25,000 years to trap a shadow

A HISTORY OF THE
BIRTH OF
MOVING PICTURES

by

WILFRED E. L. DAY
F.R.P.S. F.R.S.A.

ABRIDGED EDITION

Twenty Five Thousand Years to Trap a Shadow.

Contents of Section 2.-

Contents of Section 2 Continued.

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Dr Peter Mark Roget M.D. F.R.S

as a young Man about the time he gave his Wonderful Paper before the Royal Society

Dr PETER MARK ROGET M.D. FRS.

The Founder of the Science of Moving Pictures

SECTION 2.

HOW THE WHEELS OF A BAKER'S CART LAID THE FOUNDATION OF A GREAT INDUSTRY.

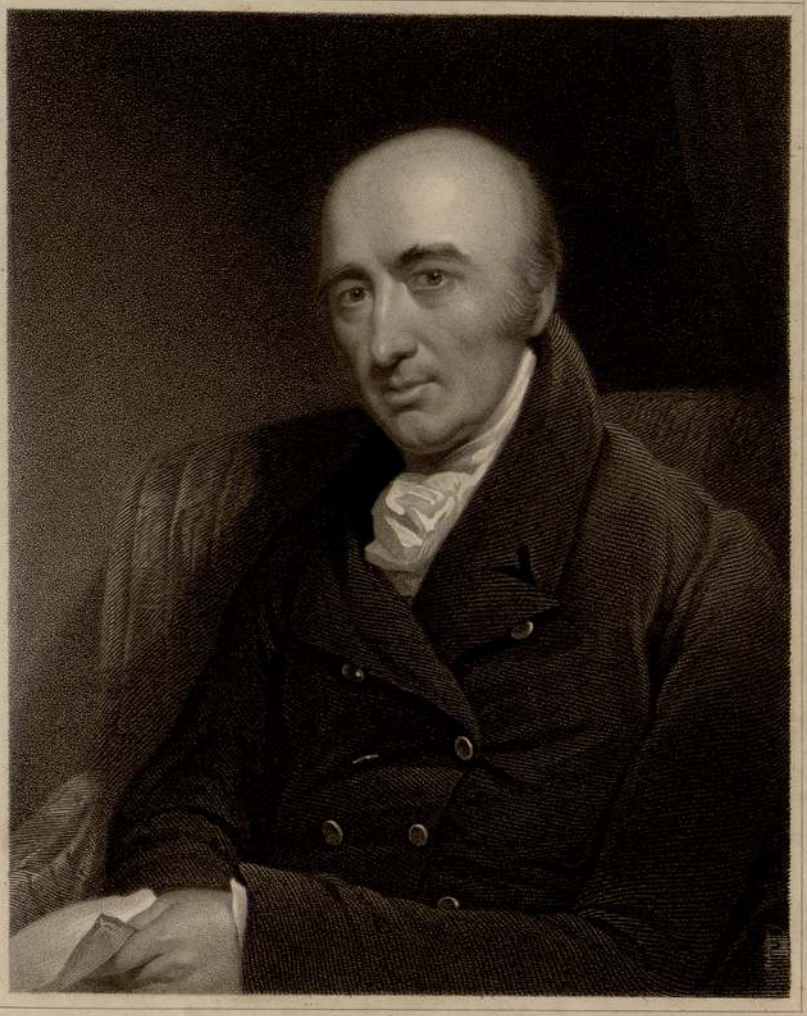
THE FOUNDATION OF THE SCIENCE OF MOVING PICTURES BY DR. PETER MARK ROGET. M.D. F.R.S.,

Chapter No.

The name of Dr. Peter Mark Roget, M.D., F.R.S., will stand out for all time as the man who laid down the basic principle for the portrayal of movement, in Pictorial form, and a short record of his life will prove of interest to the reader.

Dr. Peter Mark Roget, was born at a house in Broad Street, Soho, in the West End of London, on January 18th, 1779. He was the only son of John Roget, a native of Geneva who was the Pastor of a French Protestant Church in Little Dean Street. London. His Mother, Catherine, was the only surviving sister of Sir Samuel Romilly, the famous law reformer, who was the means of getting the death penalty abolished for trivial crimes. His Father died at Lausanne in 1783. When Doctor Roget was only four years of age, he having been brought up by his Mother, in 1793, Mrs. Roget and her son went to reside at Edinburgh, and when Dr. Roget was fourteen years of age, he entered the University in that city. Two years later in 1795 he entered the medical school of the University and graduated as M.D. on June 25th, 1798, and was subsequently appointed to several Public Institutions as Medical Adviser. In October, 1808, he returned to London and took up his residence in Bernard Street, near Russell Square, being appointed Physician to the Spanish Embassy and other important bodies, moving later to Upper Bedford Place, W. During this period Dr. Roget formed a great friendship with Dr.Wollaston, through whose influence he was elected a Fellow of the Royal Society, on March 16th, 1815, and after

Dr. Wollaston who introduced Dr Peter Mark Roget to the Royal Society



Engraved by W. Holl.

J. H. WOLLASTON.

From the original Picture by J. Jackson in the possession of the Royal Society

Under the Superintendance of the Society for the Diffusion of Useful Knowledge.

London: Published by Charles Knight, Pall Mall East.

Dr. Peter Mark Roget (Continued).

writing several important papers on the Physical Sciences, including the one that laid the foundation for the production of moving pictures, was elected Secretary to that learned Society on November 30th 1827, following Sir John Herschel in that high office, which he exercised until his retirement in 1849. His death occurred at West Malvern, England in his 91st year on September 12th, 1869. Thus it will be seen that Dr. Peter Mark Roget, M.D., F.R.S., had a very distinguished career and made himself master of the Science of Physics in several important branches. Therefore, it is not to be wondered that in 1824 he enlightened the whole world with his lectures and writings, and made the first real attempt to solve the mystery of portraying life-like movement in pictorial form. The whole of the principles involved were clearly laid down by Dr. Peter Mark Roget, M.D., F.R.S., who was better known as the compiler of that splendid work, the "Thesaurus of English Words "and Phrases", especially to the thousands who used his work for the solution of cross word puzzles.

It was a very simple every day occurrence that led Dr. Roget to devote much time and deep study, to the science of movement. Whilst looking through the laths of a Venetiain blind at his house at 3, High Street, Soho, he saw a Baker's cart delivering bread at the house opposite, watching the cart as it was being driven away, he passed his eye rapidly up and down the laths of the blind, getting a momentary glimpse of the wheels of the cart, which he knew were revolving, yet viewed between the laths of the blind, they appeared to be standing quite still.

This phenomena seemed to entrance him, and after witnessing the same effect upon several occasions, he studied the matter deeply with the result that he gave a very interesting and explanatory paper before the "Royal Society" on December 9th, 1824.

Dr. Peter Mark Roget, (Continued).

This was entitled, "Explanation of an Optical "Deception In the Appearance of the Spokes of "a Wheel, seen through Vertical Apertures". This extremely interesting paper will perhaps show how much Dr. Roget had studied the subject, and through the kindness of the Royal Society, to whom I hereby acknowledge my indebtedness, the Author is able to reproduce the whole of the paper and explanatory Diagram, also the photograph of Dr. Wollaston.

COPY OF PAPER FOLLOWS:

The paper, as will be seen, gives a complete explanation of the entire phenomena, with a series of diagrams, which make the whole matter quite clear. After publication of this paper by the Royal Society, a great deal of enthusiasm was aroused amongst Scientists generally and the great Doctor Farraday, devoted much time and study to the phenomena and even went so far as to produce the little instrument known as "Farraday's Wheel", which shows two toothed wheels being revolved rapidly in opposite directions, and setting up the peculiar phenomena of showing a single toothed-wheel standing pefectly stationery.

It also set the great mind of Sir John Herschall working upon the subject, the result of which was the invention of the Thaumatrope, the instrument which consisted of a card with a bird drawn upon one side and a cage upon the other. Cottons were secured to each side of the card, and when rapidly rotated, the bird appeared to be inside the cage.

Extract from the Philosophical Transactions of the Royal Society which published the paper given by Dr. Peter Mark Roget, M.D., F.R.S., on December 9th, 1824.

It was this paper which laid the foundations for the principle of Moving Pictures and was acknowledged by Dr. Plateau, of Ghent, and Dr. Stampfer, of Vienna, as the source from which they derived the information enabling them to produce the first Moving Picture Machines, the Phenakisticope and Stroboscope, 1830.

V. *Explanation of an optical deception in the appearance of the spokes of a wheel seen through vertical apertures.* By P. M. ROGET, *M. D. F. R. S.*

Read December 9, 1824.

A CURIOUS optical deception takes place when a carriage wheel, rolling along the ground, is viewed through the intervals of a series of vertical bars, such as those of a palisade, or of a Venetian window-blind. Under these circumstances the spokes of the wheel, instead of appearing straight, as they would naturally do if no bars intervened, seem to have a considerable degree of curvature. The distinctness of this appearance is influenced by several circumstances presently to be noticed; but when every thing concurs to favour it, the illusion is irresistible, and, from the difficulty of detecting its real cause, is exceedingly striking.

The degree of curvature in each spoke varies according to the situation it occupies for the moment with respect to the perpendicular. The two spokes which arrive at the vertical position, above and below the axle, are seen of their natural shape, that is, without any curvature. Those on each side of the upper one appear slightly curved; those more remote, still more so; and the curvature of the spokes increases as we follow them downwards on each side till we arrive at the lowest spoke, which, like the first, again appears straight.

THE FOUN[illegible] THE SCIENCE OF [illegible]CTURES

Dr. [illegible]OGET, M.D., F.R.S.

THE name of Dr. Pet[illegible] stand out for all ti[illegible] laid down the bas[illegible] portrayal of movement[illegible] A short review of his [illegible] prove interesting.

He was born in a hou[illegible] Soho, London, on the [illegible] He was the only son of [illegible] of Geneva, who was th[illegible] Protestant Church in [illegible] London. His mother, [illegible] only surviving sister of [illegible] the great artist. His fa[illegible] in 1783. Peter Mark [illegible] years of age, and was [illegible] mother. After the dea[illegible] Roget went to live at [illegible] at an establishment ke[illegible] It was here that your[illegible] early tuition. He was[illegible] the study of scienc[illegible] subjects which, with t[illegible] he pursued diligently.

In 1793, Mrs. Roget [illegible] reside at Edinburgh [illegible] young Roget, who w[illegible] age, entered the Un[illegible] In 1795, two years [illegible] Medical School of the University, graduating as M.D. on June 25th, 1798. Subsequently, he was appointed as medical adviser to several important institutions. In October, 1808, he returned to London, where he took up residence near Russell Square, on being appointed Physician to the Spanish Embassy and other important bodies.

During this period Dr. Roget formed a great friendship with Dr. Wollaston, through whose influences he was elected a Fellow of the Royal Society on March 16th, 1815, after writing several interesting and important papers on the physical sciences, including the one that laid the foundations for the portrayal of movement. On November 30th, 1827, he was elected secretary to that learned Society. In this position, he followed Sir John Herschel, and remained until his retirement in 1849.

His death ocurred at West Malvern, England in his 91st year, on September 12th, 1869.

Thus it will be seen that Dr. Peter Mark Roget, M.D., F.R.S., etc., had a most distinguished career and made himself master of the science of physics in several important branches. It is not to be wondered at, that in the year 1824, he enlightened the world by his writings and lectures.

DIAGRAM FOR SPOKED WHEEL DR PETER MARK ROGET MD FRS.

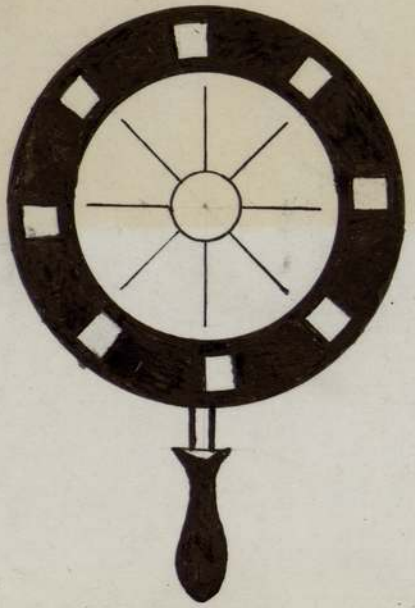


FIG. 1.

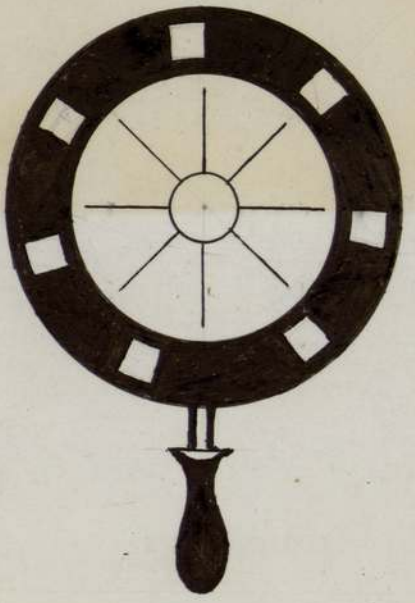


FIG. 2.

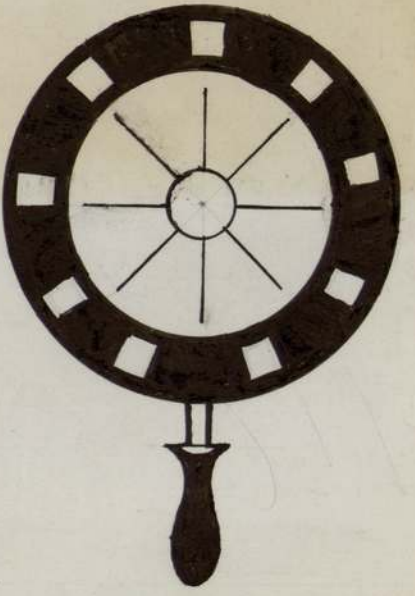


FIG. 3.

DR. ROGET'S EXPLANATION OF AN OPTICAL DECEPTION, ETC.

The most remarkable circumstance relating to this visual deception is, that the convexity of these curved images of the spokes is always turned downwards, on both sides of the wheel; and that this direction of their curvature is precisely the same, whether the wheel be moving to the right or to the left of the spectator. The appearance now described is represented in Plate XI. Fig. 1.*

In order to discover a clue to the explanation of this phenomenon, it was necessary to observe the influence which certain variations of circumstances might have upon it; and the following are the principal results of the experiments I made for this purpose.

1. A certain degree of velocity in the wheel is necessary to produce the deception above described. If this velocity be gradually communicated, the appearance of curvature is first perceptible in the spokes which have a horizontal position: and as soon as this is observed, a small increase given to the velocity of the wheel, produces suddenly the appearance of curvature in all the lateral spokes. The degree of curvature remains precisely the same as at first, whatever greater velocity be given to the wheel, provided it be not so great as to prevent the eye from following the spokes distinctly as they revolve: for it is evident, that the rapidity of revolution may be such as to render the spokes invisible. It is also to be noticed that, however rapidly the wheel revolves, each individual spoke appears, during the moment it is viewed, to be at rest.

2. The number of spokes in the wheel makes no difference in the degree of curvature they exhibit.

3. The appearance of curvature is more perfectly seen when the intervals between the bars through which the wheel is viewed, are narrow; provided they are sufficiently wide to allow of the distinct view of all the parts of the wheel in succession, as it passes along. For the same reason, the phenomenon is seen to the greatest advantage when the bars are of a dark colour, or shaded, and when a strong light is thrown upon the wheel. The deception is, in like manner, aided by every circumstance which tends to abstract the attention from the bars, and to fix it upon the wheel.

4. If the numbers of bars be increased in the same given space, no other difference will result than a greater multi-

* The appearance is question has been noticed by an anonymous writer in the Quarterly Journal of Science (Vo.X.p.282) who gives, however, no explanation of the phenomenon. It would have been impossible, indeed, to reconcile the facts as they are there stated, with any theory that could be imagined for their solution.

plication of the curved images of the spokes; but if a certain relation be preserved between the angles subtended at the eye by the whole intervals of the bars, and of the extremities of the spokes, this multiplication of images may be corrected. The distance of the wheel from the bars is of no consequence, unless the latter are very near the eye, as in that case the apertures between them may allow too large a portion of the wheel to be seen at once.

5. If the bars, instead of being vertical, are inclined to the horizon, the same general appearances result; but with this difference , that the spokes occupying positions parallel to the bars, are those which have no apparent curvature: while the curvatures of the other spokes bear the same relations to these straight spokes, and to each other, that they did in the former case. When the inclination of the bars is considerable, however, the images become more crowded, and the distinctness of the appearance is thereby diminished. The deception totally ceases when the wheel is viewed through bars that are parallel to the line of its motion.

6. It is essential to the production of this effect, that a combination should take place of a progressive with a rotatory motion. Thus, it will not take place if, when the bars are stationary, the wheel simply revolves on its axis, without at the same time advancing nor when it simply moves horizontally, without revolving. On the other hand, if a progressive motion be given to the bars, while the wheel revolves round a fixed axis, the spokes immediately assume a curved appearance. The same effect will also result if the revolving wheel be viewed through fixed bars by a spectotor, who is himself moving either to the right or left; because such a movement on the part of the spectator produces in his field of vision an alteration in the relative situation of the bars and wheel.

It is evident from the facts above stated, that the deception in the appearance of the spokes must arise from the circumstance of separate parts only of each spoke being seen at the same moment; the remaining parts being concealed from view by the bars. Yet since several parts of the same spoke are actually seen in a straight line through the successive apertures, it is not so easy to understand why they do not connect themselves in the imagination, as in other cases of broken lines, so as to convey the impression of a straight spoke. The idea at first suggests itself that the portions of one spoke, thus seen separately, might possibly connect

themselves with portions of the two adjoining spokes, and so on, forming by their union a curved image made up of parts from different successive spokes. But a little attention to the phenomena will show that such a solution cannot apply to them: for when the disc of the wheel, instead of being marked by a number of radiant lines, has only one radius marked upon it, it presents the appearance, when rolled behind the bars, of a number of radii, each having the curvature corresponding to its situation; their number being determined by that of the bars which intervene between the wheel and the eye. So that it is evident, that the several portions of one and the same line, seen through the intervals of the bars, form on the retina the images of so many different radii.

The true principle, then, on which this phenomenon depends, is the same as that to which is referable the illusion that occurs when a bright object is wheeled rapidly round in a circle, giving rise to the appearance of a line of light throughout the whole circumference: namely, that an impression made by a pencil of rays on the retina, if sufficiently vivid, will remain for a certain time after the cause has ceased. Many analogous facts have been observed with regard to the other senses, which, as they are well known, it is needless here to particularize.

In order to trace more distinctly the operation of this principle in the present case, it will be best to take the phenomenon in its simplest form, as resulting from the view of a single radius, (fig.2) OR of the wheel VW, revolving steadily upon its axis, but without any progressive motion, and seen through a single narrow vertical aperture which is moving horizontally in a given direction PQ. Let us also assume that the progressive motion of the aperture is just equal to the rotatory motion of the circumference of the wheel. It is obvious that if, at the time of the transit of the aperture, the radius should happen to occupy either of the vertical positions VO or OW, the whole of it would be seen at once through the aperture, in its natural position; but if, while descending in the direction VR, it should happen to be in an oblique position RO, terminating at any point of the circumference at the moment of the aperture has, in its progress horizontally, also arrived at the same point R, the extremity of the radius will now first come into view, while all the remaining part of it is hid. By continuing to trace the parts of the radius that are successivly seen by the

combined motions of the aperture and of the radius, we shall find that they occupy a curve Rabcd generated by the continued intersection of these two lines. Thus, when the aperture has moved to A, the radius will be in the position Oa; when the former is at B, the latter will be at OB, and so on.

Again; let us suppose that when the aperture is just passing the centre, the radius should be found in a certain position on the other side OY, and rising towards the summit. Then tracing, as before, the intersections of these lines in their progress, we shall obtain a curve precisely similar to the former. Its position will be reversed; but its convexity will still be downwards.

If the impressions made by these limited portions of the several spokes follow one another with sufficient rapidity, they will, as in the case of the luminous circle already alluded to, leave in the eye the trace of a continuous curve line; and the spokes will appear to be curved, instead of straight.

The theory now advanced is in perfect accordance with all the phenomena already detailed, and is farther confirmed by extending the experiments to more complicated combinations.

It readily explains why the image, or spectrum, as it may be called, of the spoke, is at rest, although the spoke itself by revolving: a circumstance which might escape notice, if the attention were not particularly called to it.

Since the curved appearance of the lines results from the combination of a rotatory, with a progressive motion of the spokes, in relation to the apertures through which they are viewed, it is evident that the same phenomena must be produced if the bars be at rest, and both kinds of motion be united in the wheel itself. For, whether the bars move horizontally with respect to the wheel, or the wheel with respect to the bars, the relative motion between them, and its effects, in as far as concerns the appearance in question, must be the same. The attention of the spectator should in both cases be wholly directed to the wheel, so that the motions in question should be referred altogether to it. Thus, in fig. 4, the real positions, at successive intervals of time, of the spoke Aa, when the wheel is rolling on the ground in the direction AZ, are expressed by the lines Aa, Bb, Cc and Dd. While the spoke is in these positions, the portions of it really seen through the fixed aperture VW, are the parts a,B,γ,δ, the impressions of which, being

retained upon the retina, and referred to the wheel when in its last position, form the series of points m, n, p and q, in the curved spectrum mD.

