OPTICAL TOYS

and the

DEVELOPMENT OF THE PROJECTED IMAGE

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Looking back to the days when people first explored the field of the projected image, I devoted a lot of time to 'consuming' books and publications on the subject, but failed to discover where and how it all started. I found, there was no definite starting point, it was due to the various contrivances and the effort of ages, that it gradually developed and resulted in what we call the projected image.

In this article, I shall concentrate on how optical devices have affected the projected image. Based on items of my collection, I shall make an attempt to show how many of these have been relevant to the magical effects of the lantern.

CHINESE SHADES migrated via Persia, Turkey and Greece to Italy and Germany and spread throughout the whole of Western Europe. In the 18th century, travelling Italian showmen went to England to perform their Galantee Shows and Ambroise, a Frenchman, opened a shadow-theatre in London. Especially in France, the *ombres chinoises* were very successful. In 1772, Dominique Séraphin introduced them and established a shadow-theatre at Versailles. Next, it moved to Paris where it was carried on by his descendants until 1870. A decade later, Rodolphe Salis started his 'chinoiseries' in the cabaret 'Le Chat Noir', also in Paris. In collaboration with the painters Henri Rivière and Caran d'Ache, it grew into a most sophisticated show in which music, design and literature were combined into a distinctive form of drama.

Toy and print-shops sold various kinds of shadow-theatres, these having become a major amusement. Some had a beautifully coloured proscenium-frames with all the characters ready to be played. Others, printed the black figures and scenes on sheets, to be pasted on cardboard ready for cutting out.

Lots of shadow techniques were put into practice. There was the art of *portrait-silhouettes*, the cutting of scenery and decoration patterns, the negative shades or so called *white shadows* (2), the *ombromanies* or handshadows etc...

Subsequently, shadows were adapted to the magic lantern. Paper-cuttings, originally intended as patterns for paper theatres, were used for illustrating slides. Series of grotesque figures of primitive character were painted in black on long sheets of glass (3). Some slides combined shadows with coloured scenery. Strips of glass, depicting silhouettes of tiny people and vehicles, were slipped into a wooden frame and passsed in front of a brightly coloured background. The French slide-painter Desh (4) achieved very remarkable effects by using this technique. Curious shapes of cast shadows were obtained by comic drawings, e.g. the silhouette of an elephant was produced by a lady holding up her open umbrella in a storm. Still others had figures cut from a thin brass sheet and were fitted with articulated limbs. Operated by rackwork or lever motion, they moved in a very natural way (5).

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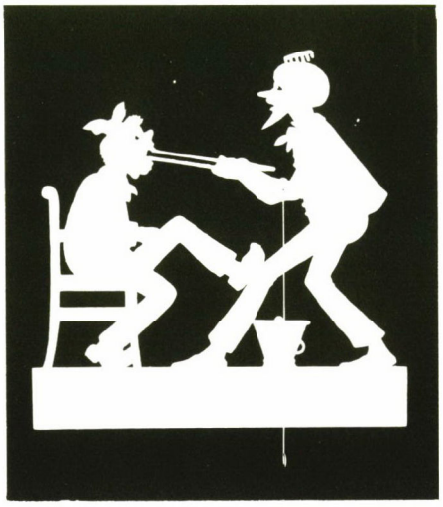

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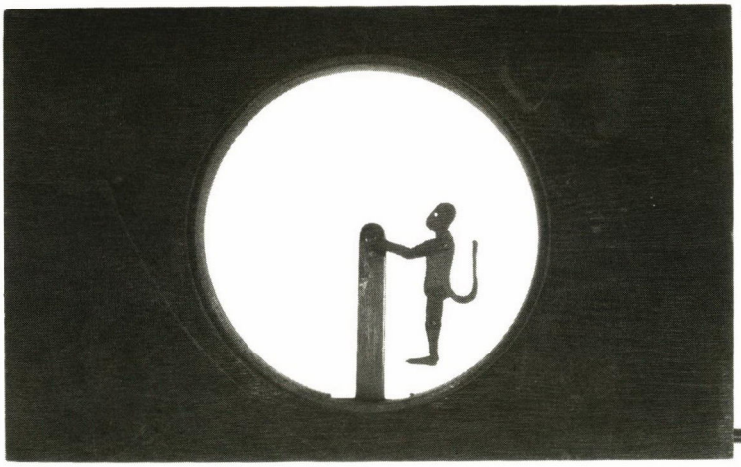

