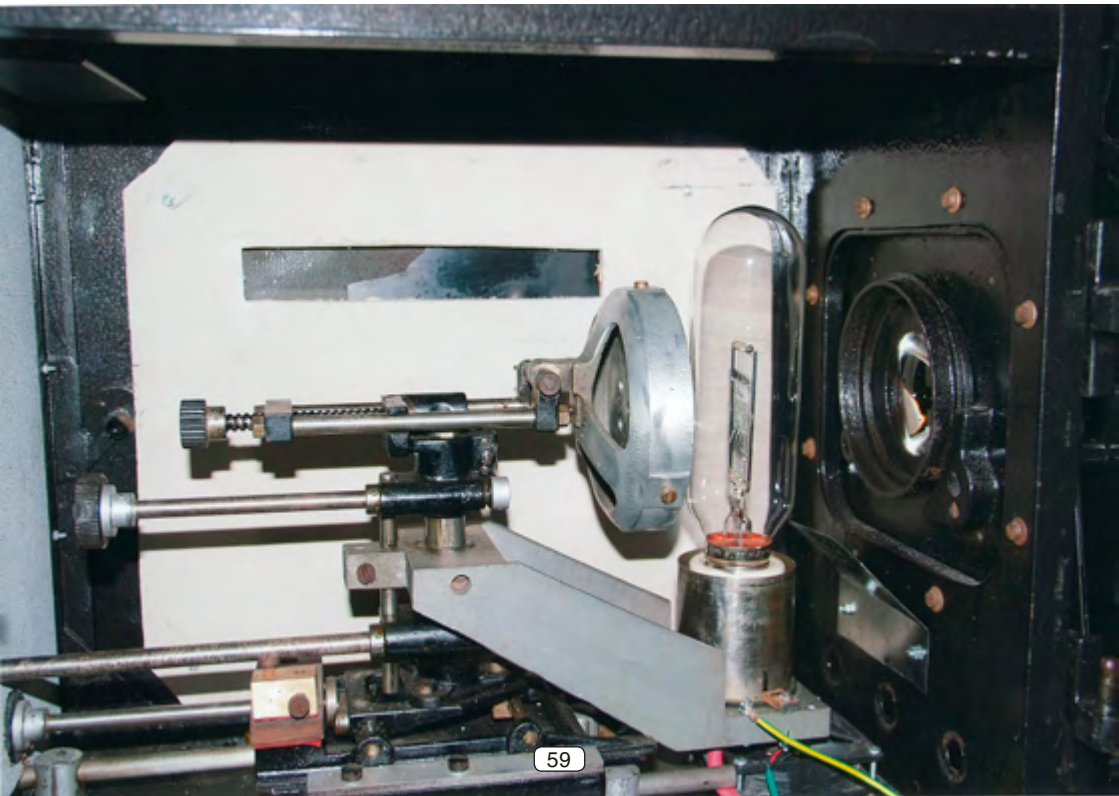




The Westar projector

Dion Hanson

Everyone is familiar with the Westar projector (Fig 1) and so I thought it would be a good idea to have a closer look at it and also learn a little bit about servicing it. The first Westar came into this country in 1947 and consequently some of these earlier machines are in need of a little TLC. Originally manufactured by Century in America the overseas rights for the Westar were purchased by Westrex. This enabled them to manufacture and sell under licence the equipment worldwide.

The projector was introduced in Britain by Western Electric who by this time had become Westrex, which stood for Western Electric Export. The projector itself was known by the Westrex engineers as the model 2001/A which was normally mounted on the 2002 soundhead or rep set. The word rep was short for reproducer which encompassed anything that reproduced sound such as the non-synch turntable.

1

The 2002 had two sprockets and the film was stabilised round the sound drum with a magnetically damped flywheel. The later soundhead (type 2003) had a single sprocket and the film was stabilised by what was known as the 'Davis' tight loop and a simple flywheel. Obviously this achieved quite a cost saving on the 2002 both in manufacturing and servicing.