That the attention may the more easily follow the wheel in its progression, it is necessary that its circumference be distinctly seen, and its real situation correctly estimated. Hence, although it be true, that by a sufficient exertion of attention the phenomenon may be exhibited by means of a single aperture, it is much more readily perceived, when the number of apertures is such as to allow the wheel to be seen in its whole progress. For this reason the phenomenon is very distinct in the case of a palisade. Each aperture produces its own system of spectra; and hence, when the apertures occure at short intervals, the number of the spokes is considerably multiplied; but if the intervals be so adjusted as to correspond with the distances between the spokes at the circumference of the wheel, the images produced by each aperture will coalesce, and the effect will be much heightened.

A mathematical investigation of the curves resulting from the motion of the points of intersection of a line moving parallel to itself, with another line revolving round its axis, will show them to belong to the class of QUADRATRICES, of which the one which touches the circumference of the inner generating circle is that which is known by the name of the QUADRATRIX OF DINOSTRATES. Such a system of curves is representated in fig. 3, where MC,CN are the generating radii, A the outer, and B the inner generating circles, and PQ the common axis of the curves.

All these curves have the same general equation,namely,

$$y = (b - x).\ \text{Tang.}\ x.$$

where the co-ordinates are referred to the axis at right angles to the vertical generating radii, and passing through the centre of their revolution; the basis b being measured on the axis from the point of its intersection with the curve to the centre; and x being the arc of the inner generating circle, as well as the abscissa.*

A wheel simply rolling on its circumference exhibits, when seen through fixed bars, only those portions of the curves which are contained within the inner circle; but when its motion of revolution is more rapid than its horizontal progression, as when it is made to roll on an axle of less diameter on a raised rail-way, then the remaining portions of the curves will be seen, and others, on the lower part of the

wheel, having a contrary flexure, will also make their appearance. These are seen at FF in fig. 3.

If the spokes, instead of being straight, be already curved, like those of the Persian water-wheel, their form, when viewed through bars, will undergo modifications, which may readily be traced by applying to them the same theory. Thus, by giving a certain curvature to the spokes, as in fig. 5, they will at one part of their revolution appear straight, namely, where the optical deception operates in a direction contrary to the curvature.

The velocity of the apparent motion of the visible portions of the spokes is proportionate to the velocity of the wheel itself; but it varies in different parts of the curve: and might therefore, if accurately estimated, furnish new modes of measuring the duration of the impressions of light on the retina.

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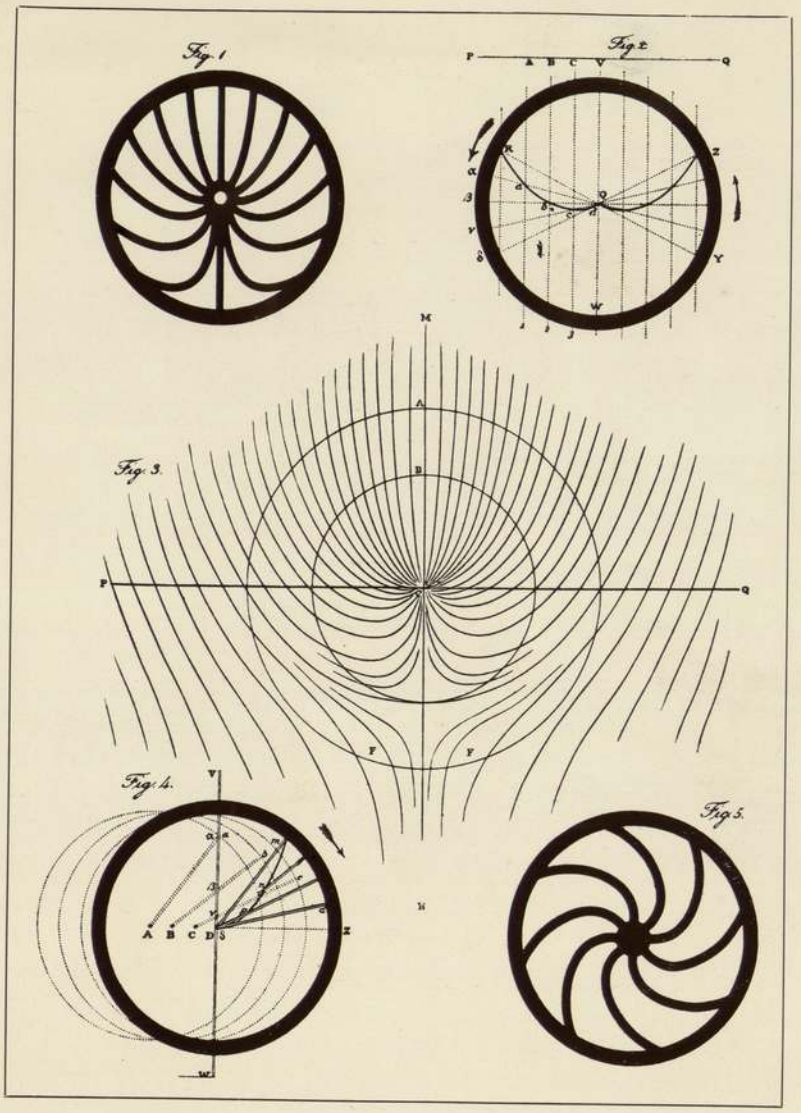
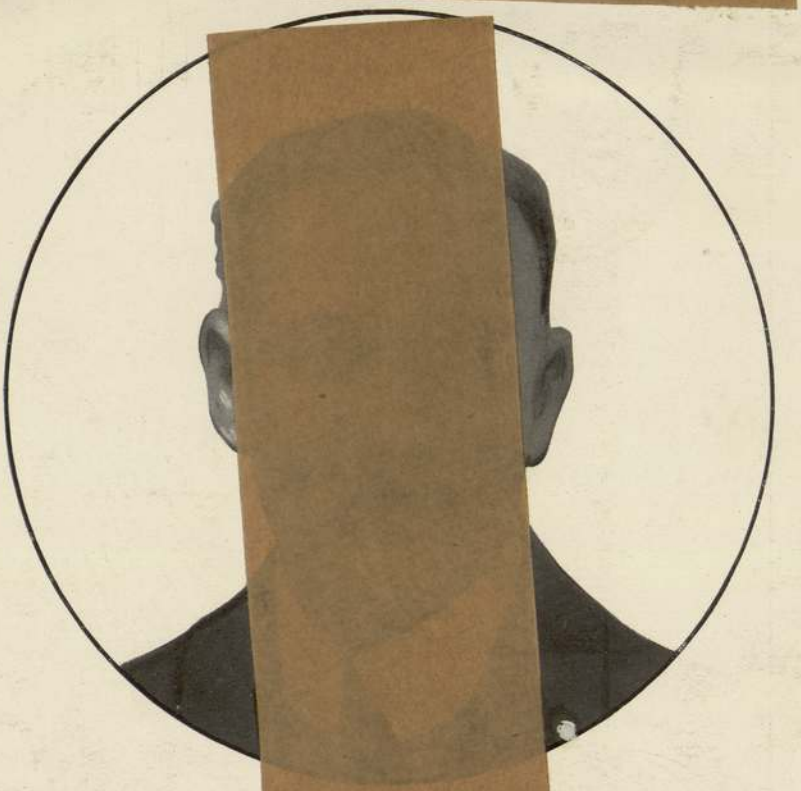
* This equality between the arc and the abscissa is a necessary consequence of the progressive motion of the wheel being equal to the rotatory motion of its circumference: the former motion producing the increments of the abscissa; and the latter those of the arc of the circle. The equation $y = (b - x)$. tang. x. is deduced from a simple analogy of the sides of similar triangles.



Dr. Peter Mark Roget's Diagram
of Wheel Phenomena

W. [redacted] UL



WILLIAM FRIES[redacted] England as he was when he [redacted] June 1889.

His Patent No[redacted] by the British Patent Office, June 21st, 1889, is the master patent for Kinematography and has been acknowledged by the American and other courts as the prior patent of the world.

ROMANCE—this word becomes possessed of peculiar significance when applied to the happenings of this man's life. It was undoubtedly represented to the full in the life of W. Friese-Greene. He was the real and true inventor of commercial kinematography. He was the first man to patent and publish his method for the use of celluloid as a photographic support for motion picture photography

His struggles with almost insurmountable obstacles; his desire for knowledge and its application, were intense in the extreme. His striving to overcome the great and difficult problems with which his path was

Dr. Peter Mark Roget, M.D., F.R.S. as he was at 80 years of age

Perhaps the greatest achievement arising out of the paper by Dr. Roget, was the invention of the Phenakisticope, by Doctor Plateau of Ghent and the Stroboscope, invented by Doctor Stampfer of Vienna, both of these instruments being of exactly similar construction.

The same phenomena that arrested the attention of Doctor Peter Mark Roget, is to be seen nightly upon the numerous screens throughout the world, when the fast-moving wheels of a motor car are seen to be apparently running in the reverse direction.

Perhaps a simple explanation of this phenomena will prove both enlightening and interesting and I think the whole matter will be readily understood by the following description given by Doctor Plateau after his observations on Roget's spoke-wheel:-

"When the revolutions of the shutter on the camera
"are equal to the revolutions of the spokes of the
"wheel

The Thaumatrope · 1824
or Wonder Turner

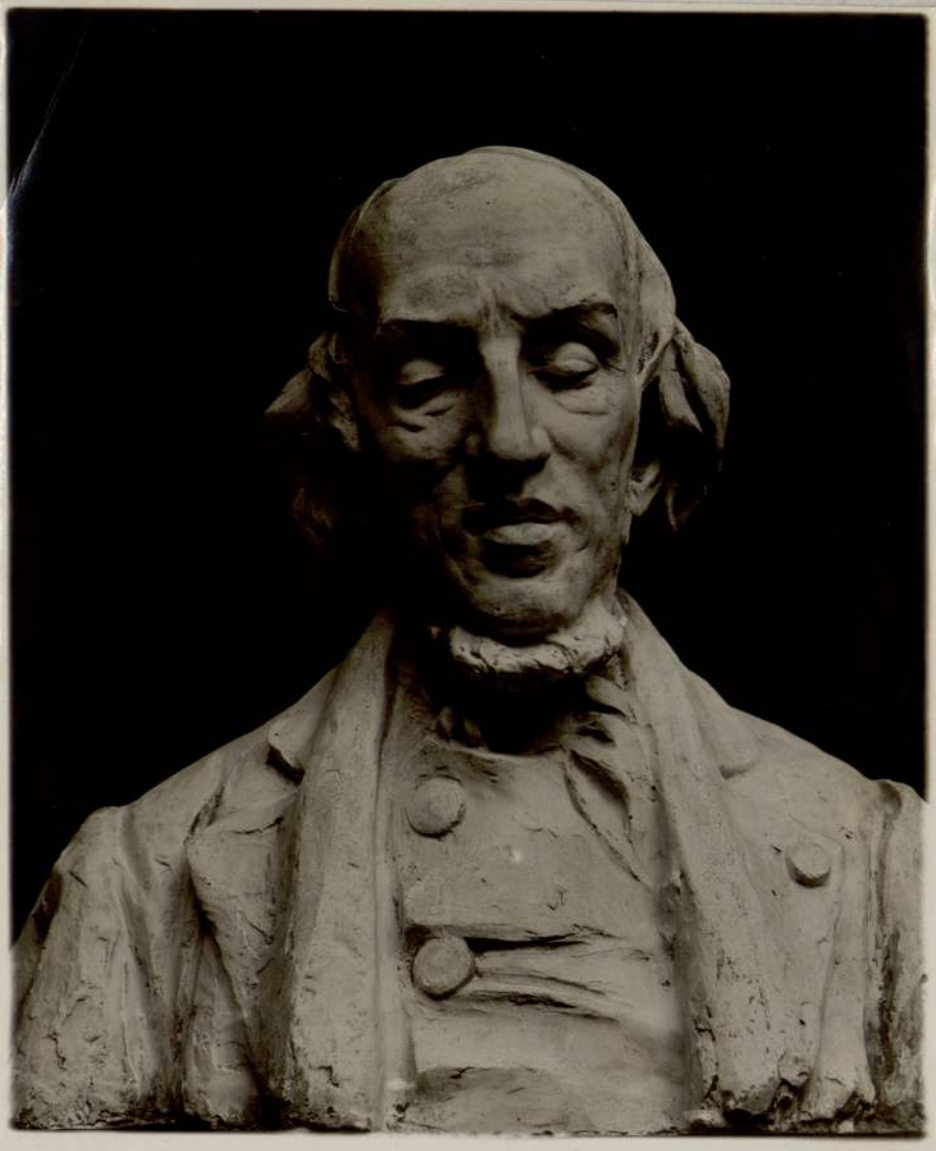
they appear as if stationery or standing still. When the revolutions of the shutter are less in number than the revolutions of the spoked wheel, the wheel appears to travel forward.

When the revolutions of the shutter are more than the revolutions of the spoked wheel, the wheel appears to travel in the reverse or backward direction.

THE THAUMATROPE.

The first practical instrument to show more than one object in the same plane of vision was the Thaumatrope or Wonder Turner of 1826. This word was derived from the two Greek Words:-"Oavue"or Wonder, and "TREXW"or To Turn, and has already been explained; this little toy gave delight in thousands of homes, and was first sold by Dr. Paris at the Royal Society's rooms in Albemarle Street, W; afterwards by William Phillips at George Yard, Lombard Street, London, who was the publisher, the price being 7s..6d for twelve different subjects in a box. This little toy was produced later in an enhanced form to show both depth and movement. Sir David Brewster next gave his observations on the Thaumatrope in his wonder book, "Natural Magic", published in 1832, wherein he practically -to a certain extent- foreshadows the modern Picture Theatre Entertainment, by stating in a rather long explanation:- "how pictures both animate and inanimate might be shown "upon a screen, with compartments to open, through which "the principal characters could be made to appear." This instrument in an enlarged form was also used later for demonstration purposes by Dr. Pepper at the Polytechnic Institute. Dr. Farraday, the next great Scientist to probe into the secrets of Wheel Phenomena, after listening to Dr. Peter Mark Roget's Paper upon the subject,

Plateau of Ghent



Dr. J. Plateau of Ghent

11/

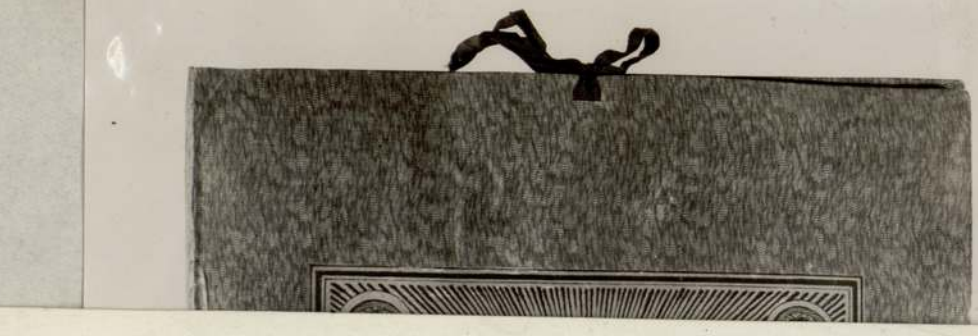
The inventor of The Phenakistiscope
later called the 'Fantoscope',
also the Anorthoscope.

paid a visit to some lead grinding mills owned by a Mr. Maltby. Upon viewing these works his attention was directed to two cog wheels which were revolving with great velocity, and which if viewed in one direction set up the phenomenon of showing the toothed wheels as if they were perfectly plain without any cogs cut in their periphery. Faraday, also made it quite clear that a single toothed wheel when revolved in front of a mirror gave an exactly similar effect. This phenomenon was not new as it had previously been recorded by Dr. Plateau of Ghent, during his investigations in 1828 following the principles laid down by Roget, and also by Aime and other scientists, in 1831, but it is only fair to Dr. Faraday to say, that Dr. Plateau's work at that time was unknownto him.

THE PHENAKISTICOPE.

Joseph Antoine Ferdinand Plateau, was born in 1801 and was a native of Ghent in Belgium. He devoted the greater part of his life to the study of persistence of vision and the science of optics generally in all their varying phases, and his labours between the years 1828 and 1832 resulted finally in the production of the Phenakisticope; the first actual instrument ever to be constructed to show apparent life like movements. It is true the figures were only hand drawn and coloured, but it was not an extremely difficult task to supplement photographic subjects in place of the drawings, when later photography was invented and in 1830, he had achieved and perfected his invention. This instrument consisted of a flat cardboard disc with figures in various phases of movement printed thereon, and between each phase, a viewing hole was cut. The disc was mounted upon a spindle attached to a handle and when rotated and viewed in front of a mirror, a very realistic view of life-like

The Phenakisticope or Fantascope



The Author demonstrating the method of Viewing the Phenakisticope

E. F. Burney. Del. — J. Watts. Sculp.

A FASHIONABLE PARTY.

First moving Picture Entertainment to be illustrated shows a group of Society Ladies Viewing the Phenakisticope
Circa 1835 engraving by E. F. Burney
This engraving was kindly loaned to the author by Lee G. H. Gabb Esq

The Phenakisticope or Fantascope

Plateau's Phenakisticope 1830

10

A FASHIONABLE PARTY.

First moving Picture Entertainment to be illustrated shows a group of Society Ladies Viewing the Phenakisticope
Circa 1835 engraving by E. F. Burney
This engraving was kindly loaned to the author by G. H. Gabb Esq

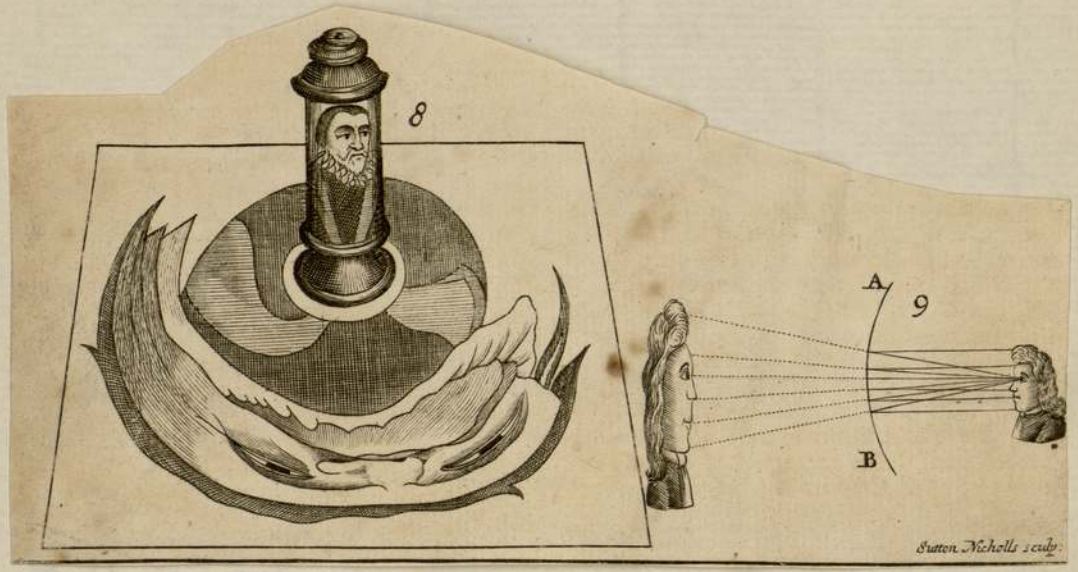
The Anamorphoscope

The figures used for the Anamorphoscope

The Anorthoscope

as it appears Viewed through the

The Anamorphoscope



This instrument when viewed in a cylindrical mirror; re-constructed a distorted image, into a perfectly symmetrical figure

The Anorthoscope

to it appears Viewed through the

movements could be seen. It is interesting to note that Dr. Plateau acknowledged in the publication of Quetelet's Correspondence Mathematique-et-Physique his indebtedness to Dr. Peter Mark Roget, M.D.,F.R.S., for the knowledge he had imparted in the paper he published in 1824, in the Philosophical Transactions of the Royal Society, which gave him all the necessary information to enable him to invent and produce the "Phenakisticope", and these two learned men frequently corresponded with each other on many matters concerning the optics.

When this instrument was brought to England and printed and published by Forres of Piccadilly, Akerman and others, the rather high sounding title given to it by Plateau was dropped and the word "Fantoscope" substituted in its place and it leaped into instant popularity, being sold in an attractive box with handle and mirror complete at 10s..6d.

THE ANORTHOSCOPE.

The "Anorthoscope", was another clever and mystifying Optical Illusion from the fertile brain of Dr. Plateau. This idea he conceived from the "Anamorphoscope", which consisted of distorted figures drawn to correct angles and when viewed by the aid of a cylindrical mirror, the figures or scenes assumed correct shapes. The Anorthoscope was an instrument rotated by hand, the movement being imparted by two belts, which passed over two pulleys mounted on two separate spindles; upon one of these spindles was mounted a transparent, queerly distorted figure disc with four enlongated slots cut therein.