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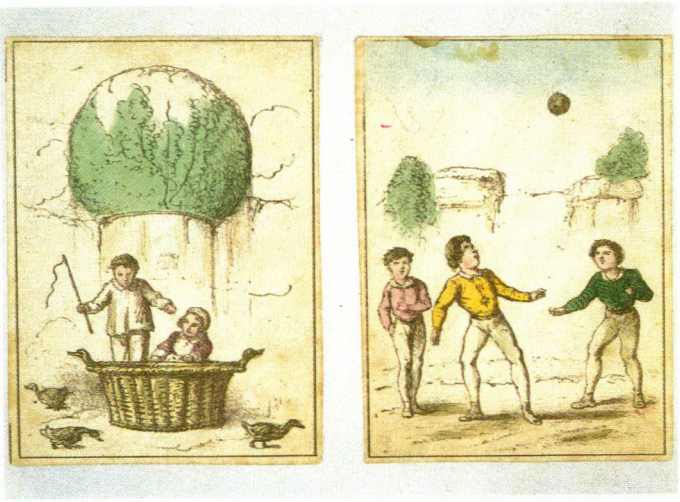


LE TOUCHER

6.

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LA LANTERNE MAGIQUE


LE THAUMATROPE
(DÉPOSÉ)
FAIRE LES FICELLES ENTRE LES MAINS ET IMPRIMER AU CARTON UN RAPIDE MOUVEMENT DE ROTATION

11.

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At the turn of the century, a small toy-theatre appeared in France called the 'Ombre Cinéma'. It consisted of a translucent screen with black vertical lines and with a light source behind. A long paper strip, showing a procession of characters – printed in two successive positions and in vertical lines, too – was unrolled along the rear of the grid. Alternately each position is uncovered and thus the characters seem to move.

For a long time, scientists and philosophers had researched into optical phenomena. The laws of light and perspective were studied and experiments were carried out with lenses and mirrors. The practical applications of this knowledge lead to the invention of many ingenious and entertaining devices intended to capture the interest and sympathy of a public always eager for change and new things.

In the 18th century, optical recreations were largely propagated following the publication of the book *Nouvelles Récréations Physiques et Mathématiques* by the geographer and physicist Edme Charles Guyot (1706-1786), which was printed in several editions and translated and published in German, Dutch and English. The book covers a wide variety of applications on physiological and mathematical subjects such as *perspectives*, *magnets*, *fire*, *electricity* and *optics* and is illustrated with engravings by Sellier. The sections devoted to optics – *l'Optique*, *la Catroptique*, *la Dioptrique* – contain a wide range of optical illusions and explainations of how they work and how they do the tricks to deceive vision through the aid of mirrors and lenses. A clear explanation is given of the construction of perspective boxes, magical theatres, anamorphic drawings, the camera obscura and the magic lantern and of the projection of ghost illusions on smoke. These devices did not all involve projection, but they had one thing in common, they gave the illusion of seeing an image, because objects seemed to be where they were not.

Optical amusements came more and more into vogue and experienced a wide popularity in the 19th century. New ideas were developed and many of the principles of older inventions were extended and simplified. Varieties of delightful playthings appeared as 'optical toys and instruments' in catalogues of that time. They were mass-produced to be sold as scientific curiosities for popular entertainment. Although, most of them were made of paper, cardboard, glass and japanned metal and operated by simple tabs and bits of string, they worked very well and produced most beautiful effects. They were at the same time instructive and entertaining and amused young and old. The intangible element, that we cannot express in words, is the mysterious charm and the magical working effect that seems to hover over all those playthings.

Let us take a look into this exciting and mysterious world and discover those toys which are relevant to the projected image.

There are *changing pictures* which were made of paper and constructed in such a way that two images were superimposed on each other. When pulling out a tab or when they are illuminated from behind, they change into a completely different view, often of opposing subjects (6). They remind us of the effects of dioramic or dissolving views.

Moving pictures were made of thin cardboard and parts of the subject could be animated by means of a lever or a tab (7), acting almost in the same way as lever (8) or slipping slides.

Anamorphic pictures (9) are distorted drawings, which come to normal proportions when viewed, for example, in a cylindrical or conical mirror. The principle is still used in today's Cinemascope projection – though lenses rather than mirrors are involved.