But enough about the history let us have a look at the workings as it was much loved by both projectionists and engineers because of its simplicity and

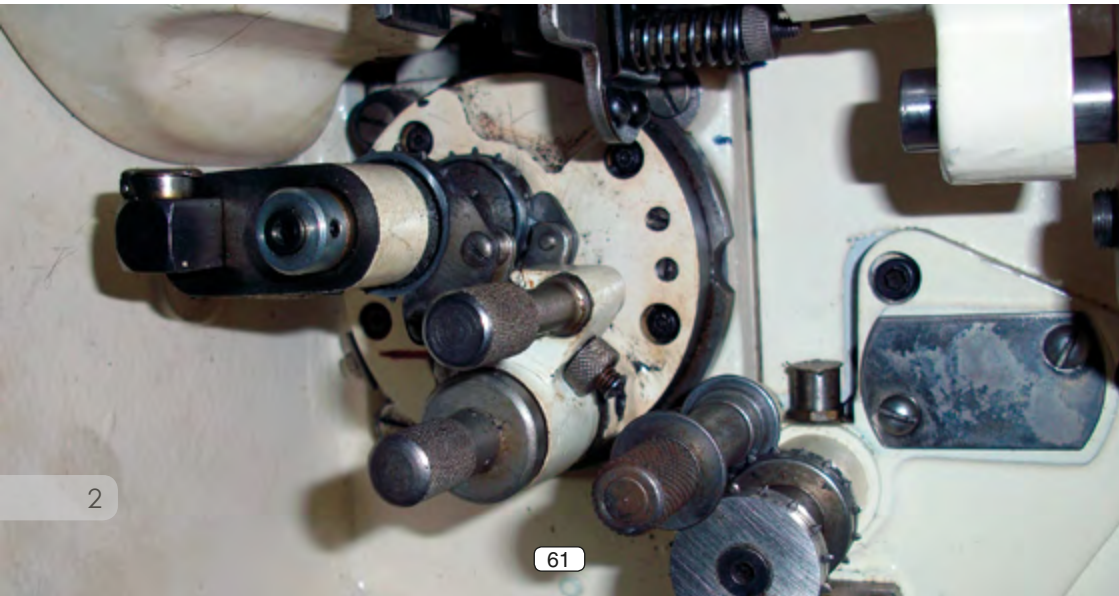
reliability. From an operator's point of view we have at the top a simple three roller fire trap. No little hinged plates or hidden rollers that stick and so it is quick to clean and thread the film through. Always check the rollers rotate freely and have no flat spots.

Next the feed sprocket (77097 for 'Fox' holes) which pulls the film off the top spool and feeds it into the picture or studio gate, the film being kept in place by a rotating pad roller. The distance between the pad roller and sprocket should be two film thicknesses so that when a splice goes through the pad roller does not fly open.

The rear part of the gate is fixed and the front section opens using a large round chrome knob on the lens barrel. Behind this knob is a locking pin to hold the gate open when you pull it towards you, the small spring is to ensure the gate remains closed while running.

The film then goes onto the intermittent sprocket and is held in place with a pair of spring loaded shoes (Fig 2). Older machines have two shoes and a butterfly spring whereas newer ones have a single assembly and a coiled spring. The whole intermittent unit moves up and down to facilitate correct racking. The vertical alignment of the intermittent sprocket and studio gate is critical and is set using a special tool issued to all Westrex engineers.

After another loop the film goes onto the hold back sprocket which if the Westar is on a 2002 is another type 77097 or on a 2003 it is a 77098. The two sprockets might look to the eye to be identical but are in fact turned with slightly different diameters even though they are both four picture sprockets. The reason for this is that on a 2002 or any other soundheads the film is not tight going into the sound drum but on a 2003 it is tight due to the Davis sprung loaded tight loop. Consequently, if you have a Westar and find you are having trouble with the film sometimes running out of the scanning drum during a show for no apparent reason; check that the correct bottom sprocket is fitted.