The Fantascope

Fantoscope 1830

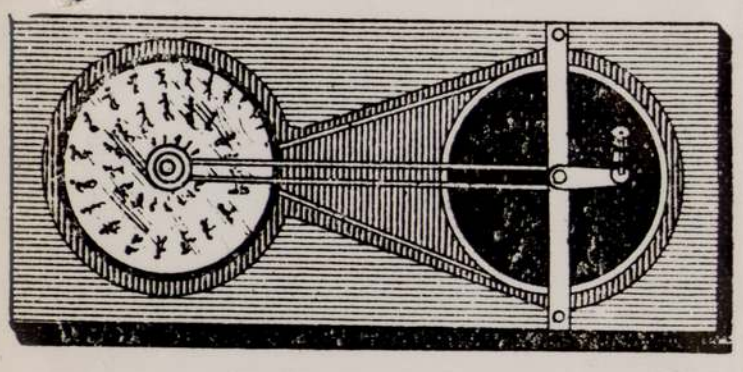
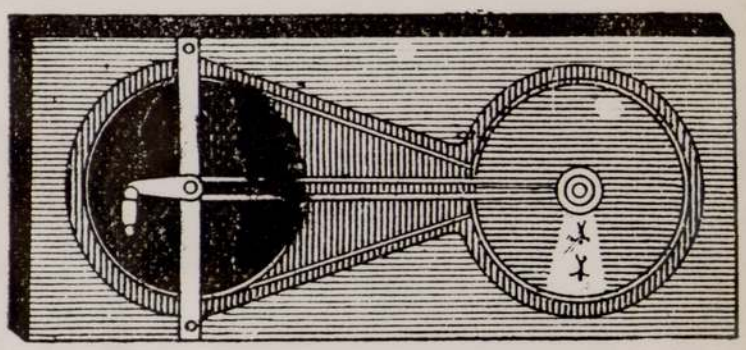
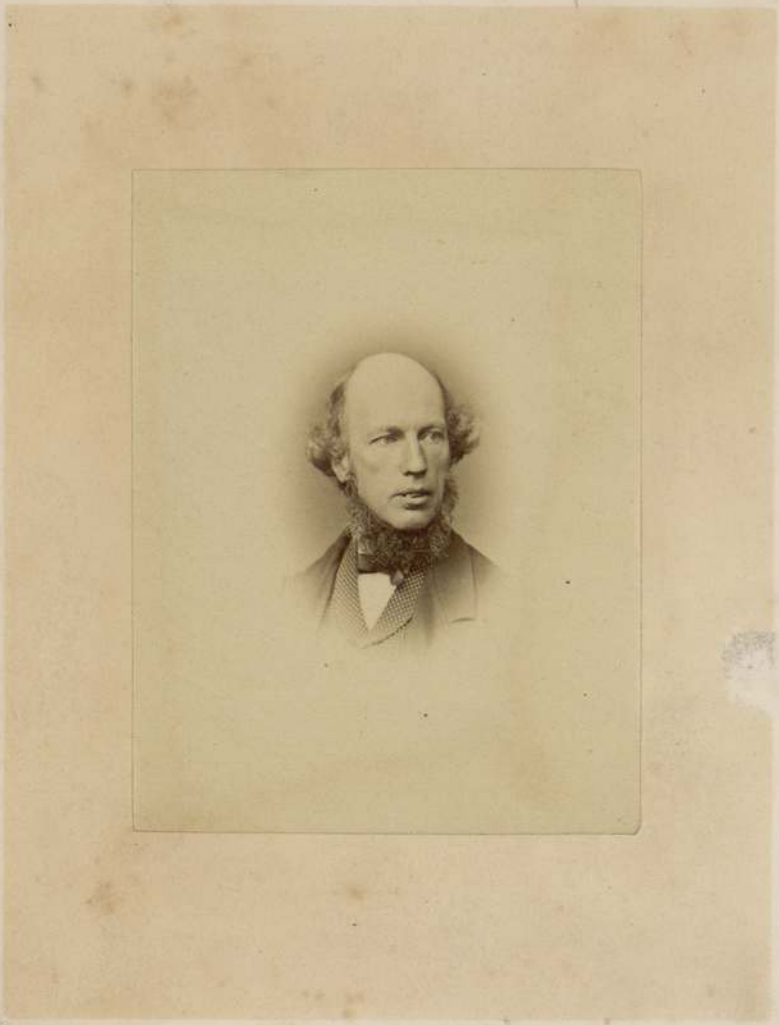


Fig. 17. — Phénakisticope en mouvement



Projecting Phenakisticope



Photographed by Ernest Edwards, 20 Baker Street, W.

Dr. Carpenter

Photo of Sir Chas Wheatstone

Pseudoscope &c.

Sir Charles Wheatstone

The figure disc was geared to make four revolutions to each one of the shutter disc and the discs revolved in opposite directions. When this instrument was rotated before a light and viewed through the slots, a series of figures perfectly symmetrical and of normal proportions could be seen, the figures being correctly seen at any speed of rotation. Dr. Plateau also gave a very lengthy explanation of the manner in which these figures could be viewed in stereoscopic relief. It is sad to read of this great Scientist, who, through exposing his eyes to the bombardment of the sun's rays went totally blind, this he did, in his research for knowledge, to be able to record the length of time the eye could stand the intense light of the sun without injury.

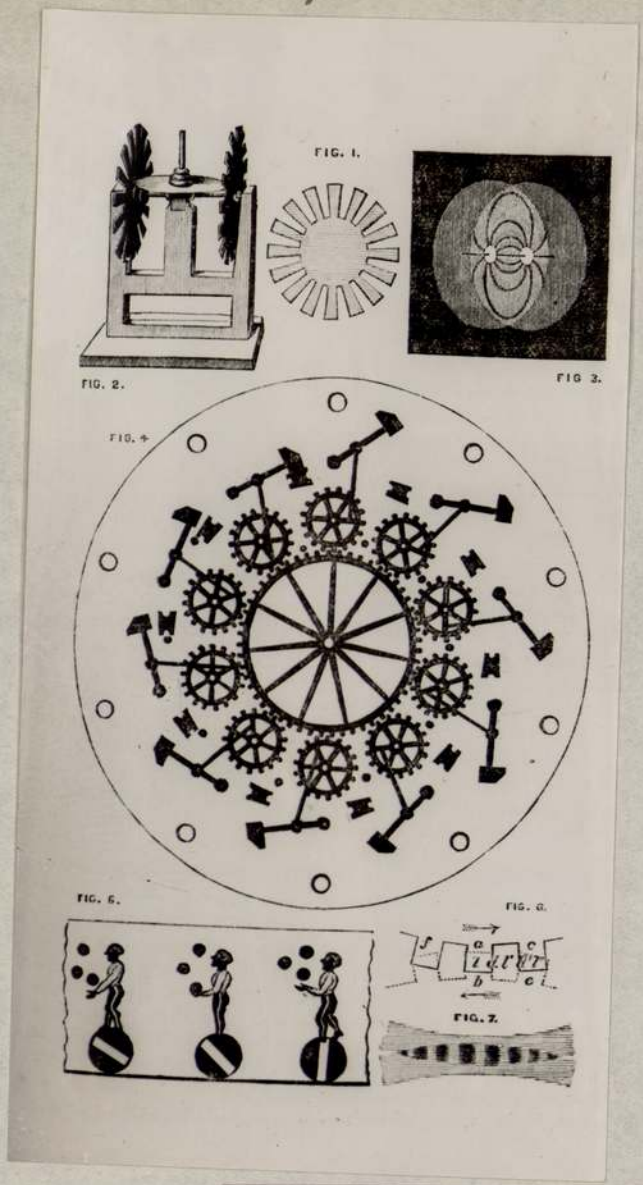
Sir Charles Wheatsone was another great scientist that devoted a great deal of time in carrying out numerous experiments with the optics. He greatly improved the effect of Plateau's Phenakisticope by mounting both the figure and shutter discs upon separate spindles fitted to a machine which had a cog and snail movement to give an intermittent movement to the figure disc and was the inventor of the reflecting stereoscope. Another clever invention by the same scientist was that of the "KALEIDOPHONE" for showing the vibrations of sound; this consisted of a series of steel rods somewhat like a steel knitting needle of various lengths each mounted with a bright silver plated ball on the top and as they were caused to vibrate from the notes of a violin or a singer, so the silver ball reflected a beam of light. That very particular optical instrument known as the "PSEUDOSCOPE" was another invention by Sir Charles Wheatsone.

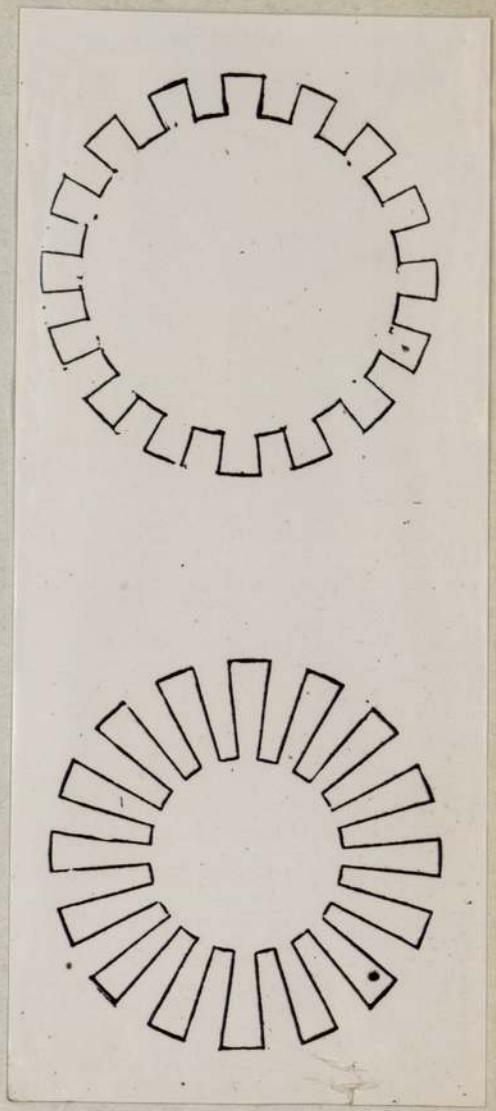
S. Stampfer

Wien bei Joseph Bermann, am Graben, zur gold. Krone N° 619.

Professor Simon Stampfer the inventor of the Stroboscope

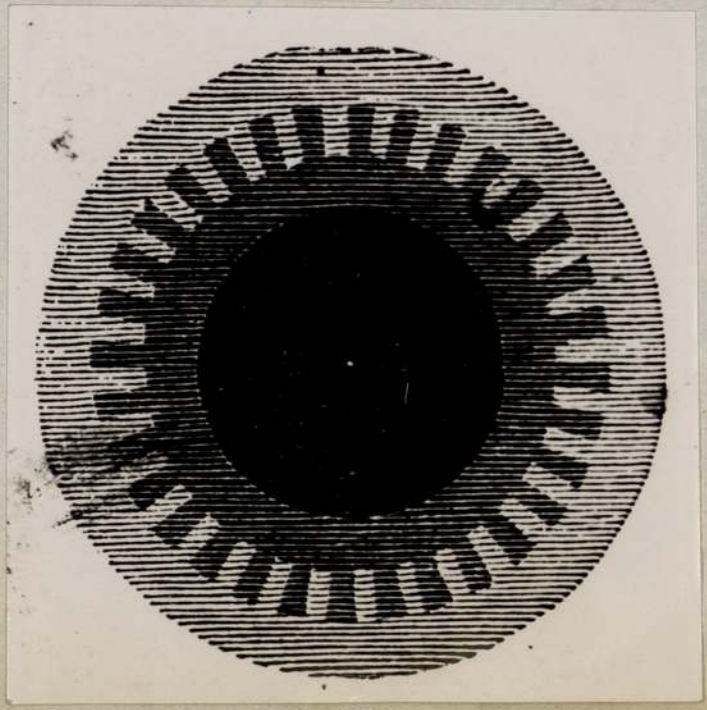
Farradays Wheel, Stroboscope &c





Farradays Wheel
Cogged Discs

Fig. 2.
Farradays
Wheel.



Shadow
Penumbra
set up by
Farradays
Wheel

Anorthoscope

Figure shewn for the Anorthoscope which when viewed in the instrument re-form into five Angels.

The Athenæum

"PSEUDOSCOPE".(CONTINUED).

This consisted of two rectangular prisms of glass, fixed at such an angle that the relative direction of the rays reaching the eye, from objects seen through them is laterally invested by internal reflection, so that the conveyance of the optical axis increases with the distance of the object being viewed. Thus, any raised surface, such as the head of a coin, appears to be recessed or hollowed out, and is a truly mystifying illusion. There were many other clever inventions such as the Wheatstone Bridge, and other electrical Instruments, but unfortunately space will not permit of them being recorded in this present work.

Dr. William B. Carpenter, M.D. did much to further the experiments of Plateau and in his numerous writings throws much light upon the numerous applications and suggests many improvements to both of Plateau's instruments. Wheatstone's reflecting stereoscope was mentioned by Carpenter as being a suitable optical system, whereby moving pictures could be viewed, with all the natural depth and beauty of the originals. Another system also mentioned was Brewster's Lenticular Steroscope as patented in 1860 by W. I. Shaw for viewing the Phenakistocope with true life like proportions.

Thus we see in this invention, the fertile brain of Dr. Plateau and the writings of Dr. Peter Mark Roget, M.D., F.R.S., the foundation laid for a vast industry to follow. Almost simultaneously with the invention of the Phenakistocope came the news that Dr. Stampfer in Vienna had invented a similar instrument which he called the "Stroboscope".
Dr. Simon Ritter Von Stampfer, a native of Vienna in Austria, after studying the writings of Dr. Peter Mark Roget, conceived the idea of showing movement by figures drawn upon a flat disc, and in 1830, he had achieved the same results as Plateau, and through Quetelet, acknowledged the source from which he derived his information. This instrument was printed and published in Vienna by M. Tretunsky, whose London Agents were Josiah Myers & Co. Ltd., of 144, Leadenhall Street. E.C.4.

The Daedaleum or Wheel of the Devil
invented by Dr Horner of Bristol 1834

Re-invented and patented by Mons Devigues
in 1860 and called by him the Zoltrope
or Wheel of Life

Both the Phenakistocope and Stroboscope were submitted by Quetelet for observation by Dr. Faraday and these instruments were used by many clever scientists to assist in their investigations when observing the vibrations of sound.

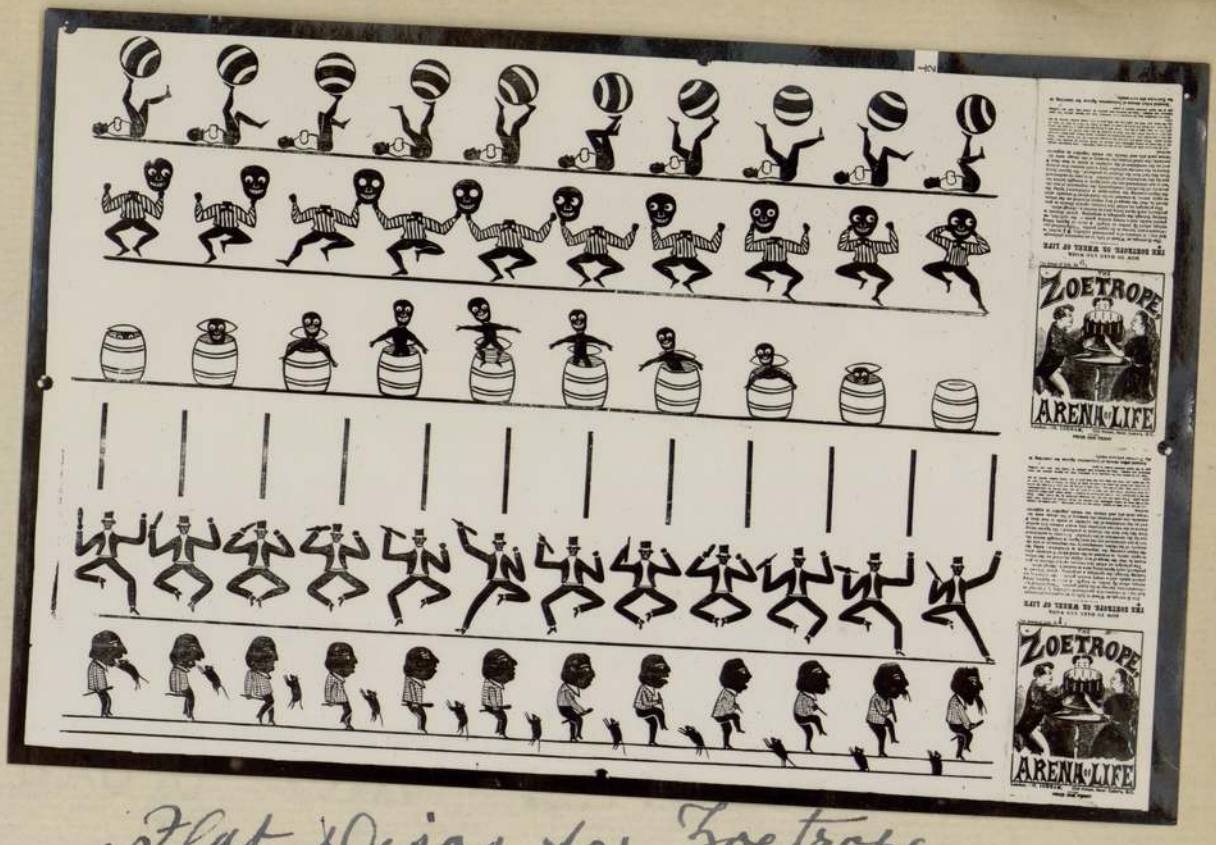
THE KINESCOPE.

The Kinescope was a similar instrument to Wheatstone's Photometer as it used steel beads to give the reflection of light and was the invention of H. Perrigal, Jnr., June, 1860. These instruments had various numbers of steel beads supported on a geared rotating disc, which by altering the rotation of the gearing when turned, could be made to show various geometrical designs.

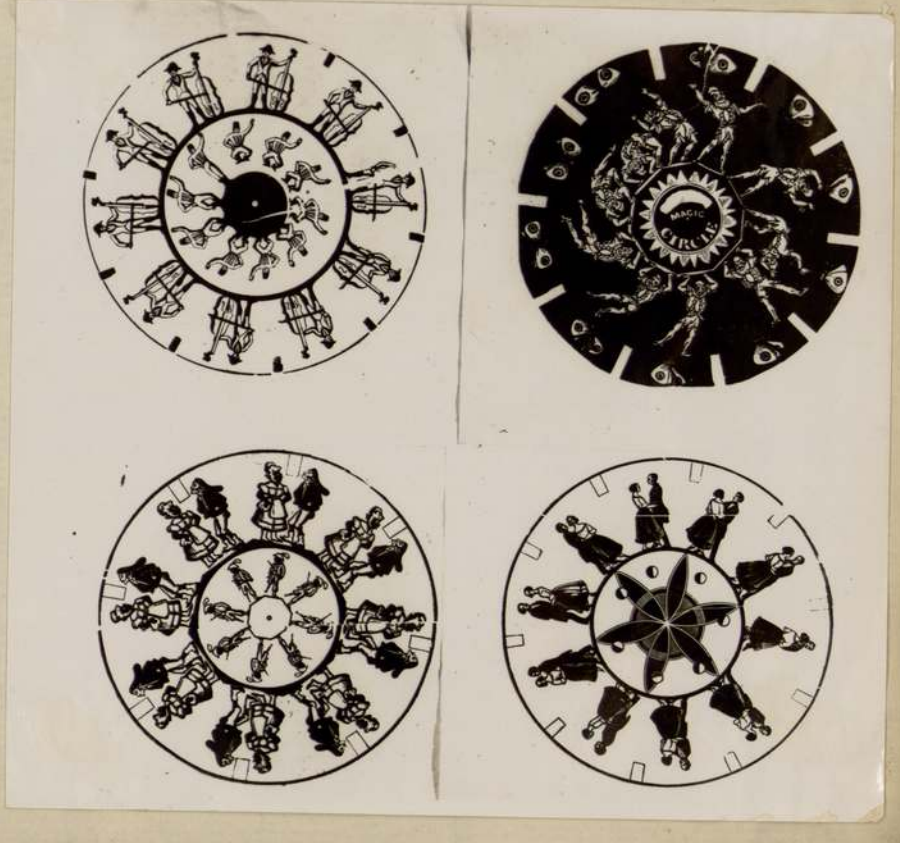
THE ZOETROPE.

The Zoetrope was invented in 1834 by Mr. W.G. Horner of Bristol, England, who was the son of a Clergyman and writing in the Philosophical Magazine of 1834, he describes his invention as follows:-

"The apparatus is merely a hollow cylinder of a moder-
"ately high margin, with apertures at equal distances
"placed cylindrically around the edge of a revolving
"disc. Any drawings which are made on the interior
"surface in the intervals of the apertures, will be
"visible through the opposite apertures, and if executed
"on the same principle of graduated action, will pro-
"duce the same surprising play of relative motions as
"the common magic disc" (Meaning the Fantoscope) "does
"when spun before a mirror."etc., etc., After giving a more details description of this invention, Mr. Horner states that he had communicated every needful part of the detail to a respectable optician, Mr. King, Jnr., of Bristol, England.



Flat Discs for Zoetrope



THE DÆDALEUM.

This machine was called by the inventor, "THE DÆDALEUM, or wheel of the devil, and unlike the Fantoscope or Stroboscope the Daedaleum had the advantage of being viewed by several persons at the same time. Bands of figures were used printed upon paper and this marked a definite advance towards the invention of a band of celluloid film for the same purpose in Kinematography. This same instrument was patented later in 1860 by a Frenchman, named M. P.H. Devignes, who was granted a Patent, No.537 for this instrument which he called the Zoetrope or Wheel of Life, and it had a huge sale all over the world, being sold in Great Britain, by the London Stereoscopic Co. Ltd., of Cheapside, London.

In addition to the Bands of figures to go round the inside of the drum, flat discs were supplied to lay flat on the inside base of the drum which viewed through the slots as before showed many fantastic and ever changing designs. This same instrument was again patented in the United States of America by William E. Lincoln of Providence, U.S.A., so that it may be said to have enjoyed quite a number of Birthdays.