One of the most popular toys of the Victorian age was the *Kaleidoscope*. It consists of two mirrors set at an angle, fixed in a tube. Pieces of coloured glass and other transparent objects are reflected and repeated symmetrically all around a circle. By turning the tube, beautifully coloured, continuously changing patterns are produced. The invention was adapted to the lantern by Charles Darker. An arrangement of mirrors and lenses was attached to the front of the lantern. The effects were achieved by rackwork frames, containing pieces of coloured glass, bugles and beads introduced into the usual slide-holder. Nothing resembles the kaleidoscope more than the effects produced by chromatrope lantern slides.

Magic lantern slides and the animated devices described above, work by mechanical aids and are not true *moving pictures* in the sense we understand it. A completely different series of scientific toys are those which are effected by the principle of *persistence of vision*, that is, the impression of an object retained by the retina of the eye for a split second after its disappearance. This phenomenon was first described by Dr. Roget in 1824 in a lecture to the Royal Society.

In 1825, Dr. John Ayrton Paris invented a delightful little plaything to which he gave the name of *thaumatrope* (10), which means 'wonder turner'. It is a cardboard disc, with on either face a different image. Two bits of string are attached to it at opposite edges. By twirling the disc between fingers and thumbs, the images seem to be superimposed upon each other appearing as one. Various designs, such as a parrot entering his cage and a rider mounting his horse, were sold in round boxes, labelled 'Thaumatropical Amusement'. Similar series were published in France. A later version of twelve printed discs in a rectangular box, merges coloured prints together with black silhouette figures. Among them, a scene of a magic lantern show performed by children. By turning the disc, the silhouette of a Punch is thrown upon the little screen.

In 1832, Joseph Plateau, a Belgian physicist, invented the *Phenakistiscope*. Like the thaumatrope, the phenakistiscope applies the same principle of persistence of vision. It was the first attempt to create real movement. A number of radial slots are cut out around the circumference of a cardboard disc. In between, pictures are drawn in successive phases of movement. By looking into a mirror and rotating the disc rapidly, the pictures reflected in the mirror seen through the slots, are seen to occupy fixed positions while executing their proper movements.

Several attempts were made to adapt the phenakistiscope to optical projection. In 1851, the Austrian Lieutenant Franz von Uchatius fitted a transparent disc with painted figures on a projector and created for the first time moving pictures on the screen. In 1869, A.B. Brown (USA) patented a kind of hand-cranked projecting phenakistiscope, supplied with a maltese cross and shutter to ensure intermittent movement. The Frenchman G. Demenÿ adapted his *Phonoscope*, invented in 1892, to a Molteni projector. He placed a series of close-up photographs in a phenakistiscope disc, picturing himself, pronouncing the words '*Vive la France*'. Other applications were the *Wheel of Life* and the *Choreutoscope*, which appeared as special forms of lantern slides.

But, the most effective of all optical toys which contributed to projection was the *Praxinoscope*, invented by Emile Reynaud and patented in Paris in December 1877.

8.

Charles Emile Reynaud was born in 1844 at Montreuil sous Bois (Seine), the son of a medal engraver and watchmaker. His mother was a fine artist in water-colours, a pupil of the botanical painter Redouté. From his early childhood he was educated in a spirit of technology and art. At the age of 14, he served his apprenticeship to a precision engineer. Then, he studied photography and attended scientific lectures for many years. After his father's death, he and his mother left Paris and moved to Puy-en-Velay, their place of origin. From 1873 till 1877, he lectured on physics, mechanics and chemistry in a college at Puy.

Since 1832, Plateau and Horner had been inventing devices for producing illusions of movement by intermittent viewing, creating single continuous action. Reynaud was not satisfied with these, because of the multiplying effect of the subject and a considerable loss of light caused by the pierced slots. He developed his *Praxinoscope* (11) to overcome these defects. Along the inner side of a tin drum, he placed a strip with drawings which were reflected in a polygonal drum of mirrors in the centre. When revolving the drum, figures were viewed in the mirrors and produced smooth movement without loss of brilliance.

In 1879 he introduced the *Praxinoscope-Théâtre* (12, 13 & 14). Through a miniature proscenium frame, holding a thin sheet of glass, the moving figures were now seen superimposed upon a reflected scene.

With the *Praxinoscope à Projection*, patented in 1880, he made his first step towards animated projection. This time, the paintings were on separated glasses put in a flexible band and fitted in a revolving drum. By passing light through the glasses, figures were reflected in the mirrors and sent through a projecting lens to be focused upon a screen. A second lens superimposed a background scene.