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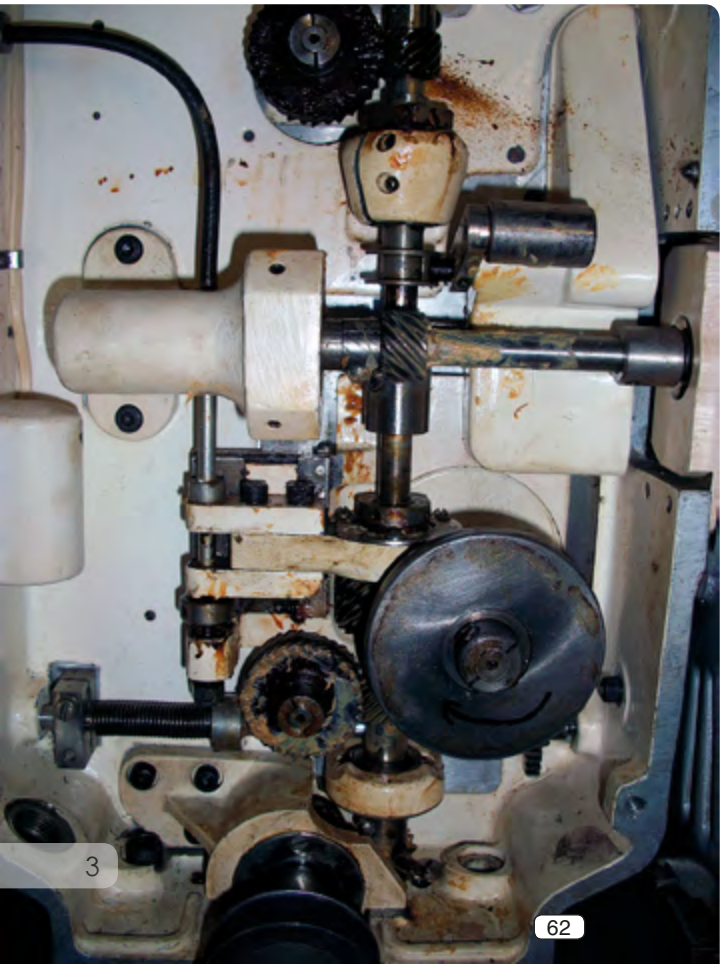
That is enough about the operating side of the Westar for the moment; let us now have a look round the back (Fig 3). If yours is like most then the first thing you notice is all the grease flung all over the place, particularly if it is the black graphite grease. If the grease gets thrown off the gears then there is too much on. The rule is if it is on the door then it isn't doing anything towards lubricating the gearing.

If you want to give your projector a real good service then washing off all the old grease and replacing it with fresh will give it a new lease of life and will let you see any areas of concern which may need further attention. The best way to do this is to remove the shafts individually and wash the old grease off with paraffin or if you want to be green using one of the approved cleaners. After some time of being an eco-warrior you can then do the job properly with some paraffin. But please dispose of it responsibly at your local recycling depot.

To begin the strip down first remove both halves of the shutter housing on the rear (one screw is under the heat shield housing behind the gate). Then you can remove the flicker blade or shutter. All these parts are held on by allen screws and so a full set of long reach imperial allen keys are a must, and they should not be worn. If you have to buy some new ones, buy the best. They must be hardened steel since if they are softer than the screw head they will burr up and never move a tight bolt.