The Zoetrope was used by many of the early inventores in their endeavours to produce moving pictures by means of Photography. Muybridge, Marey, T. A. Edison, and others all studied the synthesis of movement in this manner. We have already learned that Sir Charles Wheatstone in his invention with the cog and snail movement applied a front shutter to the Phanakistiscope Disc which was actually the forerunner of the movement for Kinematography being intermittent in its action, that is to say that the figure disc remained stationery whilst being viewed through the slot in the shutter disc. The slotted drum of the Zoetrope also certainly suggested the use of a separate shutter and it was therefore quite a simple matter for the invention of a separate disc and shutter upon the same shaft, viewing the pictures upon the figure disc at one end of the shaft, through a slotted shutter disc at the other end, thus obviating the use of a mirror.

This was an improvement suggested by Dr. Peter Mark Roget, in his original paper of 1824 and it was not made use of until produced as a new invention by Franz Uchatins, a Lieutenant in the Austrian Army, who produced an instrument of this description which he called the HELIOCINEOGRAPHE in 1851, this same inventor spent much time and money in producing various types of machines, using figures painted upon glass discs in his endeavours to project the Phonakistocope upon a lantern screen. This system occasioned a very great loss of light owing to the small slots of the shutter disc which he used to mask the movement, and was therefore practically useless from a public demonstration point of view, whereas, had he knowing Wheatstone's invention; where the figure disc was held stationery, whilst the front shutter made one revolution, he would have been able to accomplish his desires.

In 1853, Franz Uchatins exhibited a later instrument using a glass figure disc which was centred and held stationery, for each successive phase of movement, whilst a revolving limelight illuminated each picture, when centred; upon a screen. This method was more successful and received much praise from a group of learned professors when exhibited before the Academy of Sciences at Vienna in 1853. Another clever invention was patented the same year by A. F; I; Claudet for viewing a series of Steroscopic Views through two eye pieces fitted with lenses. In this specification it states that the successive views were eclipsed alternately by a reciprocating slide, the pictures being mounted radially upon two axis a British Patent was granted for this invention on March 23rd, 1853, Number 711.

THE KALOTROPE.

The Kalotrope was invented in 1856 by Dr. Rose of Glasgow, and was an instrument which when rotated showed some rather marvellous and beautiful Spectra Phenomena and was exhibited with much success at the Polytechnic.

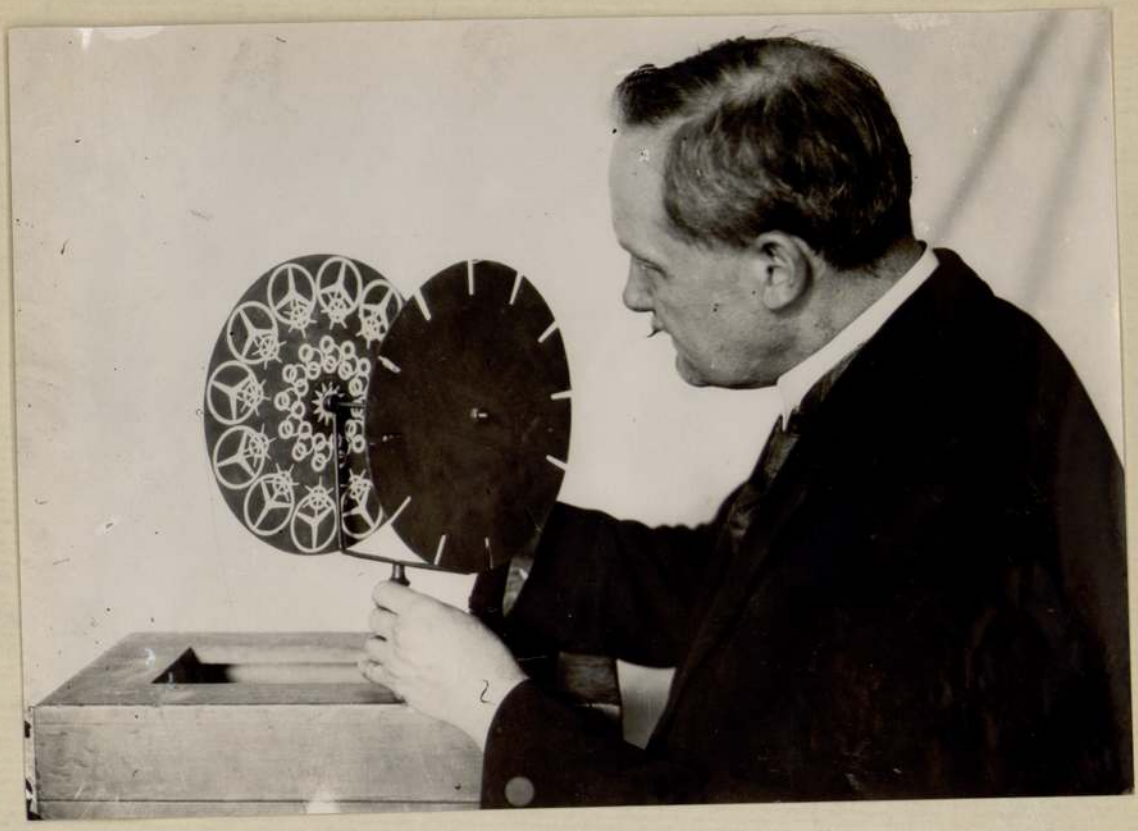
THE KALOTROPE.(CONTINUED).

This same inventor also exhibited another instrument which he called the Photodrome. This consisted of an ordinary cart wheel being rapidly revolved and having a beam of light directed upon it from an optical lantern fitted with a revolving slotted front shutter. Upon a velocity of about 300 r.p.m. being attained with the spoked wheels, all the spokes, and every semblence of the shadows from them disappeared, giving the remarkable effect of the rim of the wheel revolving in space. So perfect was this illusion, that upon one occasion an incredulous spectator crept up to the revolving wheel in an attempt to touch it but was seen by the attendants and prevented, just in time from doing so, otherwise, it would haveresulted in a serious accident.

We now arrive at a time, in 1856, when photography was getting into more general practice, and several serious attempts were being made to record a series of movements taken in sequence by means of photography. This made a great stride in the series of invention that ensued towards the advent of Kinematography.

DR JUNDXILL

Mr. A. D. Jundgill, on May 24th, 1856, invented a machine which he called the KINIMOSCOPE. This embodied the use of two figure discs similar to those used for the Stroboscope which were combined with two stereoscopic eye pieces and were viewed by reflection in a mirror, the necessary interference on shutters effect to mask the phases of movement being set up by a slotted shutter disc through which the revolving figure discs were viewed. The patent granted for this was No.1245. The same year, a patent was granted to Mr. P. Benoist for another steroscopic viewing effect of a moving picture on August 23rd, 1856. No.1965. This instrument used two steroscopic views with different phases ofmovement alternating on two separate discs. These were placed at right angles to a mirror making an equal angle between them, which had imparted to it a slight reciprocating motion thus allowing of the pictures being viewed alternately.



The Heliocineograph

A simple patent using two sides of a stereoscopic slide was taken out for the invention of R. Fisher and C.Aspray on October 5th, 1859, No.2258. The stereoscopic slide carried the two views of a similar object in different positions and motion was apparently set up by a sliding shutter alternately obscuring each eye piece. On May 22nd, 1860 an interesting viewing instrument somewhat on the lines of Wheatsonte's Reflecting Stereoscope was patented by Mr. W. T. Shaw. This instrument like others that preceded it used two revolving Phenakisticope Discs of figures. It also was fitted with two revolving discs each mounted with a single luss, thus placing a definite limit upon the time of exposure for each picture.

In another type of machine by this same inventor, a refracting instrument embodied the use of a revolving octagonal drum, which carried a picture upon each facet and another slotted drum illuminated each picture to be viewed and limited the exposure, this also confined the sight of each eye to the separate pictures; it was intended that each eye should see. One of the first men to produce Photographic images in sequence taken upon paper bands for use in the Zoetrope was Mr. C. Sellers a native of Philadelphia, U.S.A., who on February 5th, 1861, took out an American Patent for his process and he renamed the original instrument invented by Dr. Horner of Bristol, 1834, the KINEMATOSCOPE, a title which was getting very near to the ultimate name of KINEMATOGRAPH.

It is an astonishing fact that right through the invention of moving pictures how several minds have run in a similar train of thought regarding the inventions leading up to Kinematography, and how several inventors all but succeeded, only lacking the one essential medium to carry their pictures, the ribbon form of celluloid.

In 1861, the same year as Sellers' invention, we find a patent was granted on the 8th of June, No.1861, to Mr. Du Mont, in which he outlined the first principles of Chrono-Photography, wherein he states:-

Mr. Du-Mont.(Continued).

"Nowadays, photographers are enabled to reproduce
"on surfaces of great sensibility to the light what
"they have termed instantaneous images. They phot-
"graph a moving object such as an horse running, etc.,
"but have never thought of obtaining but a single
"image of the same object, and did not even wish to
"reproduce several successive ones, or the successive
"phases produced by motion".

Du-Mont then goes on to explain the various methods by which such photos could be obtained, explaining fully the use of a shutter geared to a mechanism so as to revolve and expose the photographic plates when they were perpendicular to the lens axis. He also explains how the sensitized plates could be mounted upon a prismatic drum or dropped from a magazine in a similar manner to that employed in the early snap shot cameras. The next patent was taken out by Bonelli and Cook in Great Britain on August 19th 1863, No.2063. This was interesting, insomuch that it consisted of a series of small views being mounted upon the edge or periphery of a disc and viewed through a microscope (this method was later tried by Edison). The disc was rotated in unison with a perforated or slotted eyepiece. A later patent taken out by G.Bonelli alone, which differred very little from the previous specification and might be described as a glorified phenakisticope with a series of small lenses mounted on a separate front shutter through which the pictures were viewed, in place of the usual slots, the pictures being of course being seen magnified through the lenses.

Another very important patent which was cited against numerous applicants for subsequent patents for kinematography was that of Ducos and du-Hauron, a native of France who applied for a patent of April 25th 1864 and was granted No.61976. This application was to protect an apparatus he had devised for

Beaks Choreutoscope

the photographic reproduction of any scenes or objects, with all the changes they may have undergone through a specified period of time. In his claims, which although never printed owing to the lack of
clear that he was ge
Kinematography as he

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The statements are
by Judge Wallace in
T.A.Edison, when he

In 1866, Mr. Beale,
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instrument somewhat
slide, which embodie
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In 1867, on March 6
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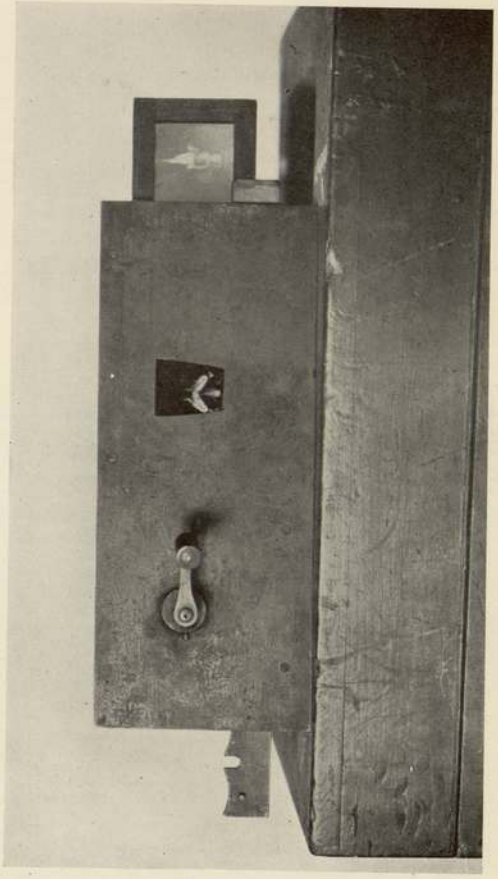


BEALE'S CHOREUTOSCOPE

This instrument was invented by Mr. Beale of Greenwich, in 1866, and although in the form of a lantern slide, it embodied all the principle elements of an up-to-date Kinematograph Projector, having a Cam and Locking Movement, Masking Shutter, Long figure Slide and was worked by a rotating handle.

the photographic reproduction of any scenes or objects, with all the changes they may have undergone through a specified period of time. In his claims, which although never printed owing to the lack of the necessary funds, he makes it very clear that he was getting extremely near to the invention of Kinematography as he states:-

> "The observer will believe he sees
> "only one image which changes gradually
> "by reason of the successive changes
> "of form and position of the objects
> "which occur from one picture to the
> "other".

He goes on further to explain the methods he employed and the scenes he could reproduce as he states:-

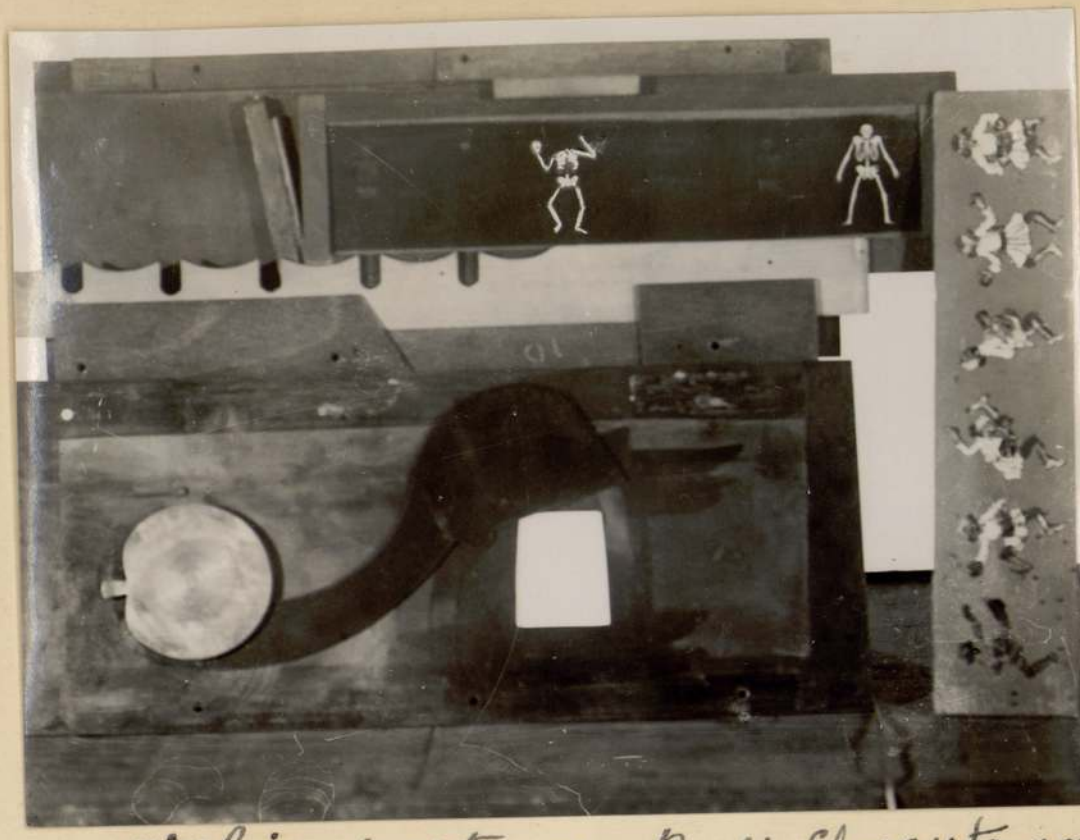
> "There will be as it were a living
> "representation of nature and the
> "same scene will be reproduced upon
> "the screen with the same degree
> "of animation".

The statements are of historical interest as they were cited by Judge Wallace in the American Courts of Law against T.A.Edison, when he proceeded against the Mutoscope Company.

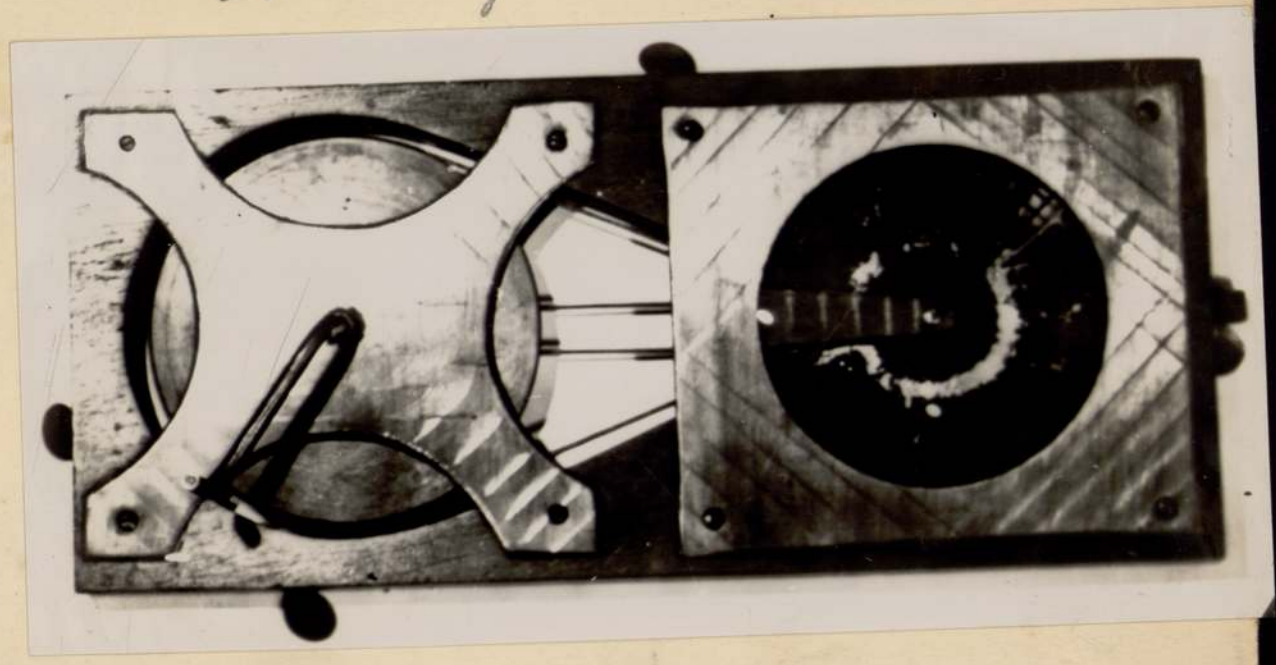
In 1866, Mr. Beale, a native of Greenwich, a suburb of London, invented the CHOREUTOSCOPE a very remarkableprojecting instrument somewhat upon the lines of a mechanical lantern slide, which embodied the use of an oscillating front shutter, to mask the successive phases of movement depicted upon a long glass slide. The figures were drawn and painted by hand and although it projected a moving picture upon the screen it was never applied to Photography. This same inventor also showed a living head using 16 transparencies upon a large glass disc, ~~that~~ showing a head apparently living, life size.

In 1867, on March 6th, Mr. M. Bradley secured a patent No.629 for a new form of Zoetrope, with slots placed above the figure bands, which offerred no new principle in the design he adopted

Bealis Choreutoscope



Working parts of Bealis Choreutoscope 1866



Rosi Wheel of Life
Show also Figure Disc

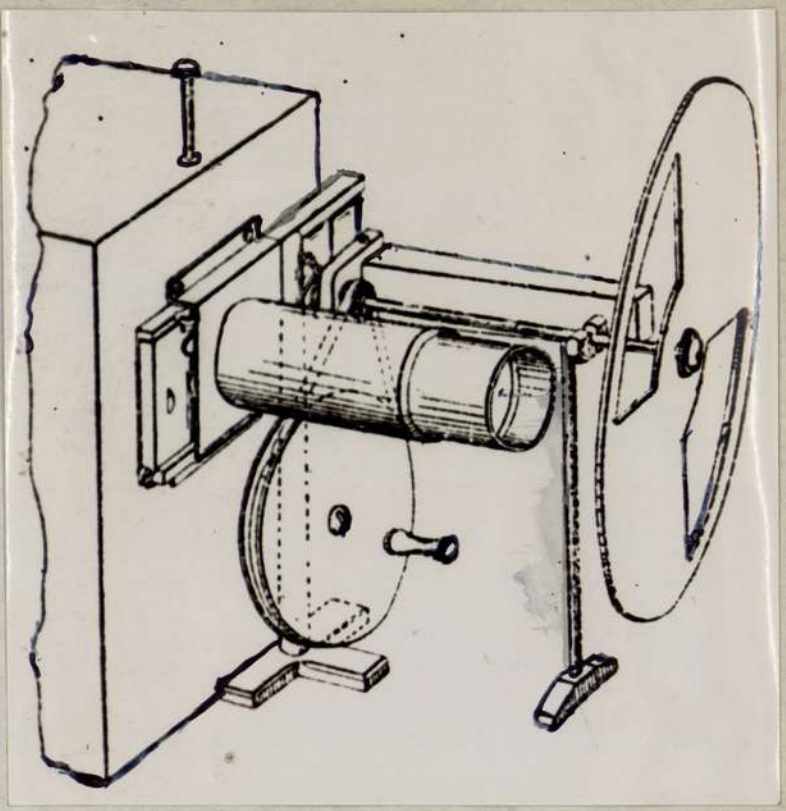
A patent taken out by Mr. E. Edwards on March 23rd, 1867, was described as a small instrument for taking a series of small photographs in succession upon the same plate, for which a British Patent 849 was granted. This invention is interesting inso much as it was revived many years later and placed upon the market under the name of KINOKAM. This instrument was capable of taking eight snapshots in succession upon a circular sensitized glass plate 5 inches in diameter, and was fitted with a radical arm mounted upon a central pivot which carried a photographic lens at one end and a projection lens at the other, thus turning the instrument from a camera into a projector in a second.