The disadvantage was that he could only show single and repeated action. He developed a system, which he patented in 1888, for using bands of greater length. Running between two reels, they were provided with perforations which gripped into spigots on a large wheel. By turning the reels, the wheel was set in motion and at the same time pictures were reflected in a mirror drum and projected upon the screen. Operating the machine was a difficult matter and Reynaud decided to exploit it himself. He entered into business with the Musée Grévin and installed his *Théâtre Optique* in the Cabinet Phantastique. It was first introduced to the public on October 28th, 1892.

People crowded about the box-office of the Musée Grévin. A large coloured poster, designed by Chéret, depicting Pierrot serenading Colombine, announced the first performance of Reynaud's *Pantomimes Lumineuses* (15).

The small theatre was full of tensely awaiting people. Three separate sequences were on the programme: *Un bon bock*, *Le Clown et ses Chiens* and *Pauvre Pierrot*. Finally, the lights dimmed and to the tones of Gaston Paulin's music, lifelike figures appeared on the screen. They were brightly illuminated and stood in strong relief to the background scene. Then, they began to move and walked over the screen, they came and went, changed positions, jumped and danced, cried and laughed, all as in reality – the public were amazed! Of course, people were aware that what they saw were images projected by some complicated machine at the back of the screen, but never before had they seen drawn figures moving, in such a natural way, with gestures much like those of living beings. The illusion was further reinforced, when Harlequin struck Pierrot with a stick on his back as they could hear the strokes perfectly synchronised with the action. At the end, Pierrot sang his love-song for Colombine and when the curtain drew, the public was wildly enthusiastic and approved with a long ovation.

More than any other toy, the praxinoscope and its derivatives have contributed to the development of the animated projected image. Reynaud is credited with inventing the perforated picture-band, an essential part in the development of cinematography. He also adapted a system of sound effects which were electrically controlled and synchronised these to his picture-strips. He contributed to the analysis of movement the principle of the cartoon-film. He created continuous action without losing sharpness or brilliance.

What made Reynaud so different from other contemporary inventors was that he not only invented but also constructed and manufactured. He was a master of the mechanical as well as the optical aspects of his devices. He drew and painted the strips himself, wrote his scenarios and directed the plays. He was an all-round artist, in a word - a GENIUS. His pioneering work was known to the Lumiére Brothers and seems, at least in part, to have paved the way for their Cinématographe which appeared in 1895.

Although PANORAMAS and DIORAMAS are not the kind of subject we are particularly dealing with in this article, their impact on the projected image has been quite considerable and must be mentioned.

The Panorama was invented in the 1780s by Robert Barker, an Edinburgh painter. This large show, exhibited in a permanent hall, consisted of a gigantic uninterrupted painting mounted on the inner surface of a rotunda. From a platform in the centre of the building the audience looked upon immense scenes. The subjects were all purely scenic and ranged from topics such as the great battles of the Napoleonic Wars and Trafalgar, to large views of cities such as Paris, Berlin and New York.

Considering to what extent Panoramas were to benefit the development of the projected image, I am inclined to compare them to panoramic slides in the sense that what the eye caught by looking all around over the painting, is achieved in the lantern by pushing the slide slowly through, creating the impression of a moving panorama.

In many of the long slides, subjects such as Napoléon's retreat from Moscow and the battles of Trafalgar and Waterloo, are quite similar to those of the Panorama. A hand-painted panoramic slide of Paris, now in the possession of the Science Museum in London, seems as though it were taken directly from Barker's Panorama.

Shortly after the invention of the Panorama, a toy theatre of the same name was published. Behind a proscenium frame, a long paper strip was unrolled and allowed people to see moving changing views. A device with almost the same effect, was the peep-show with moving background. An example in my collection depicts the cortège of Napoléon's funeral, watched by people from behind a window.

The other optical phenomenon, the Diorama, was introduced by Louis Jacques Mandé Daguerre (the inventor of the daguerreotype), and Charles Marie Bouton. The building was erected in the rue Sanson in Paris and opened to the public on July 11th, 1822. Encouraged by his success in Paris, Daguerre set up a second establishment at Park Square East, Regents Park, in London, which opened on September 29th, 1823. The Diorama consisted of two scenes at an angle to each other with seating located in between on a movable platform that moved spectators from picture to picture. The huge transparent pictures were exhibited by combining translucent and opaque painting and by changing the lighting from front and back (16). Most enchanting effects were produced, for example, a church was first seen in the full light of day, empty, and then at midnight, illuminated by candles and full of kneeling figures. By manipulating shutters and blinds, light could be covered partially or entirely, changing light and shadow, as by the effect of the sudden gleams of sunshine or when clouds were passing the moon.