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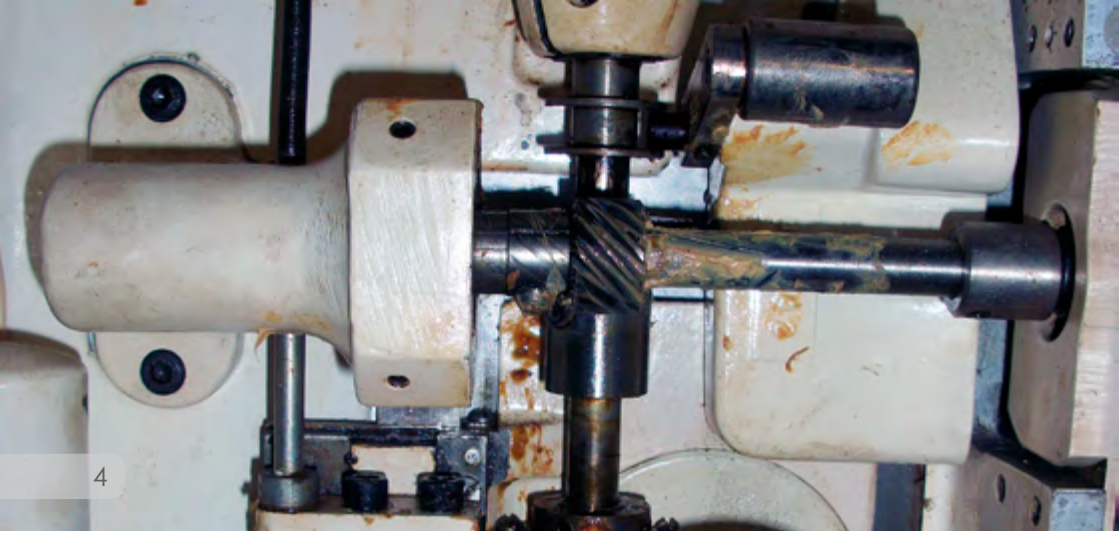
Next remove the shutter drive shaft, there are four screws holding the rear bearing and two the front (Fig 4). Once you remove the shaft take care in case there are any shims between the shaft castings and the main body casting. Also take note which screws fit where. The best practice is to screw them into the



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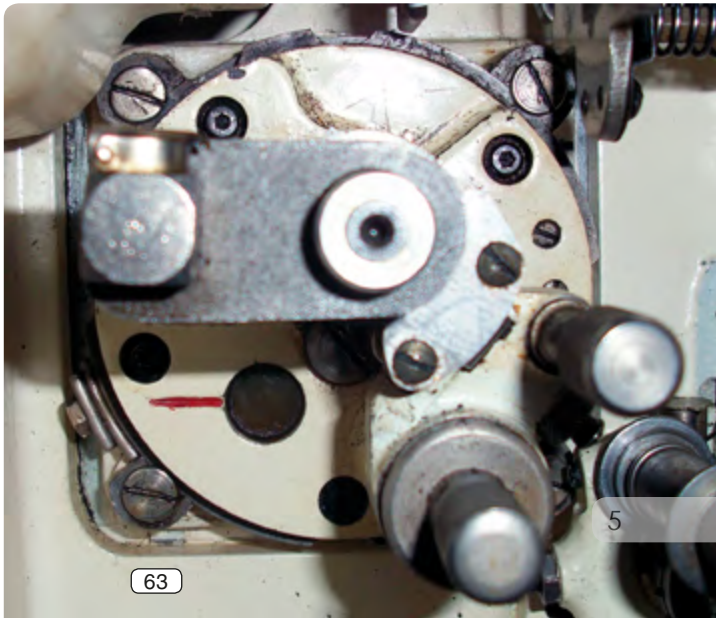
holes they came out of. You must be particularly careful on a Westar as many of the tapped holes are not through holes. This is noticeable on the shutter shaft's two front holes where the lens holder blocks the through holes. If you screw a bolt in that is too long, then as you tighten it you can crack the main casting from top to bottom. Believe me I know, I have seen it done.

Now it is time to remove the heart of the projector, the intermittent. First remove the screws holding the fixed lower half of the rear door. This then allows you to remove the flywheel, put the screw back into it for safe keeping. Now round to the front and loosen the four large headed screws around its perimeter (Fig 5). These screws although having a large head are only 4BA so never put too much pressure on them.