In 1867, Mr. Rose whose invention of the Kalotrope has already been mentioned, claimed a patent for a ZOETROPE which had a spindle running down into the stand, instead of being supported upon the stand and for this he was granted a patent No.3156 on November 8th 1867.

The next inventor to achieve a really definite results by photographic means to show movement upon a screen was the man who was called by many, the father of Moving Pictures - John Arthur Roebuck Rudge, a native of Bath, England, whose wondefful inventions will be described in a following chapter. He commenced experimenting in 1864, and continued up till the time of his death in 1903.

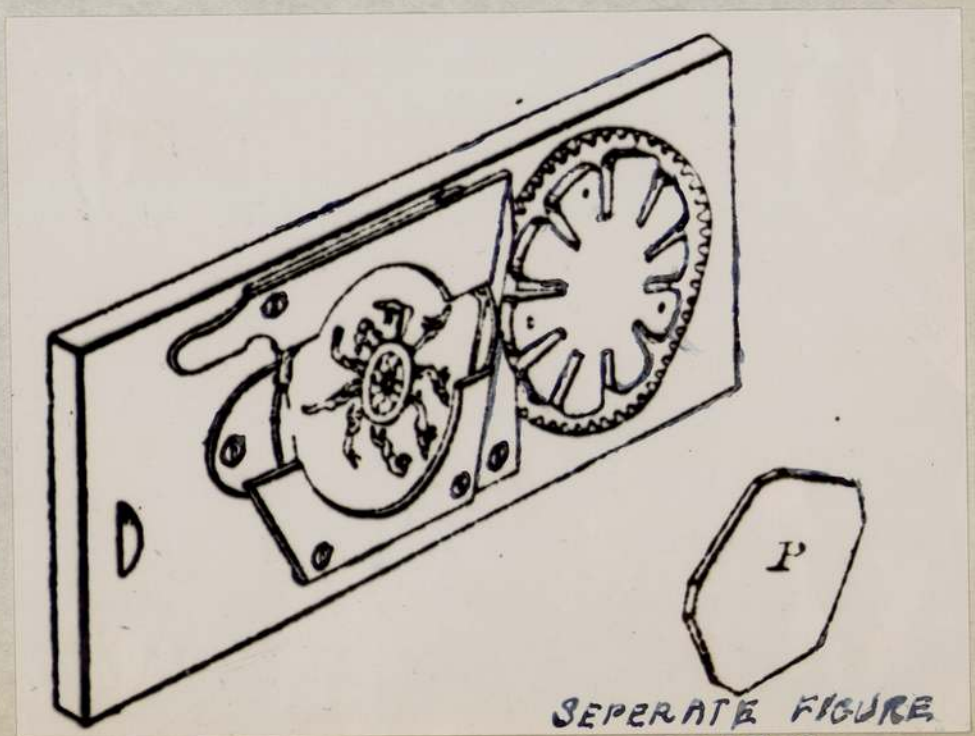
In 1869 Thomas Ross the younger patented an instrument called by him, "The Wheel of Life", which was in the form of a rotary lantern slide, carrying a glass figure disc, with a separate slotted rotating front shutter, each successive phase of movement shown on the figure disc being alternately masked and projected by one revolution of a slotted shutter.

Domisthorpe's Kinesigraph



~~Brown's~~ ~~Polygonal~~
Browns Polygonal
Moving Picture Projector
Using a Front shutter.
Constructed in 1870.

A.B. Browns
Motion Picture
Machine
Drawn or Painted
images on a
Polygonal Glass
plate



SEPERATE FIGURE
SLIDE

Thomas Ross (continued)

the claims made by him for this instrument were extremely vague, but in a later patent number 2685 granted in 1871 he set forth his claims much more clearly and stated:-

> "that his invention was for improvement
> "in instruments and apparatus for produc-
> "ing pictures of bodies apparently in
> "motion".

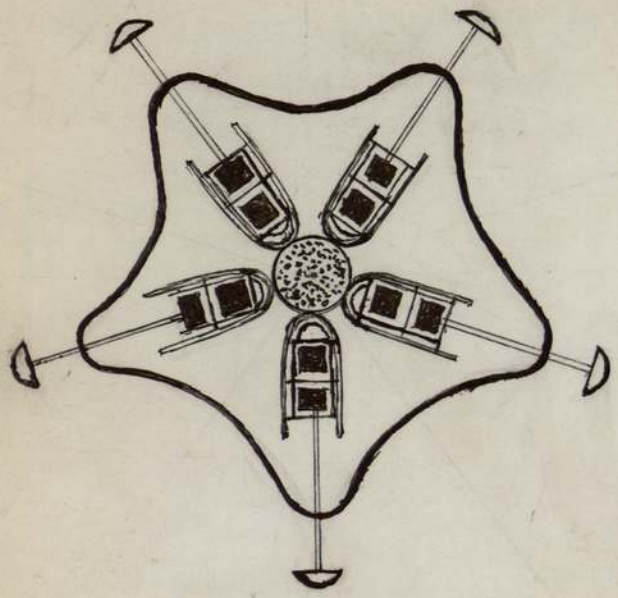
A Suggested application for a patent was put forward by Mr. F.W.Hartley on January 7th 1868 for an adaptation of the Phenakisticope for use in the optical lantern by showing a number of pictures in series upon a glass disc, in place of the ordinary lantern slides. For this invention a British Provisional Patent was granted No. 46.

The next inventor to attempt to portray movement by photographic means was Mr. A.B.Brown in America who took out a patent in New York in 1869. His instrument was somewhat similar in appearance to Beale's Choreutoscope; it had several novel features, being fitted with a cam and striking pin and the movement was masked by a rotating shutter having two blades. The number of the American Patent granted for this invention was 93.594.

Messrs. Langlois and Angiers two Frenchman in 1868 patented a device for alternately showing two microscopic of views in a rapid sequence of transposition, somewhat like a slipping slide as used in the Magic Lantern. This little instrument they called the KINESCOPE which they patented on May 2nd 1868 No. 1443.

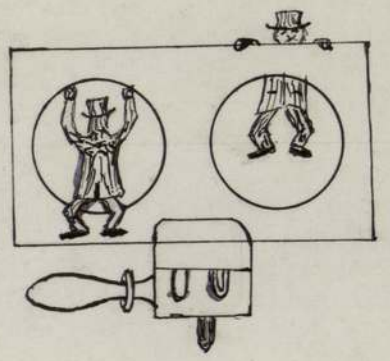
THERE WERE MANY FORMS OF MOVING FIGURES CUT FROM CARDBOARD AND SOLD AS TOYS, AND ONE EXAMPLE REPRODUCED, SHOWS A COBBLER SEWING A SHOE; BEING MADE TO MOVE, BY PUSHING THE CARDBOARD LEVER UP AND DOWN

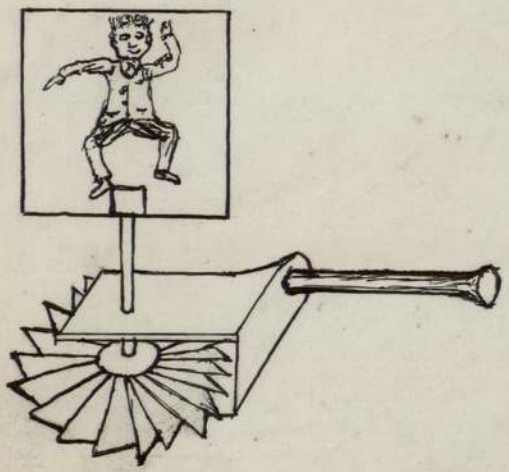
Moving Figure Toys



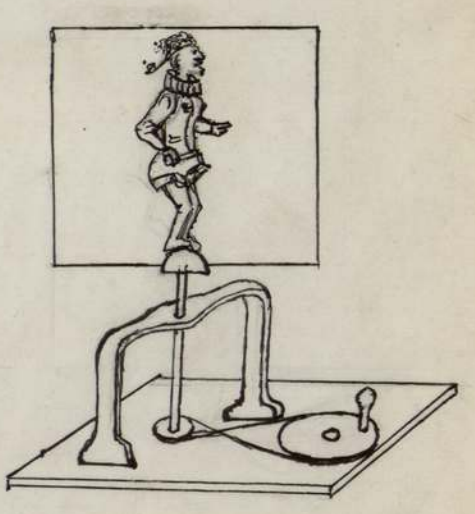
The Kinescope

The Pedemoscope



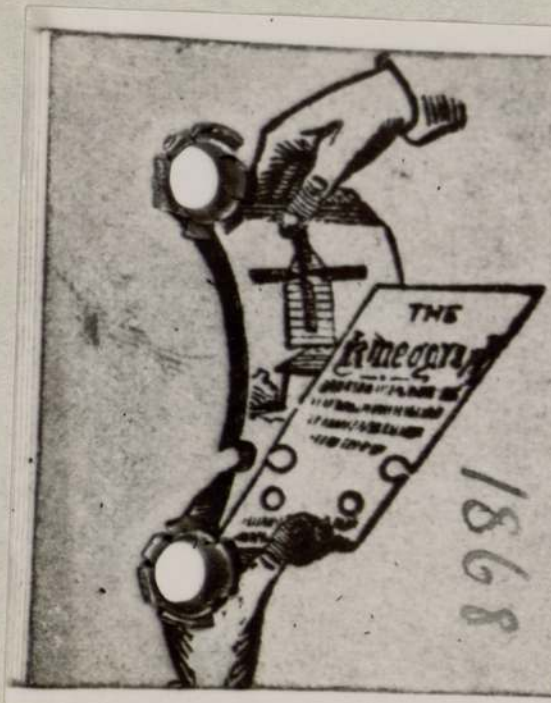


Thaumatrope Figures to be blown round



Thaumatrope figures turned by hand

Linnetts Kineograph 1868



1868

DIRECTIONS.

Hold the Book in the position shown in the Engraving, and *gently* release the leaves one at a time. A curious Optical Illusion will be produced, giving an appearance of life and motion to the Pictures.

LINNETT'S PATENT.

Linnetts Kineograph Book 1868

This consisted of a series of views mounted in a multiple form, and the movement from one view to another was occasioned by pressing a lever, which brought the second view beneath the first with position, and upon releasing the pressure of a cushion of soft rubber caused the lever to revert to its original position.

A Patent taken out by Mr. Linnett on March 18th, 1868 was the first patent in the world to be taken out for pictures to flick over in book form. Mr. Limmett had devoted much study to the Human Eye and the phenomena set up by persistence of vision and he was therefore able to put his experience into a practical form, when he made his first book of moving pictures. The name given to his invention was the KINEOGRAPH and for this he was granted a British Patent No.925. The method of operating was extremely simple as the book of pictures was held in one hand and allowed to flick over from beneath the thumb of the other hand. These little books of pictures were put up in a series of twelve subjects in a box and sold for five shillings .

It again is interesting to record how often similar inventions have been granted patents for almost identical ideas. APatent was granted to Mr. A.A.Melville No 14917 on November 17th 1886 for a book form of moving pictures exactly the same as Linnett's Patent of eighteen years previously, the only difference in the two inventions being in the mounting of the cards which in the case of Linnett's patent were fastened through one end with a wire staple, whilst Melville claimed to use a radial form of mounting, using only the extreme end of the card, both patents used hand drawn figures for their pictures only.

Whilst describing the moving pictures produced in book form it will be as well to mention the invention of other forms of moving pictures mounted upon cards in book form or otherwise. One of these inventions was

Short's Filoscope

by Mons Wattillaux a Frenchman , who used a series of of half tone Photographs for his subjects and had a special Tin clamping device, and a clip attachment for turning over the leaves. This was called the Folioscope for which a British Patent was granted in in 1896, No. 20136. Another book form of pictures which had a large sale when first produced was SHORT'S FILOSCOPE. Mr. H.W.Short was a personal friend of Mr. R.W.Paul the inventor of the ANIMATOGRAPH, and his invention consisted of a number of oblong leaves of cards each carrying a separate photograph of a sequence of movements; these were firmly fastened at one end into a metal clip. This clip was pivoted inside a metal case which was fitted with alever, and, upon this being pulled over, released the cards one at a time , so that they could be viewed whilst being flicked over. The effect produced by this little instrument was extremely realistic. Mr. Short was granted a British Patent for his invention on the 3rd November 1896 No. 23.158.

This same inventor also conceived the idea of producing a clever intermittent movement for Kinematography, which actuated a sprocket roller by a sectional worm gearing, for which he was granted a British Patent No.3777 on February 19th 1896.

In another chapter will be found particulars of the MUTOSCOPE one of the first moving Picture machines with a series of cards mounted radially and turned by hand usually to be seen at fairs and Exhibitions, this was manufactured by the K.M.C.D. syndicate and placed upon the market by the Mutoscope Co.

The Kinora was a similar type of instrument produced by Messrs. Lumiere which was made in the form of a coin freed instrument for Public use, and put up also in a hand turned and clockwork model for home use, this will also be found explained in the article relating to the invention of the Brothers Lumiere.

THE FIRST TIME A SERIES OF MOVING PICTURES WERE PRINTED ON THE LEAVES OF A MAGAZINE WAS IN THE XMAS NUMBER OF HARMSWORTH'S MAGAZINE 1898 THE PICTURES SHOWED TWO CHILDREN DANCING FROM A FILM BY LUMIERE

There was another form of moving Pictures put up in Book from, invented and Patented by Theodore Brown and called by him the KINEMASCOPE which showed movement by a print made in two colours, Red and Green and when viewed through a Red and Green Gelatine medium which was passed rapidly before the eyes, showing a transposition from one picture to another an apparent phrase of movement was created. There have been many forms of Books of Pictures made and soldsince, numerous types and other optical novelties one of which that was sold upon the streets was an illusion of a Gold fish and Globe. This consisted of a ring of tin about four inches in diameter with a tin Gold fish fixed inside upon a loose Centre. The tin ring was made to revolve by means of an archimedian screw and when pushed up from the base of the screw revolved rapidly and in a bright light had the appearance of a Glass Globe with a fish inside.

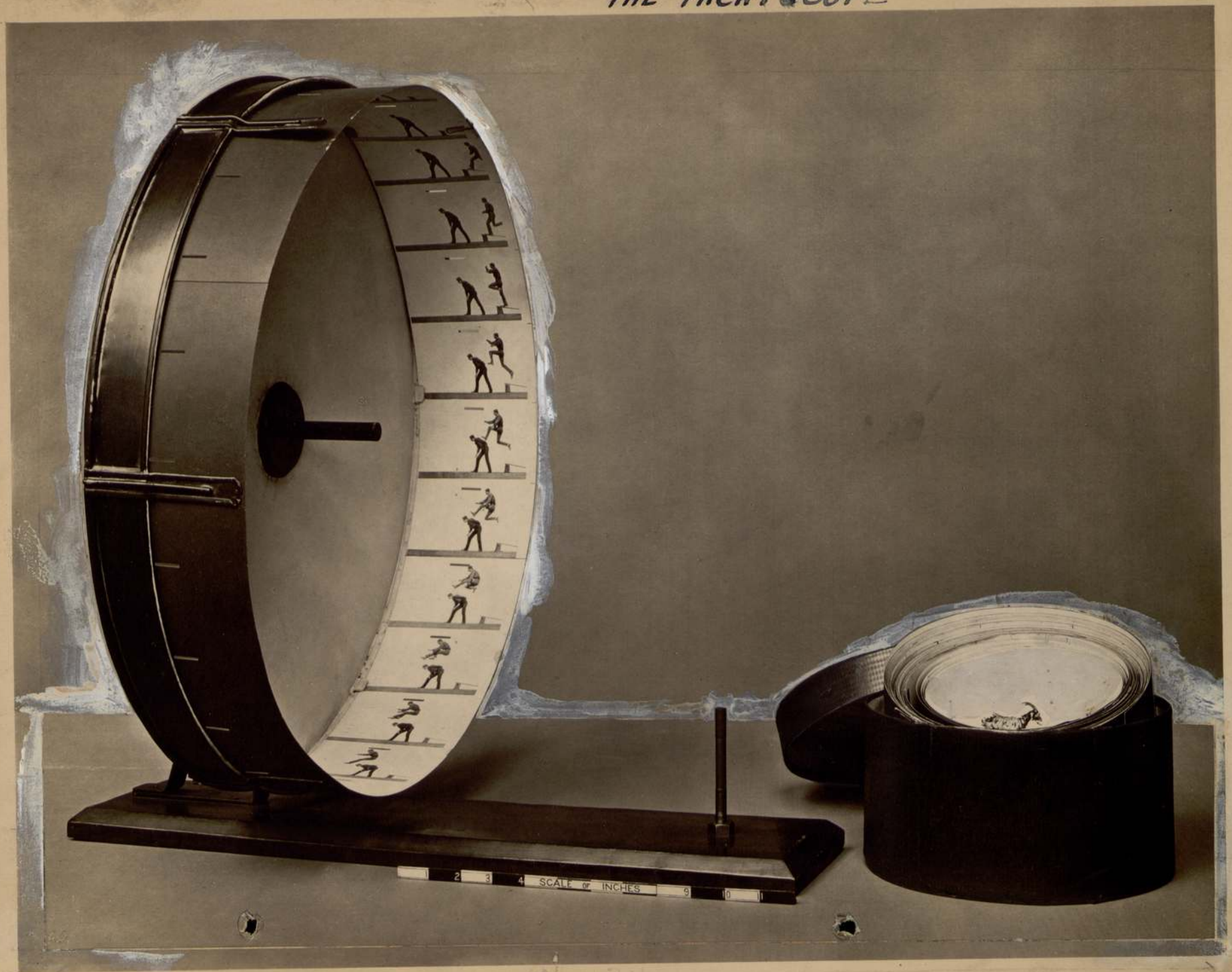
The Thaumatrope or revolving card was also produced from time to time as a penny toy, in some cases being revolved by hand and in others blown round in the form of a small windmill. A very popular form of moving picture toy was placed upon the market in 1912, which showed a head and shoulder portrait with a lined screen in front ruled upon celluloid, and upon pressing the sides with the thumb and finger, the face could be seen grimacing, and some very ludricrous results were obtained by this simple means.

Having slightly digressed from our sequence of inventions relating to moving pictures by mentioning the Various Moving Pictures produced in book form, we will resume our ordinary course once more.

On July 20th 1869 a British Patent No. 2193 was granted to Mr. D.Trevor for a method of securing a series of Photographs to be taken radially over the surface of a sensitized glass disc but nothing seems to have been done to place this invention upon the market, and it is very doubtful if ever a working instrument was ever constructed by the patentee. Many years later in 1907 a similar instrument was constructed and sold commercially by Mr. Kamm under the name of the Kammatagraph which had only a small amount of commercial success.

In the year 1870 Mr. Heyl a native of Philadelphia U.S.A.