Many of the astonishing effects produced by the Diorama are quite similar to those later shown in lantern exhibitions by means of dissolving views.

Dissolving views were introduced in about 1846 by Messrs. Childe and Hill, each responsible for a well-defined portion of the invention. There is no doubt that these gentlemen visited the Diorama. We are justified in assuming that they were inspired by Daguerre's transparencies and made attempts to adapt the effects to the magic lantern. Mr. Childe commenced his experiments in about 1840, which were afterwards elaborated and produced in their perfect form in 1846. In 1845, Mr. Hill, who was in business with Mr. Childe, invented the slide plate

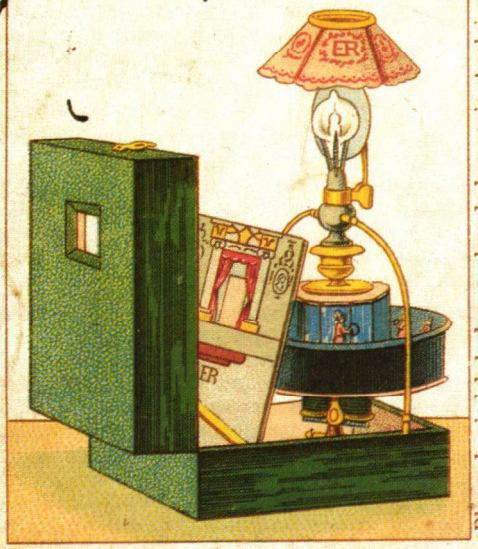
16.

BREVETÉ S.G.D.G. · PATENTED · MÉD. D'ARGENT · PARIS 1879 ·

ER PARIS

PRAXINOSCOPE-THÉÂTRE ÉLECTRIQUE

Visser le pied du moteur au fond de la boîte. La rotation se produit à volonté, dans les deux sens.



Placer le pied de la lampe dans le bougeoir et celui-ci sur l'axe du moteur. Fixer les fils aux bornes de chaque côté.

Dans cet appareil la rotation est obtenue à l'aide d'un moteur électrique, à changement de marche automatique et l'éclairage est produit par une lampe électrique à incandescence, munie d'un réflecteur et d'un abat-jour.

BREVETÉ S.G.D.G. · PATENTED · MÉD. D'ARGENT · PARIS 1879 ·

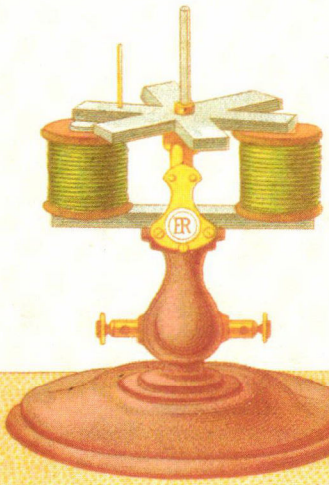
ER PARIS

Moteur électrique

AVEC AXE FIXE

et Changement de marche automatique

Une pile au bi-chromate, petit modèle, peut faire fonctionner ce moteur, avec le Praxinoscope.



Pour régler la vitesse, plonger plus ou moins dans le liquide le zinc de la pile.

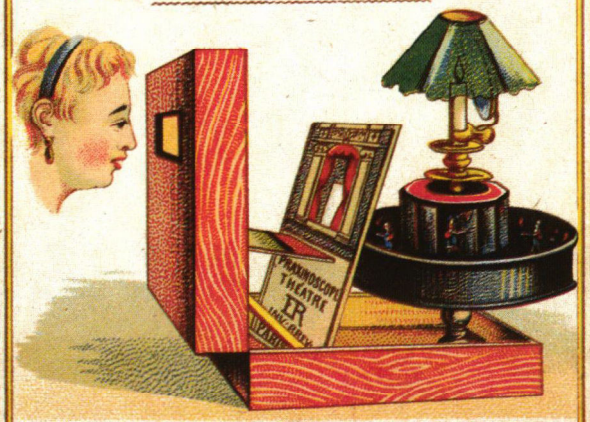
Ce moteur, spécialement disposé pour le praxinoscope permet d'obtenir, à volonté, la rotation à droite ou à gauche.

Il suffit de lancer l'appareil dans le sens que l'on désire.