The heads simply locks onto the steel rim to hold the unit in place, slackening them allows the whole intermittent unit to rotate until the heads align with the cut outs. The unit can then be eased towards you and removed. It may be necessary to rack the unit down slightly to clear the bottom of the studio gate though there is another cut-out specifically to clear the runner.

Do not try and adjust or move any other screws on the unit, leave well alone. I'll cover opening and adjusting the intermittent unit another time since this is not a task for the feint hearted.



5

At this point, if you want to, you can remove the two sprocket shafts by taking off the rear gear and drawing the shaft out from the front. Do be careful not to get these two shafts mixed up as they are very similar. On later models (2001C onwards) the sprockets are on small separate castings and can be removed by undoing the four bolts at the front, which hold the castings in place.

Finally, the vertical shaft can be removed. To do this first withdraw the two screws which hold the racking barrel gear housing in place. These are quite long and are vertical (Fig 6). Once removed the bearing casting swings towards you. If the Westar is on a 2002 sound head you must undo the screws holding the vertical flexible drive shaft. However, if it is on a 2003 or any other sound head with a horizontal coupling then the shaft just lifts clear once the upper and lower bearing allen cap screws are removed.

The vertical shaft once out can be thoroughly cleaned and checked. There is one part which often causes problems and that is the large sliding barrel gear. This gear slides up and down the shaft as you turn the racking handle. If you are a good projectionist and never had a rack this sliding action seizes up through lack of use and you are not aware of anything until you have a rack and the handle will not turn. When you remove the shaft, you may see what appears to be brown rust on the shaft and gear. This is what is known as 'fretting' and is caused when two pieces of metal move slightly or chatter while rotating. If you cannot free it then the whole shaft must be stripped down and thoroughly cleaned.

One other thing to check is if the keyway on the racking gear is worn. To do this hold the shaft and then try and rotate the barrel gear, if there is play then the keyway is worn, and the gear requires replacement (Fig 7). A worn keyway often manifests itself as ghosting on screen which cannot be removed with the shutter adjustment. If you do have to remove the gear then lay each part in a line as it comes off the shaft (standard practice) or you will find it a difficult task to reassemble it without the aid of 'The Westrex Bible'.

6

Once you are happy that you have cleaned everything and checked for wear then it is time to reassemble everything.


7

This is simply a reverse of dismantling. However, check at each stage that you have end play on all the shafts, and that the mesh on the gears is not too tight.

When inserting the intermittent, rotate it until it hits the stop plate, and then tighten the four large headed screws. Making sure you do not overtighten them and so shear them off. The stop plate guarantees the correct meshing of the vertical shaft and intermittent gears. We can be a bit cheeky here with the phasing of the intermittent and the shutter. First fit the half of the shutter housing nearest the projectionist. Then after fitting the shutter shaft and with the shutter loose on the shaft turn the intermittent over until it is midway on pull down or two teeth. Use the top of the intermittent shoes as a reference point. Then rotate the shutter on its shaft until the notched blade is opposite the central bar in the shutter glass window. Now lock the shutter onto the shaft. Inch the machine over and observe that the machine is in phase. Slight adjustment can be made using the shutter knob when the machine is running.

Hopefully, you have no bits left over and we are nearly ready to run the machine. Before doing so inch the machine over and check for any tight spots. The machine should feel free over all four pull downs of the intermittent. Now before the final switch on we need to lubricate the gears. Any good quality synthetic grease for open gears is recommended but I have often used Vaseline and find it just as effective and certainly less messy than the graphite grease used in the early days.

If you are happy then switch on the motor and the machine should run nice and quiet. If it sounds like a machine gun, then you have either not tightened the intermittent flywheel enough or you have left it off altogether. Here speaks the voice of experience.

The different suffixes of the 2001 and what they mean	
Westar	**Description**
2001/A	Original single shutter
2001/B	Original double shutter
2001/C	As A but separate sprocket shaft plates
2001/D	As C but with double shutter
2001/E	As C but adapted for CinemaScope
2001/F	As E but with double shutter
2001/G	As E but water cooled gate
2001/H	As G but with double shutter

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