THE TACHYSCOPE



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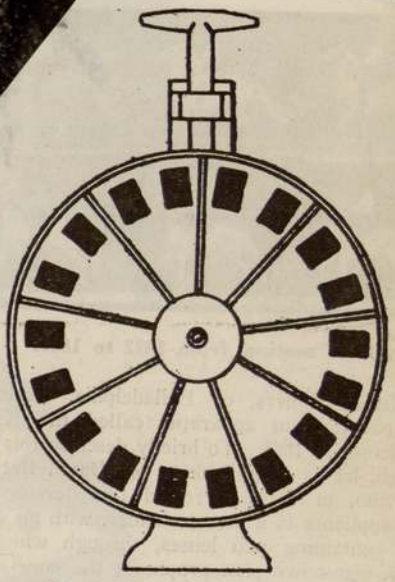
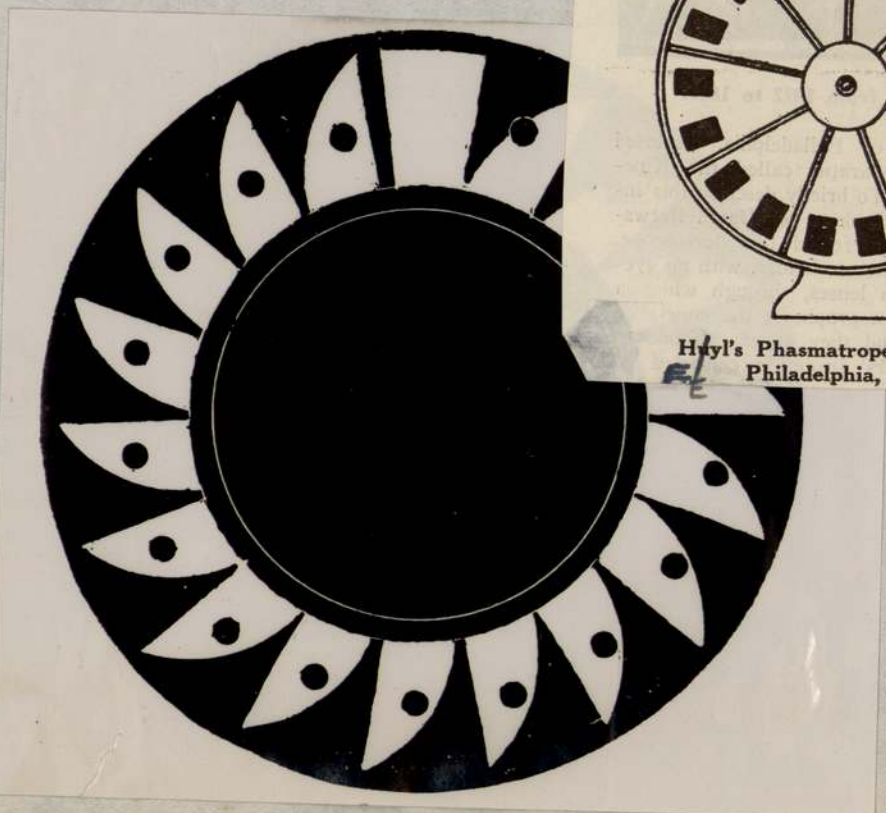
The Tachyscope by Ottomar Anschutz a native of Lissa in Po[illegible]

Janssen's Sun Photography

Dr Janssen

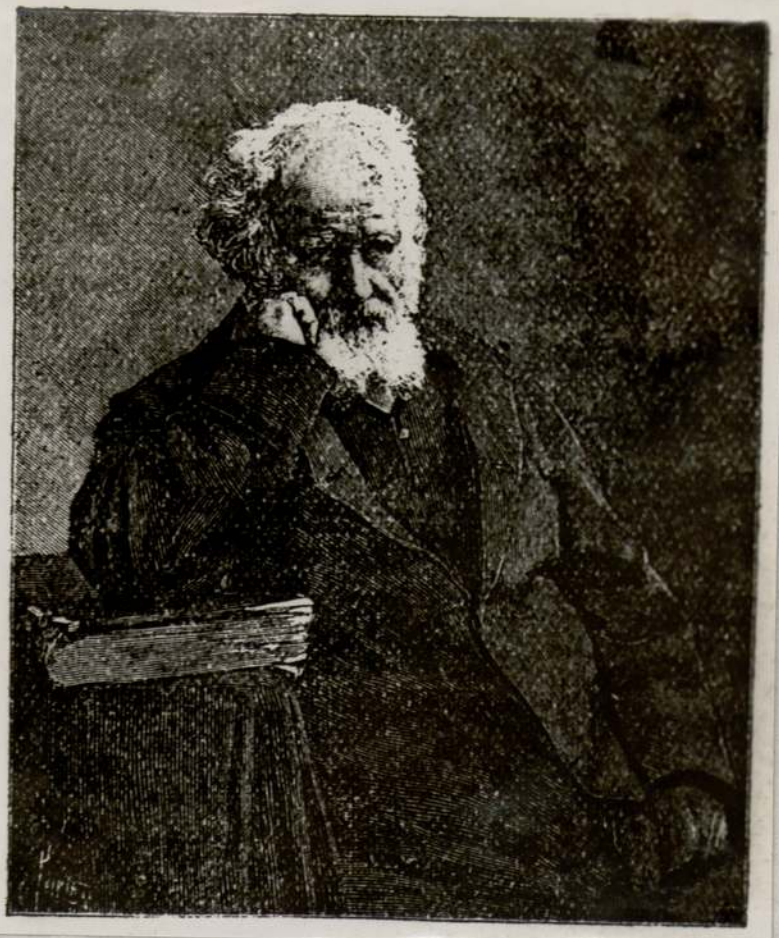


Hoyl's Phasmatrope, shown in Philadelphia, 1870.



Photographic Plate showing Venus transit across Sun

Janssen's Gun Photography



Dr Janssen

ion, from 1872 to 1887

rs, of Philadelphia, d
apparatus called the
il. To briefly describe
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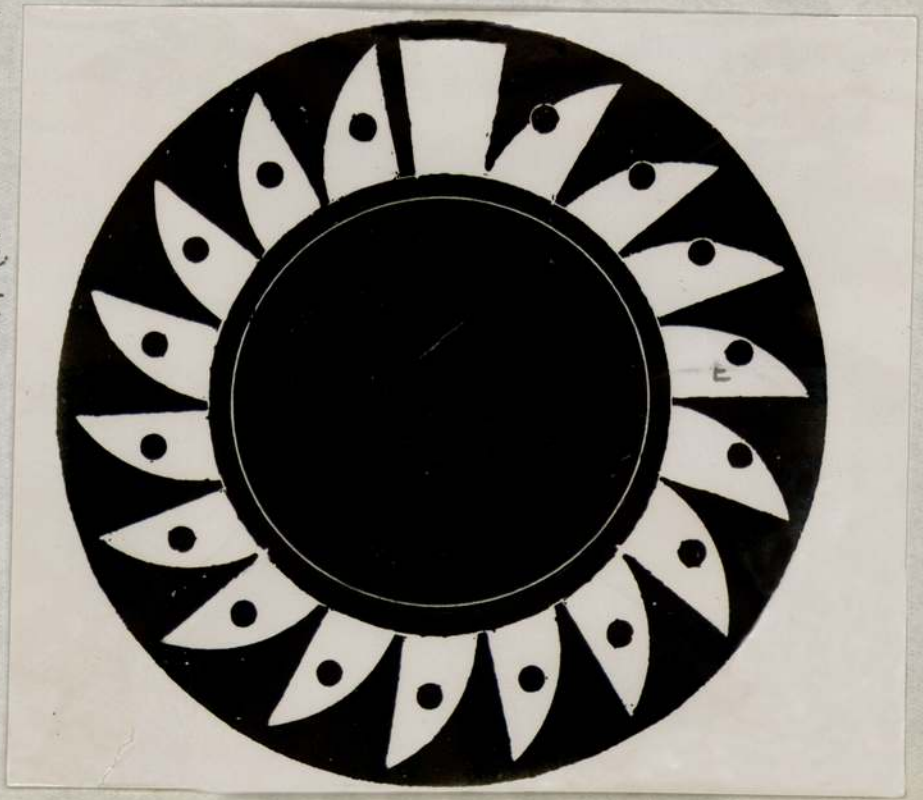
39, perfected the ste
a picture holder, with
two lenses, through
photographs of the
, and they appear
Sellers' invention co



Photographic Plate showing Venus transit across Sun

invented a machine which he called the PHASMATROPE. This consisted of a LARGE glass disc, divided into nine equal spaces, each space carrying two figures of any given movement; the mechanism which was worked by a ratchet and Pawl movement, was OPERATED by hand and was used in a similar manner to [illegible]. Mr. D.Trevor applied for a British Patent for a method of taking a series of photographs in rapid sequence upon a rotating glass plate and for this he was granted Patent No. 2193 in 1869 but the invention showed no new principle.

Beales large Face Figure Disc Choreutoscope

An instrument invented by Ottomar Auschutz a native of Lissa in Prussia which was somewhat akin to the Zoetrope he called the TACHYSCOPE. This was produced in 1888 and it was constructed to carry a band of figures photographically recorded in sequence upon a long strip of Cardboard, the figures being previously photographed as a series of rapid snapshots, and as this principle had been used before on several occasions no new method was disclosed. This instrument was exhibited with great success at the World's Fair, Chicago, U.S.A. in 1891 and showed some realistic motion pictures of an elephant walking through the Tier Garten at Berlin, and it is interesting to note that it was this Electrical Tachyscope when viewed at Chicago by T.Armat, that induced him to study motion Picture Photography, and eventually led to the production of the Vitascope Projector which was the first Projector to show moving moving Pictures, to be sold by T.A.Edison.

In the year 1874 Dr. Janssen invented his Photographic Gun with which he secured an unique set of Photographs upon a Glass Disc taken in sequence, of the transit of Venus across the disc of the Sun. This Gun Camera was somewhat similar to the instrument made and used by Dr. Jules Etienne Marey, which will be found fully explained in a later chapter setting forth the lifework of that wonderful Scientific Genius.

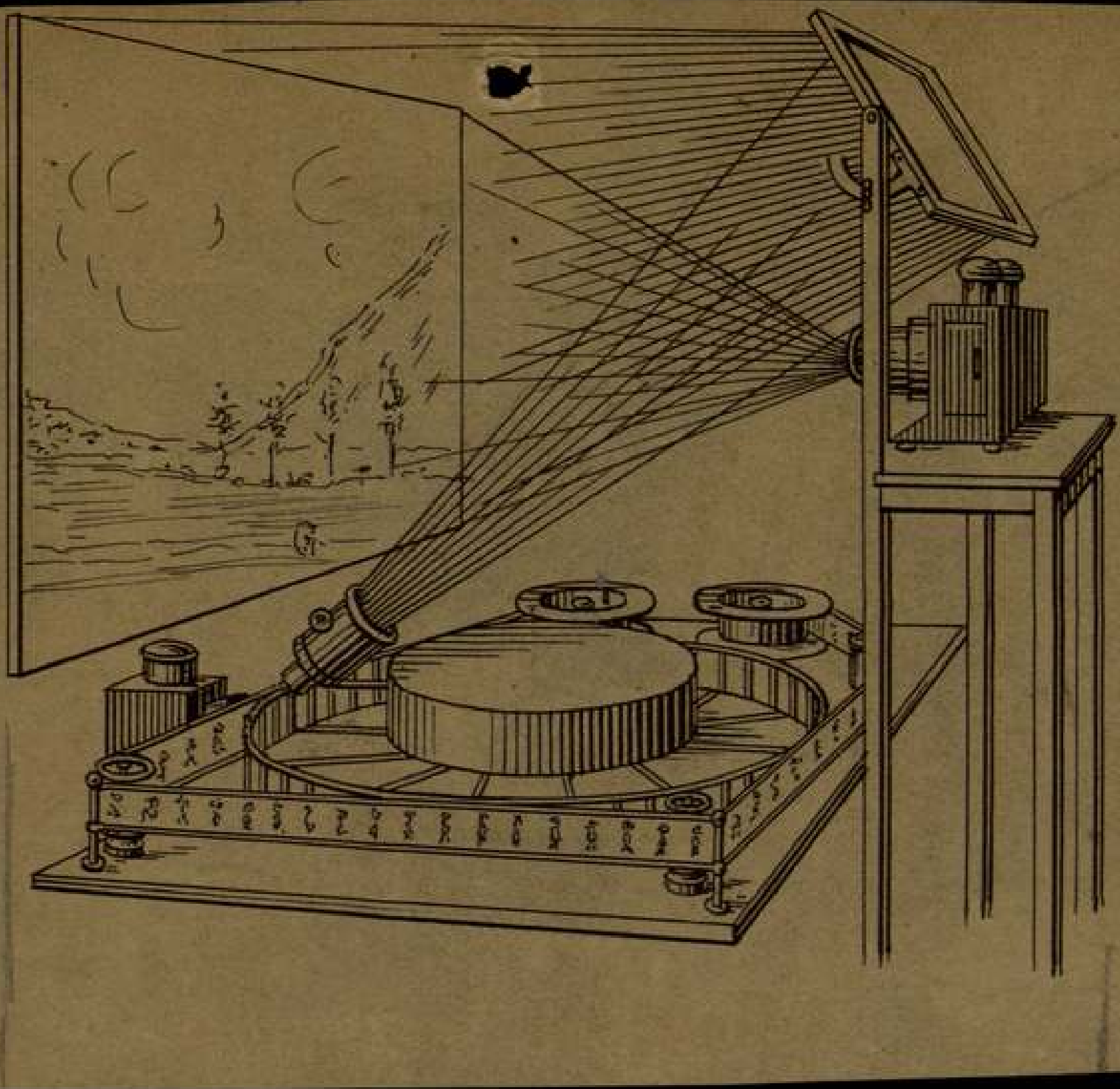
Another great enthusiast who endeavoured to show movement by means of Photography was Mr. Muybridge a native of Kingston-on-Thames, England whose life work will also be found in the following chapter. Amongst the many early inventors of apparatus for showing figures in

Emile Reynaud. Praxinoscope

9

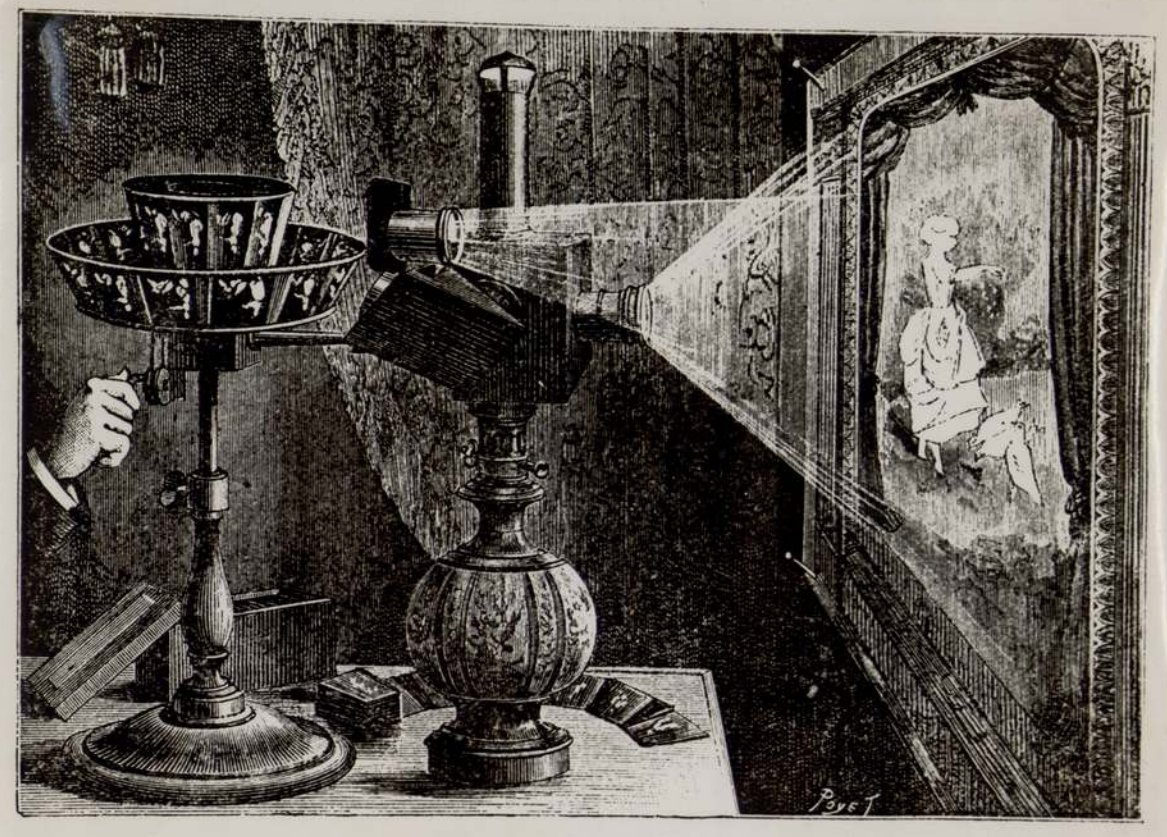
E. Reynaud

Praxinoscope

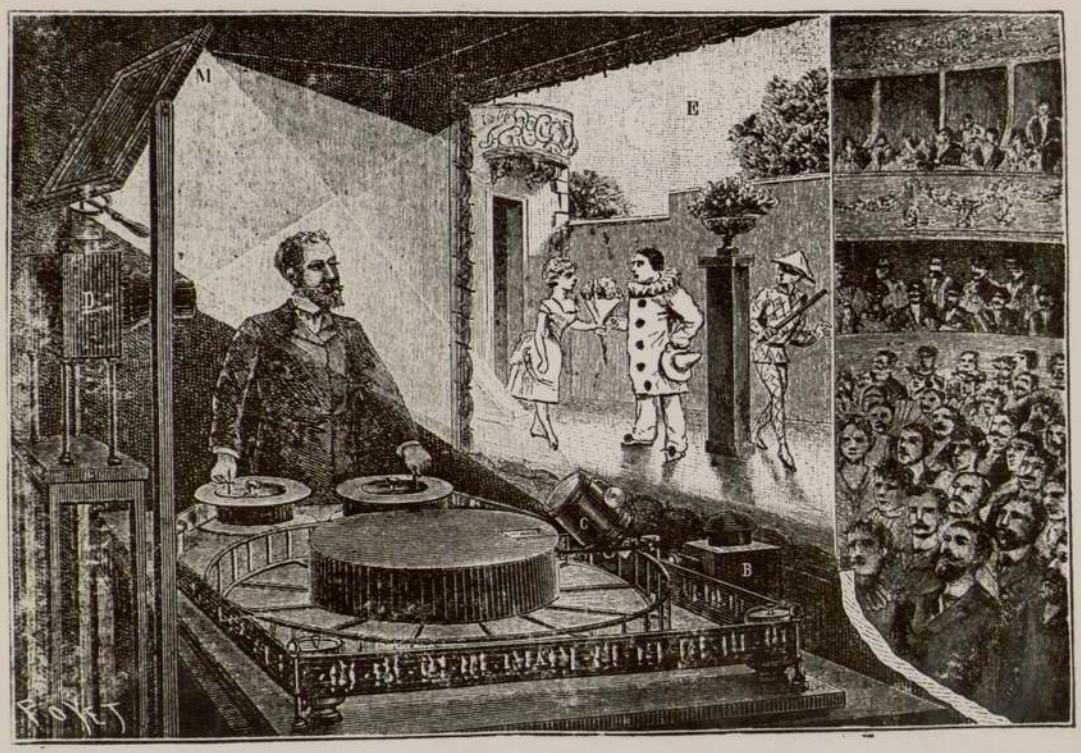


C. Reynaud. Praxinoscope

Projecting Praxinoscope



The Electrikinoscope



Reynaud. Praxinoscope

Pro

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(La scène se passe

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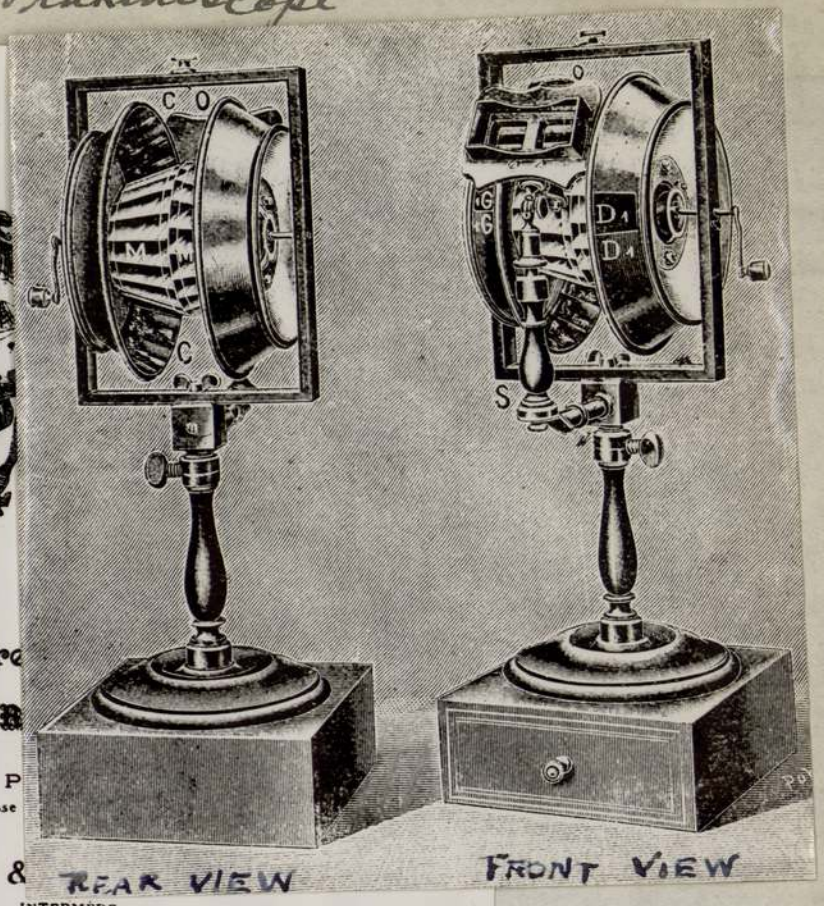


INTERMÈDE

Un Bon Bock

SCÈNE COMIQUE

PERSONNAGES: Un Promeneur, un Vo
un Marmiton, une Servante.

(La scène se passe dans la cour d'une Auberge)

Appareils et Jouets d'optiques. - LE PRAXINOSC

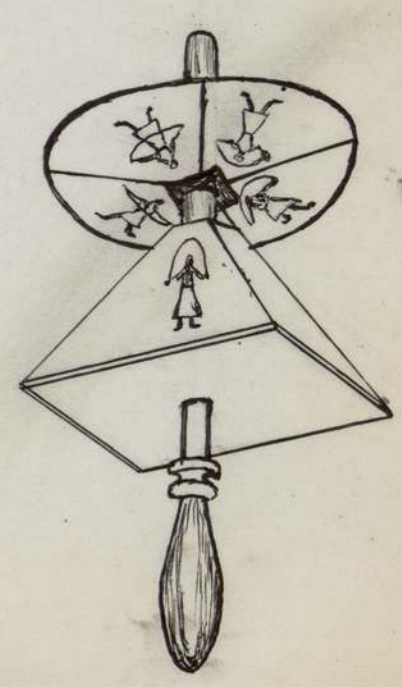
E. REYNAUD, Inventeur, 58, *Rue Rodier, Paris.*

On peut voir exposés au *Bar* du Musée Grévin les divers modèles de

Le premier Programme du Théâtre Optique au T
(28 Octobre 1892)

Programme for Praxino

Reynauds Mirror Figure Top.