(Ce moteur s'applique également au Praxinoscope-théâtre)

PRAXINOSCOPE-THÉATRE

(Breveté S. G. D. G. en France et à l'Étranger)



20 sujets parus (sur fonds noirs)

1878 MÉDAILLE D'ARGENT 1878

ER

PARIS

20 sujets parus (sur fonds noirs)

Le Praxinoscope-Théâtre, par une disposition très-simple, produit de curieuses scènes animées, où l'illusion du relief et l'attrait du décor viennent s'ajouter à l'illusion du mouvement.

PROJECTIONS ANIMÉES

obtenues à l'aide du

Praxinoscope A *projection*

Nouveau jouet d'optique

produisant sur un écran de véritables tableaux vivants.

fonctionnant à l'aide d'une lampe ordinaire

Sujets s'animant au milieu d'un décor changeant à volonté.

1878 MÉDAILLE D'ARGENT 1878

ER

BREVETÉ S.G.D.G. PARIS PATENTED ENGLAND

dissolver. Both gentlemen's ideas were adopted by the directors of the Royal Polytechnic Institution.

Similarities in word expression suggest a relationship between both media. Dissolving views were often called 'Dioramic views and effects' and lantern exhibitions were sometimes advertised as 'Dioramic entertainments' though, in fact, they had nothing in common with the Diorama proper. In a catalogue by Desh, dissolving views were announced as 'Vues fondantes et tableaux mécanisés pour Polyorama (appareil double et triple en 2, 3 ou 4 tableaux).'

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The *Polyorama Panoptique* is another optical toy, a miniature replica of the Diorama, invented by the French optician Lemaire. It is a rectangular box with a lens, in front, fitted on bellows permitting adjustment. At the top and back of the box is a movable lid to admit or exclude light. Usually 6 or 12 coloured lithographic transparencies were provided. These prints, mounted on wooden frames, were of thin paper with a double picture pasted on the back. They slip inside the box and, when holding it against the light, by moving the lids up and down, a winter scene dissolves into spring, or day into night as well as into completely different views. Some scenes were pin-pricked and covered with coloured paper to add a complementary effect of illumination.

A different kind of Polyorama, a French invention too, appeared some time later and was called *La Lorgnette Pittoresque*. It is funnel-shaped and uses round pictures instead of rectangular, and produces almost the same effect.

From copies of these toys still surviving today, we can get an idea of the charm and appeal of the Diorama.

In this article, I have concentrated on how optical devices have affected the projected image. To conclude, a few words must be said about how optical toys have benefited by the projected image.

In the last decade of the 19th century, Thomas Alva Edison brought out his *Kinetoscope* in the USA and Lumière presented the Cinématographe in France. The invention of the cinema captured the interest of the public and soon became the main attraction of the time.

In 1896, the Lumière Brothers in France introduced a small apparatus for viewing motion pictures 'at home' and called it the *Kinora* (17). It was a wooden case, in which a drum with prints, taken from their films, could be seen through a magnifying glass at the top. The drum was driven by a clockwork motor to ensure a regular rotation while a metal thumb stopped the pictures for a fraction of a second, creating life-like motion in that way.

In 1897, the Kinora appeared in England under the same name. Some models were hand-driven, others worked by spring-action and were sometimes provided with three magnifying glasses so that more than one person could see the pictures at the same time.

A very popular attraction, still seen at fairs and seaside resorts till the first half of this century, was the *Mutoscope*. It is a penny-in-the-slot viewing machine which works by turning a handle.

And then, at last, there were the *Pocket Films* those little charming flicker-books, sold by thousands or given free as publicity material, showing subjects such as a boxing match, a dancer, a man smoking a pipe or taking off his hat. A more sophisticated version was the *Filoscope*. In this, the pictures were mounted in a metal case and flashed past by pressing a lever downwards.

Nearly two and a half centuries had passed since the time of Kircher's magic lantern until the Cinématographe-Lumière was introduced. That night in the 'Grand Café', the Lumières turned on the light of their cinématographe and the first 'living pictures' flickered upon the screen. They had opened a window, a window with a view on the world, a world which would pass far above their most daring expectations. But, at the same time, they turned off the other light, the light over ages in which people had been delighted and amused by so many splendid entertaining devices. Through all those years, countless efforts had been made by scientists and inventors such as Daguerre, Plateau, Horner and Reynaud, but also by the many 'unknowns' who laboured in silence and devoted time and energy in simple pastimes. Due to all those people and the many contrivances, optical projection developed – culminating in the art of modern cinematography.