Reynaudi
Steroscopic
Moving Pictures

Reynaud. Praxinoscope

Musée Grévin

Tous les Jours
de 3 heures à 6 heures
et de 8 heures à 11 heures

PANTOMIMES LUMINEUSES

Composées et présentées
par E. REYNAUD.
Inventeur du Théâtre optique.
Musique de Gaston PAULIN.

Programme

PAUVRE PIERROT

PANTOMIME

PERSONNAGES : Pierrot, Arlequin, Colombine.
(La scène se passe dans le jardin de Colombine).

CLOWN & SES CHIENS

INTERMÈDE

Un Bon Bock

SCÈNE COMIQUE

PERSONNAGES : Un Promeneur, un Vo
un Marmiton, une Servante.
(La scène se passe dans la cour d'une Auberge)

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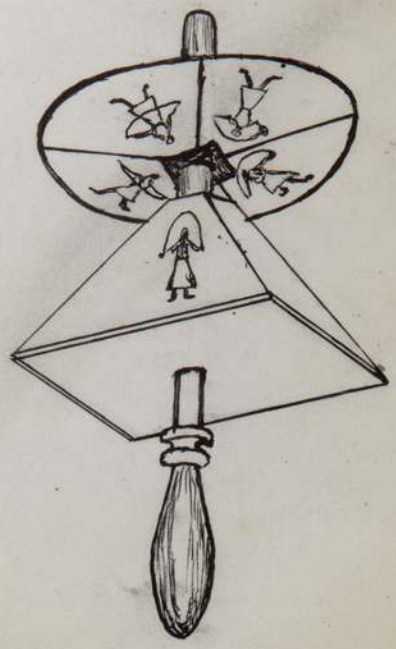


Reynauds
Steroscopic
Moving Pictures

motion upon a screen was Mr. E.Reynard a native of France who was born at Montreuil-sous-Bois, Seine in 1844 and lived later in Paris. In the year 1877 her secured a French Patent for an instrument which somewhat resembled a Zoetrope, called by him the PRAXINOSCOPE. This instrument he also patented in Great Britian on November 13th 1877 No. 4244. It consisted of a shallow revolving cylinder around the interior wall of which was placed a band of figures of any subject it was desirous of viewing in motion. These figures were not viewed through slots as in the Zoetrope but were seen reflected in a series of Mirrors placed centrally on a drum. A series of mirrors equal in number tothe figures or views upon the strip of paper placed in the drum, and when the drum was revolved a very realistic semblance of movement could be seen. In a more elaborate model called the PRAXINOSCOPE THEATRE the scenes and settings for the moving characters could be viewed at the same timeas the moving objects, by a clever arrangement of reflection.

A still more ingenious model by this same inventor was used to show the setting or seenery of any given scene upon a screen by means of a series of reflecting mirrors, and also the figures going through some evolutions of movement, were shown at the same time giving some very extraordinary life like movements although very limited in their scope. A still larger model using Two Magic Lanterns and projecting the scenes by one lantern direct and the moving figures by mirror reflection and called the THEATRIXINOSCOPE was used for public entertainment. This entertainment was successfuly carried on for years at the Musee Grèvin at Paris where the Pantomines Lumineuses became all the rage.

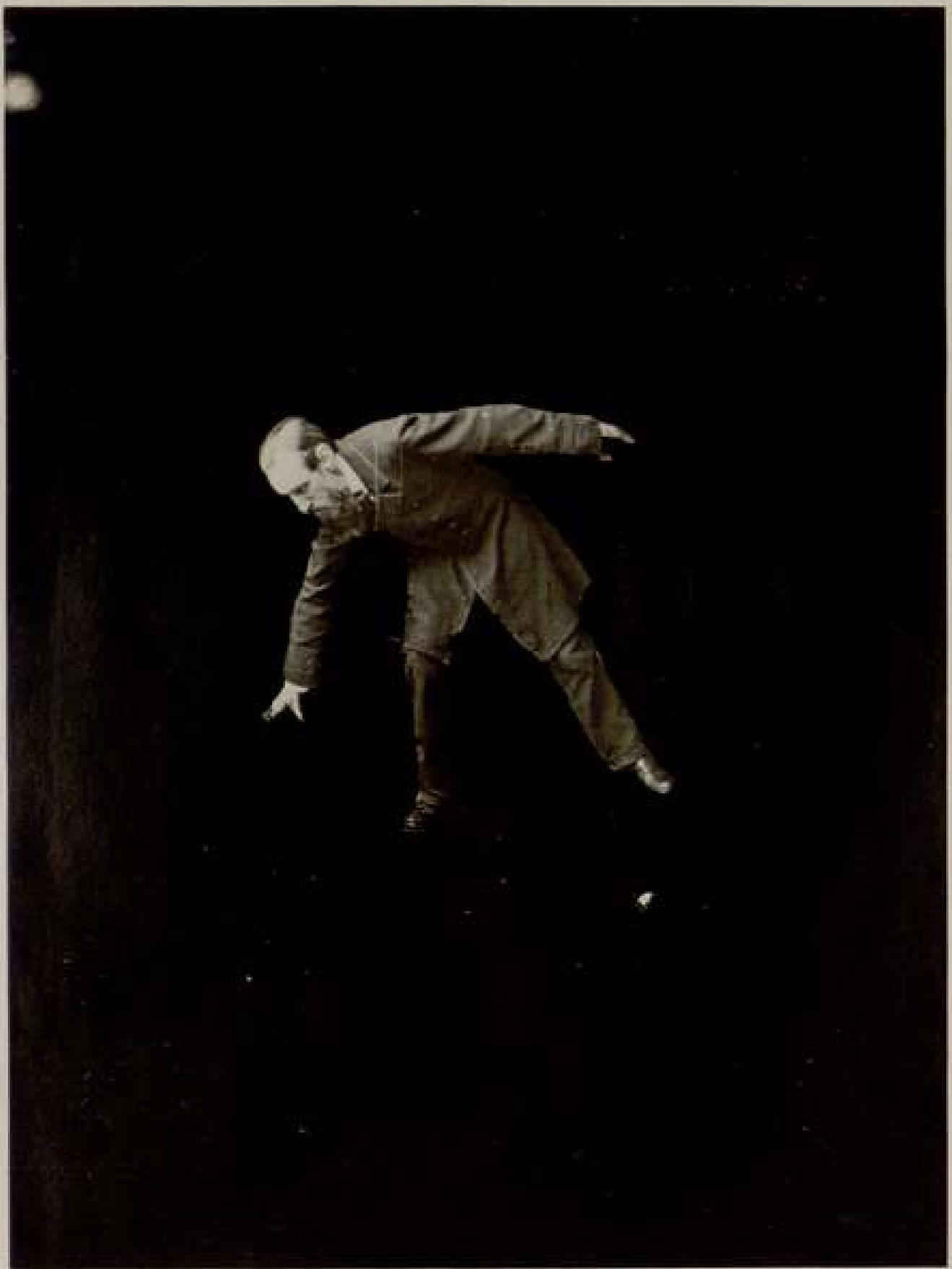
Still another model produced as a toy was made by Reynard and called by him La Toupee Fantoche or Marionette Top which consisted of a four sided mirror tapering to an apex in the Form of a Pyramid with an inverted figure disc on the top and when this Pyramid was revolved by spinning it with a string similar to a top the figures could be seen apparently moving.

a Stereoscopic form of Praxinoscope was also the invention of Emile Reynaud and some of the subjects as viewed were positively naturbl and life like, but this instrument was only made like Edison's Kinetoscope to look into.

Reyhand also produced his Praxinoscope, combined with a musical box for use in Hotels, Fairs and Pleasure Gardens, when by placing a coin in a slot the moving figures could be seen and the tunes could be heard from the Musical Box.

A German invention of the Praxinoscope was sold some years after, under the name of the KINEMATOFOR, but with the exception of the addition of a cranked handle for turning by hand there was no difference in the two instruments.

a French invention by M.M. Mortier and Chéri-Rousseau on a very similar system to the Praxinoscope was placed on the Market in 1899 and called The Alethorama but as no new principle was disclosed by the inventors, the same explanation as that given for Reynaud's Projecting Praxinoscope will suffice.



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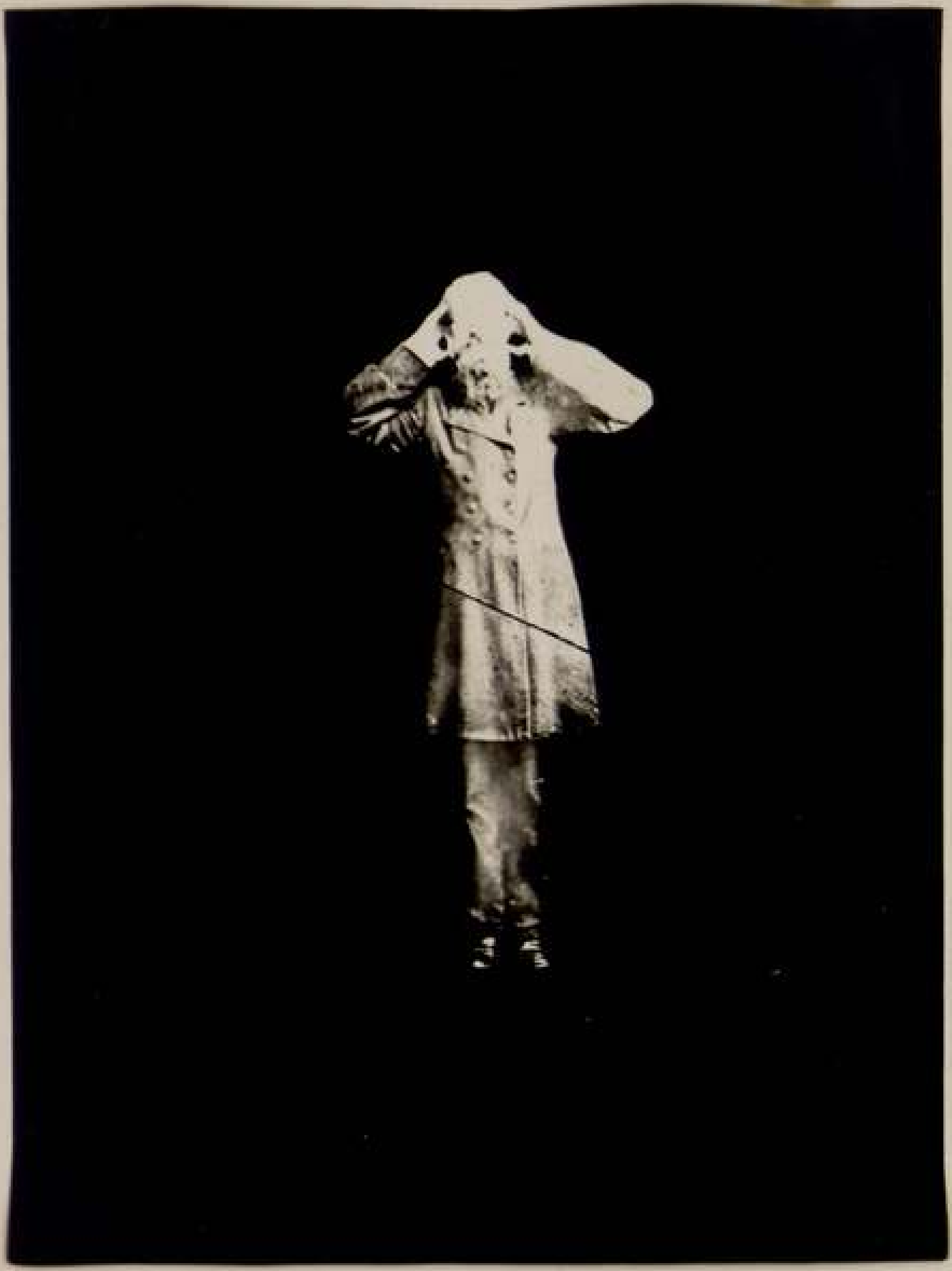

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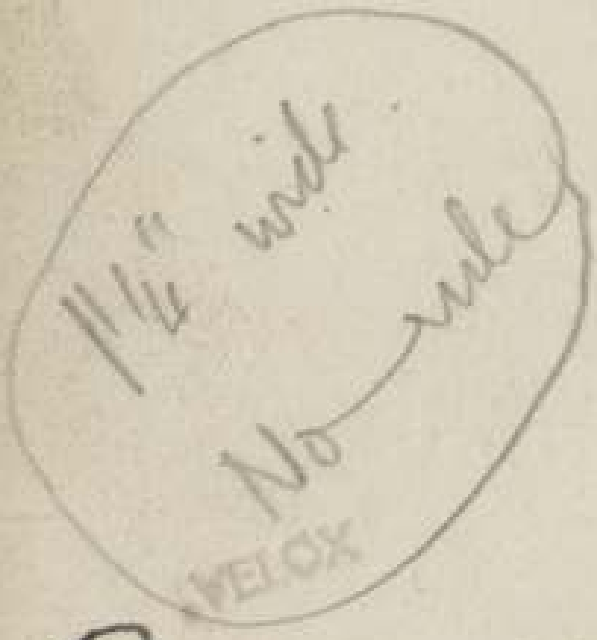
Pudge Slide for
Life in the Lantern
~~Rio Rhodesia~~
Lantern
~~1866~~



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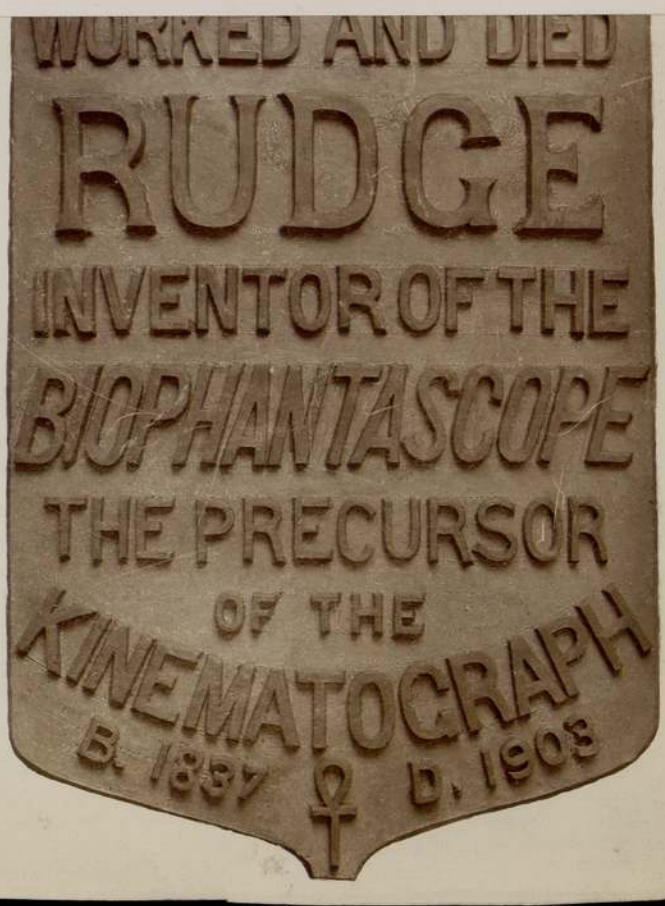
1 of 7 slides
made by Rudge of Bath
for his Life in the
Lantern

J.A.R. Rudge Life in the Lantern.

Seven Slides
Life in the L



J.A.R. Rudge Life in the Lantern.

Seven Slides
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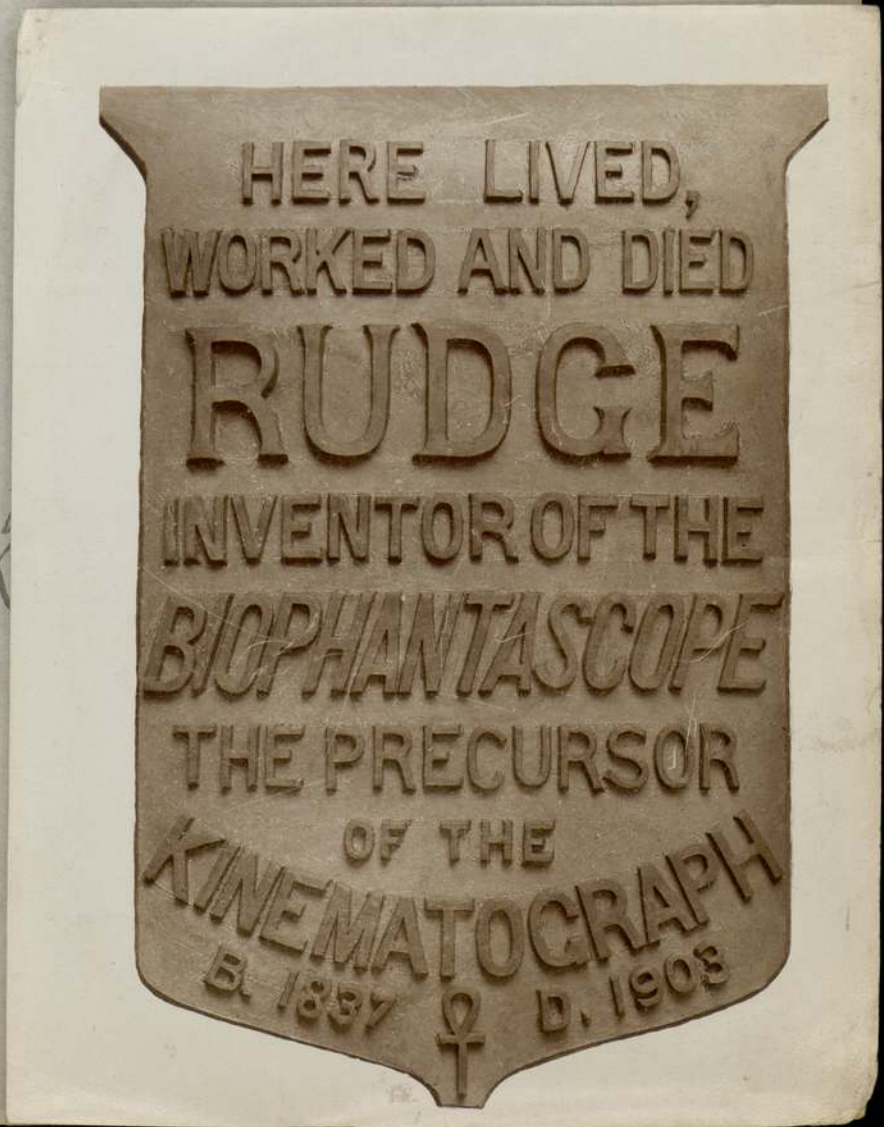


J.A.R. RUDGE LIFE IN THE LANTERN.

Seven Slides for Rudge's
Life in the Lantern

A WONDERFUL TEACHER.

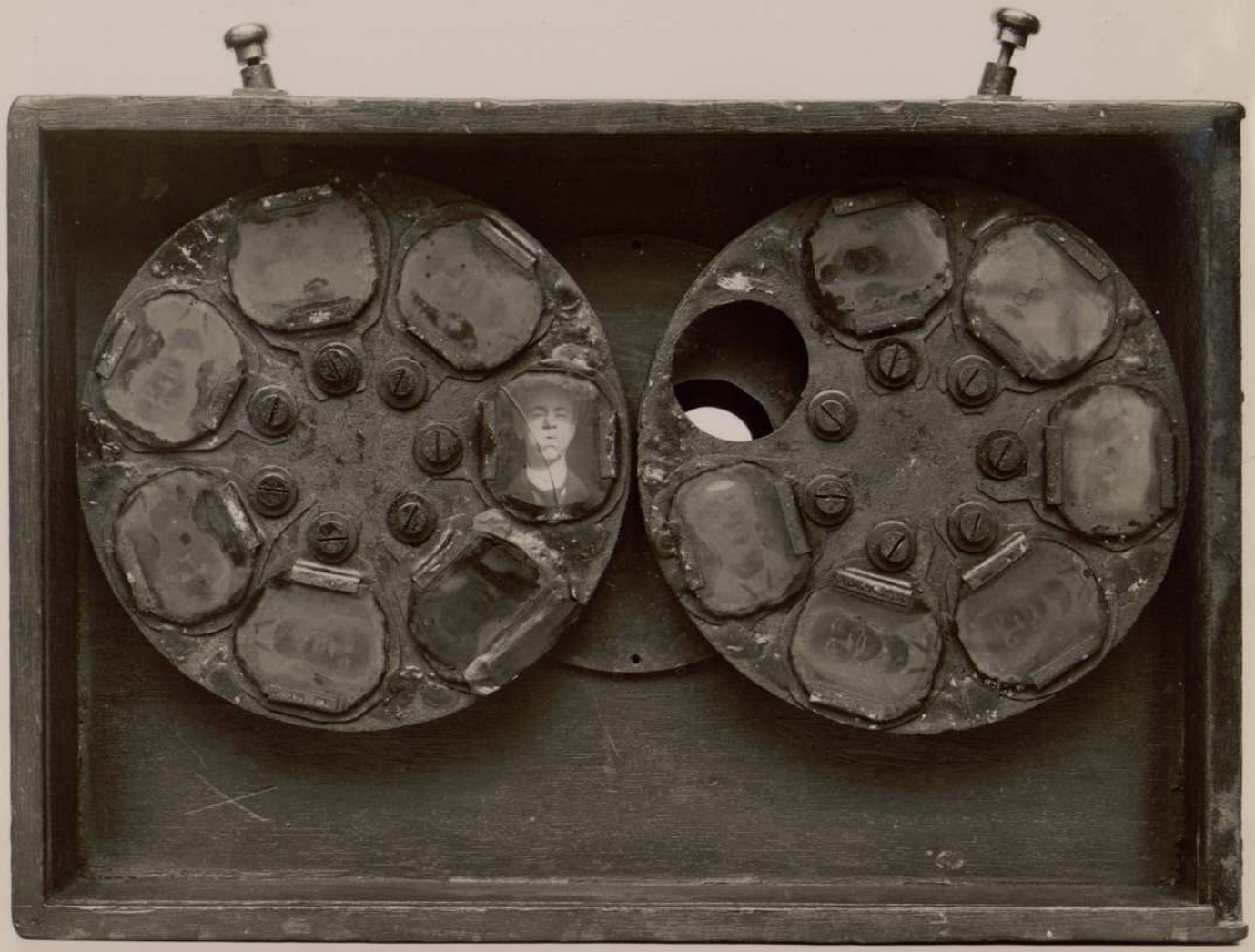
The Great Pioneer Work Accomplished by J. A. R. Rudge, who taught the first inventor of Kinematography, W.Friese-Greene, how to make a Photograph Move.

No.11.

The City of Bath can be justly proud of its association with the invention of Kinematography, for in this city, at No.1 New Bond Street Place, it can be truthfully said, that the seed of this wonderful science was sown. It was when he was about 25 years of age, in 1864, that John Arthur Roebuck Rudge first conceived the idea of reproducing movement by means of photography. In 1870, he had succeeded in inventing an instrument using a double glass disc, each disc carrying a series of facial expressions, which were exposed alternately, in the form of a double lantern slide, and projected in front of an optical lantern. This optical effect, he called, "Life in the Lantern" and he created quite a sensation when he threw this grimacing face upon the screen, apparently going through various movements, as if in Life, and one old resident did not hesitate in calling him an emmissiary of the Devil.

So infatuated did Rudge become with this study that he neglected his business and practically devoted his whole time to the invention of moving pictures. The next effort Rudge perfected in 1873, this he called his Bio-Phantoscope. The instrument consisted of a Vertical, Cylindrical, Optical Lantern which carried around its exterior a rotating gallery of seven slides showing one complete phase of any given movement; this could be repeated as often as desired, and although it could be run continuously, it only showed one phase of any given movement; ~~In 1881, Rudge made the acquaintance of W.Friese-Greene and from him Greene learned much of the methods to be adopted when attempting to secure a sequence of photographs of any moving object.~~

Rudge's Bio Phantoscope



Will Day Collection

No.11.(con.)

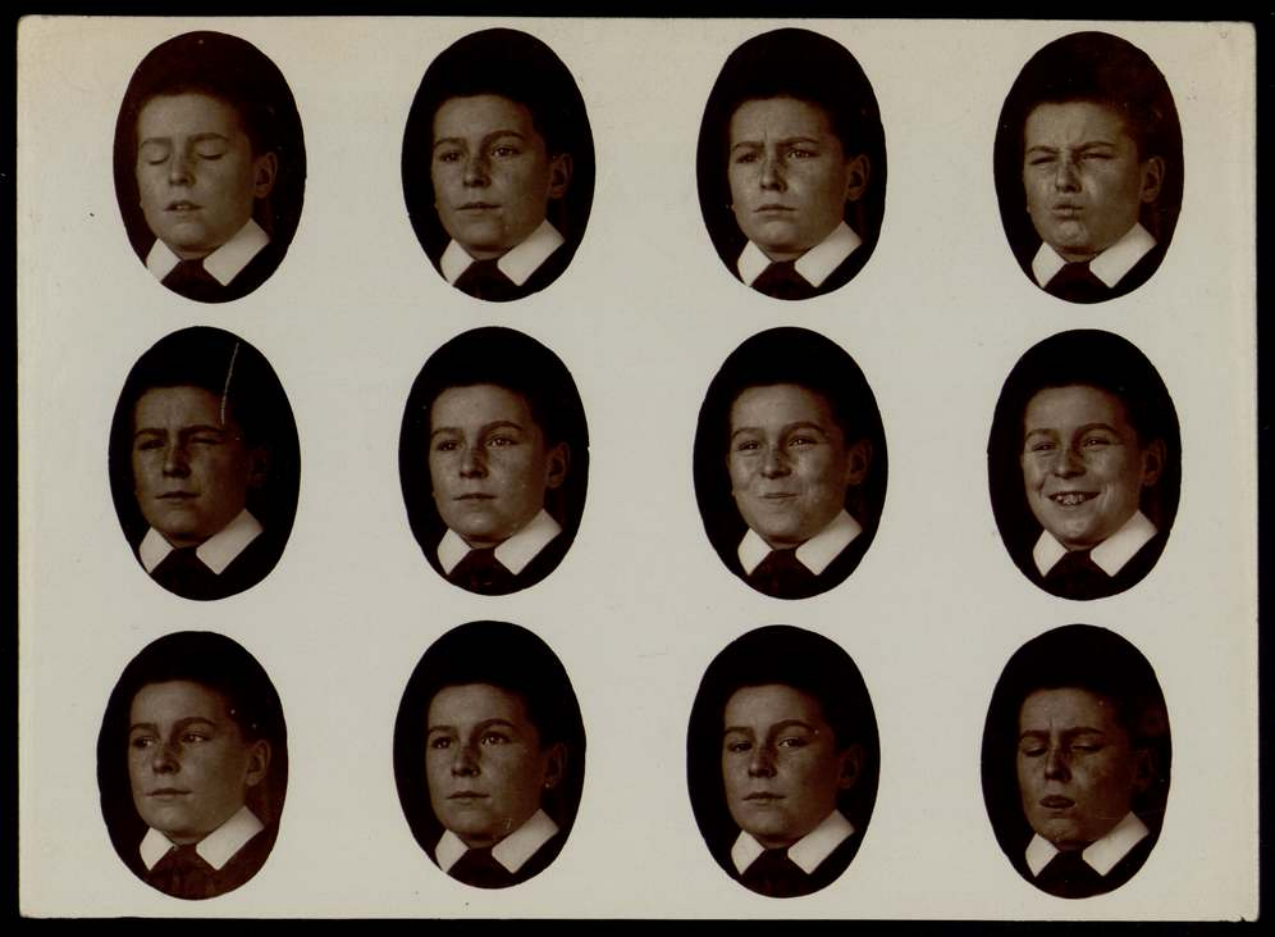
In1881 Rudge made the acquaintance of William Friese-Greene and from him Greene learned much of the methods to be adopted when attempting to secure a sequence of photographs of any moving object. This queer looking projector can undoubtedly be termed the progenitor of all the movies, as it was this and subsequent glass disc machines constructed by Rudge and Greene, that enabled Greene to master and complete the art of Kinematography and was the means of his taking out the first Patent in the world for securing a series of Photographs upon a band of Celluloid Film.

One of the most important objects Rudge was ever trying to acheive was the production of a Projector which dispensed with the use of a Shutter to mask the transition from one picture to another. To try and achieve this end,he made many attempts and conceived different ideas, which he applied in a practical form, in his endeavour to overcome the flicker, and loss of light, occasioned by the use of a Rotary Front Shutter. One of Rudge's efforts in this direction was a camera constructed by him which was fitted with a battery of 12 lens all of which were made to give a properly timed series of exposures in rapid sequence.

This method again although fairly successful, did not give the results that Rudge was trying to obtain, as the movement was again confined to a single complete phase of any given motion. This instrument was of large proportions, and extremely cumbersome, and after Rudge had tried it out, he abandoned the idea as being impractical and dismantled the machine.

The final effort Rudge tried to accomplish was the production of a series of photographs taken on vertical strips of glass about 6½x inches in length, each strip carrying six separate photographs of any moving object that it was desirous to secure. There were seven of these glass slips placed vertically side by side in a mechanically operated framework, which dropped each slide, one picture at a time, in rotation, the lantern was

Rudge's Nephew



Rudge's Biophantascope.

Pictures of Frank Hustable.

Rudge's Biophantasm

Charlotte Cottle (now deceased)
a minor actress in Mr Nebel's
Pantomime Company at the Bath
Theatre Royal.

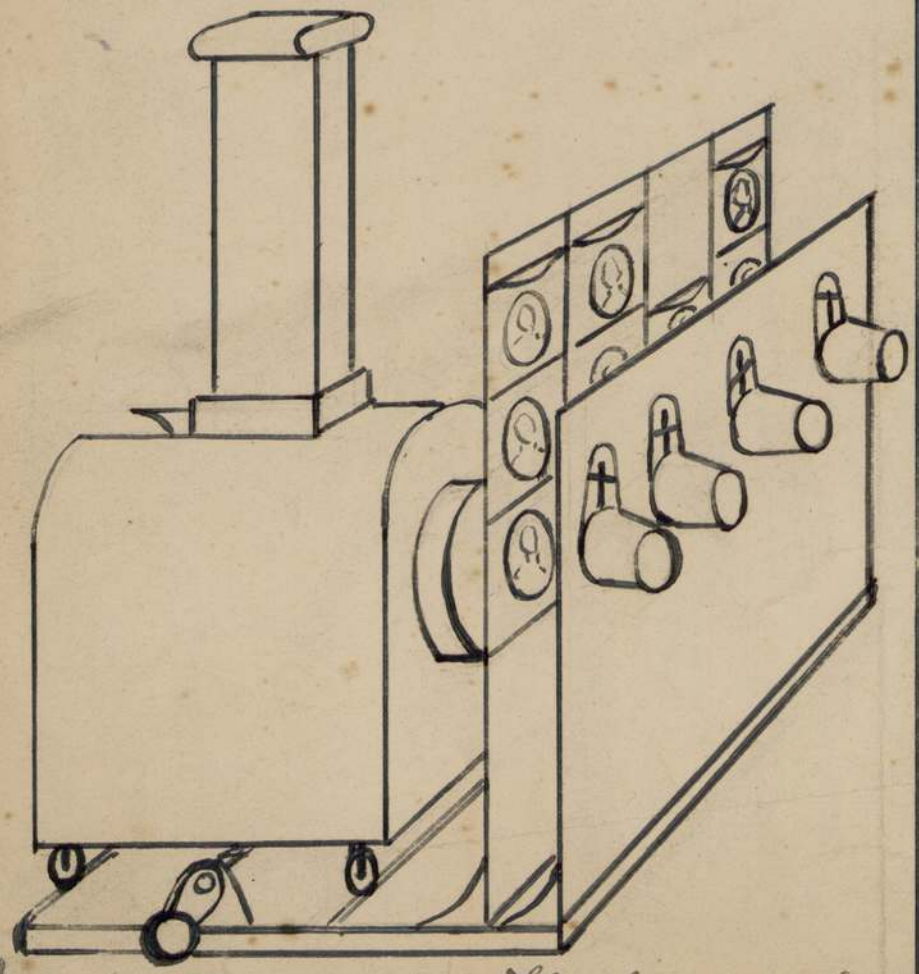
Rudge had an idea that the
heaving of the breast in breathing
would produce a striking effect
Hence the low necked dress.

Rudge's Bio-Phantoscope 1884.

One of the many designs for

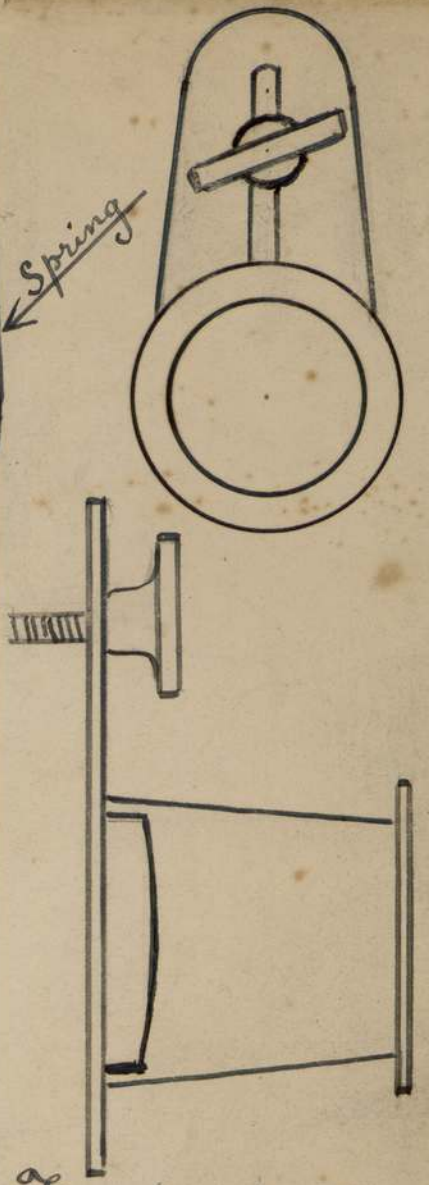
RUDGE'S BIOPHANTASCOPE

This pattern was made about 1887.



No shutter was used. The lantern body, moved by an Archimedean screw, carried the light from picture to picture.

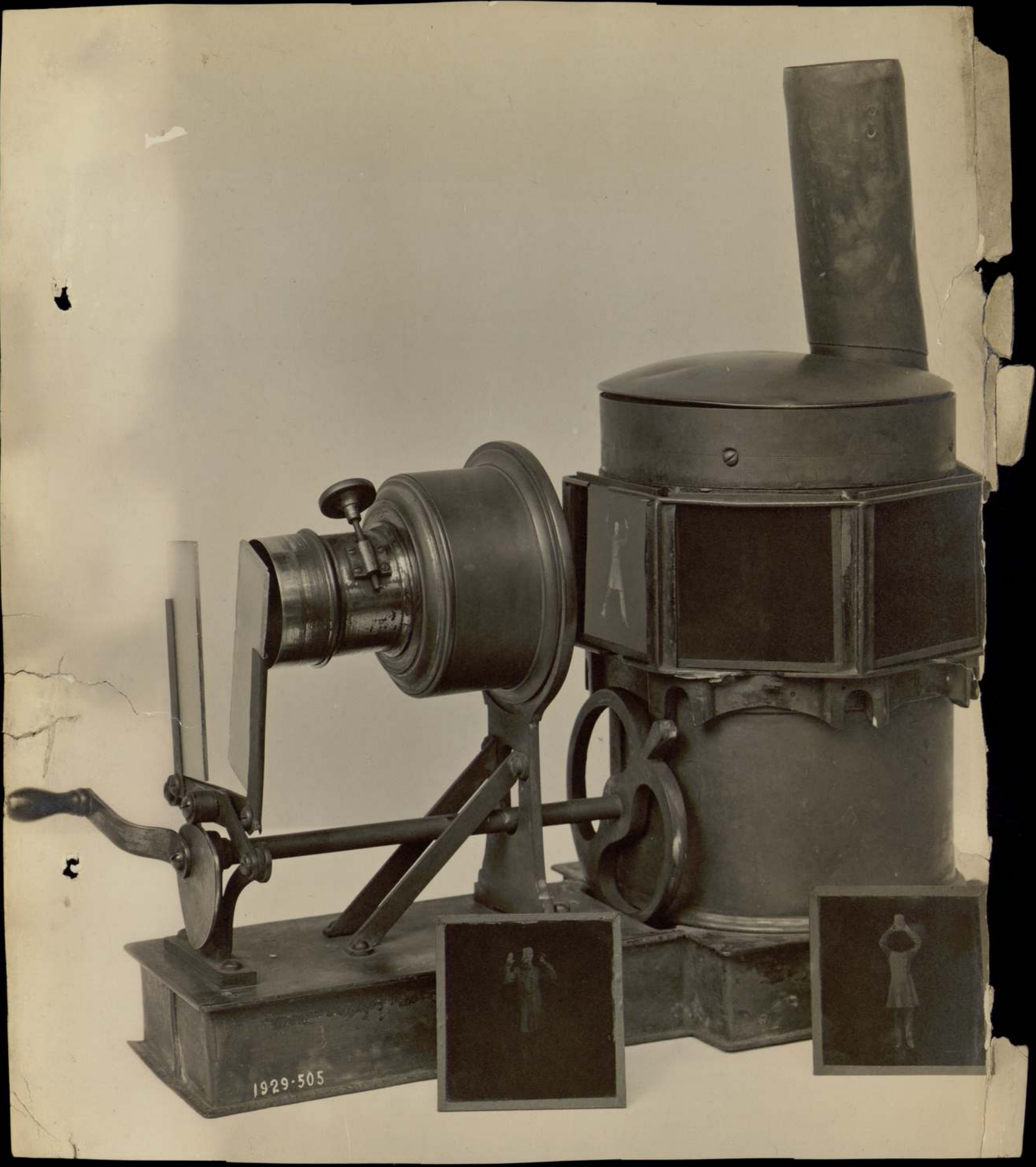
Glass transparencies in sliding metal carriers.



Front and side view of projecting lens with arrangement for registering.

pushed over in order to centre each glass strip in its turn, and project the subject upon the screen. It was upon this last invention that Rudge was engaged, when he was seized with an illness that proved fatal, and which, ~~after an illness that proved fatal, and which,~~ after much sufferring, caused his death in January 1903. Rudge did not patent any of his inventions, which were numerous and extremely varied, and all his experimental apparatus was constructed by himself.

All his subjects were photographed on single glass plate negatives, and from a quantity of 50 or 60 snap shots, he would select a sequence of photos to reconstruct a phase of movement which he reproduced for projection purposes upon a glass disc. On one occasion, Rudge constructed a boat which he propelled by Electricity, being one of the first to adopt this method of propulsion. He sought no reward for his labours, seeming quite satisfied to have accomplished any invention, or work, that he set his hand to do, and to receive the high praise for his accomplishments, from those friends and admirers, who enjoyed his intimate society. He lies buried in St. Michael's Cemetary, Bath, where throughthe efforts of his life long friend, Mr. Ernest Crawford a beautiful monument suitably inscribed was erected to his mémory by Alderman Chivers, a previous Lord Mayor of Bath, who also inscribed a tablet which was affixed to the wall of his premises at New Bond Street Place.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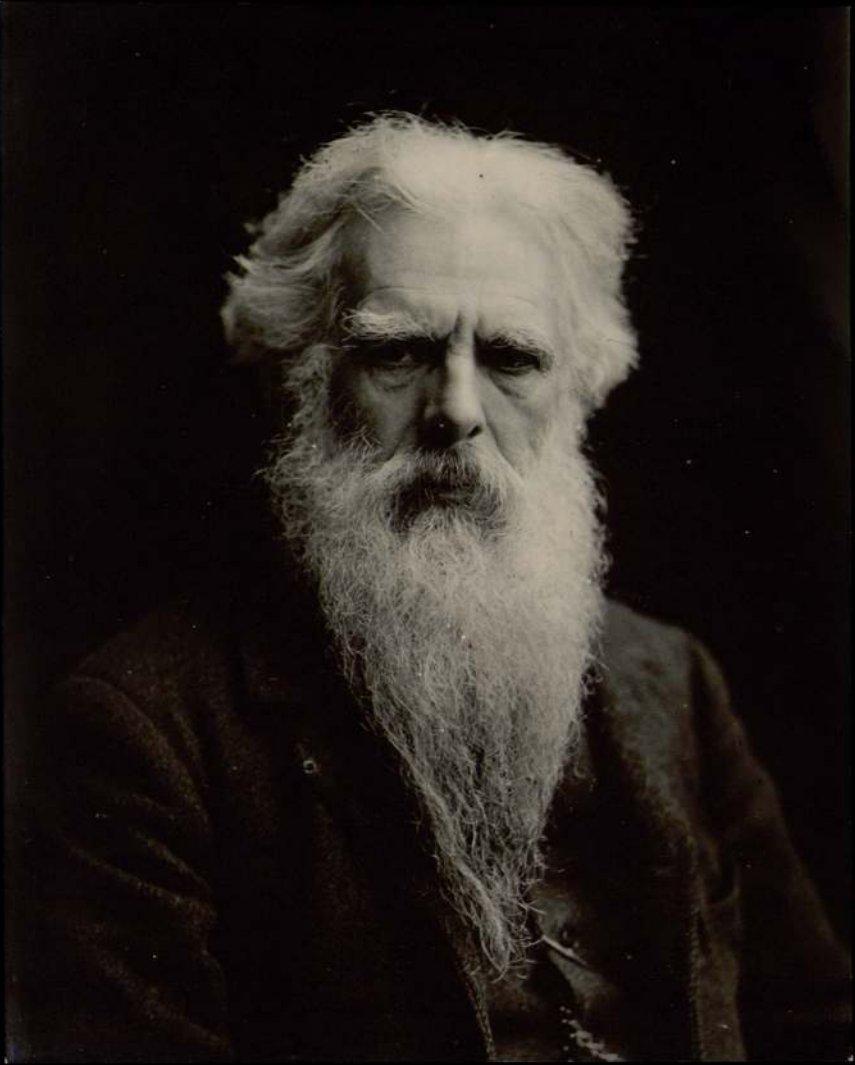
6½ x 5½

5 ½" yards



Mr. Edward Muybridge


BORN
9TH APRIL
1830
DIED
8TH MAY
1904
EADWEARD JAMES MUYBRIDGE
A NATIVE OF KINGSTON-UPON-THAMES
BENEFACTOR OF THIS PUBLIC LIBRARY
A SCIENTIFIC INVESTIGATOR OF
ANIMAL LOCOMOTION
WITH HIS CAMERA AND MACHINE THE
ZOOPRAXISCOPE
HE PRODUCED MOVING PICTURES
IN AMERICA IN THE YEAR 1880
AT PARIS IN 1881 AND BEFORE THE
ROYAL INSTITUTION IN 1882 FROM
THESE INVENTIONS THE MODERN
CINEMATOGRAPH
HAS BEEN EVOLVED

A BET THAT CHANGED THE WORLD'S HISTORY.

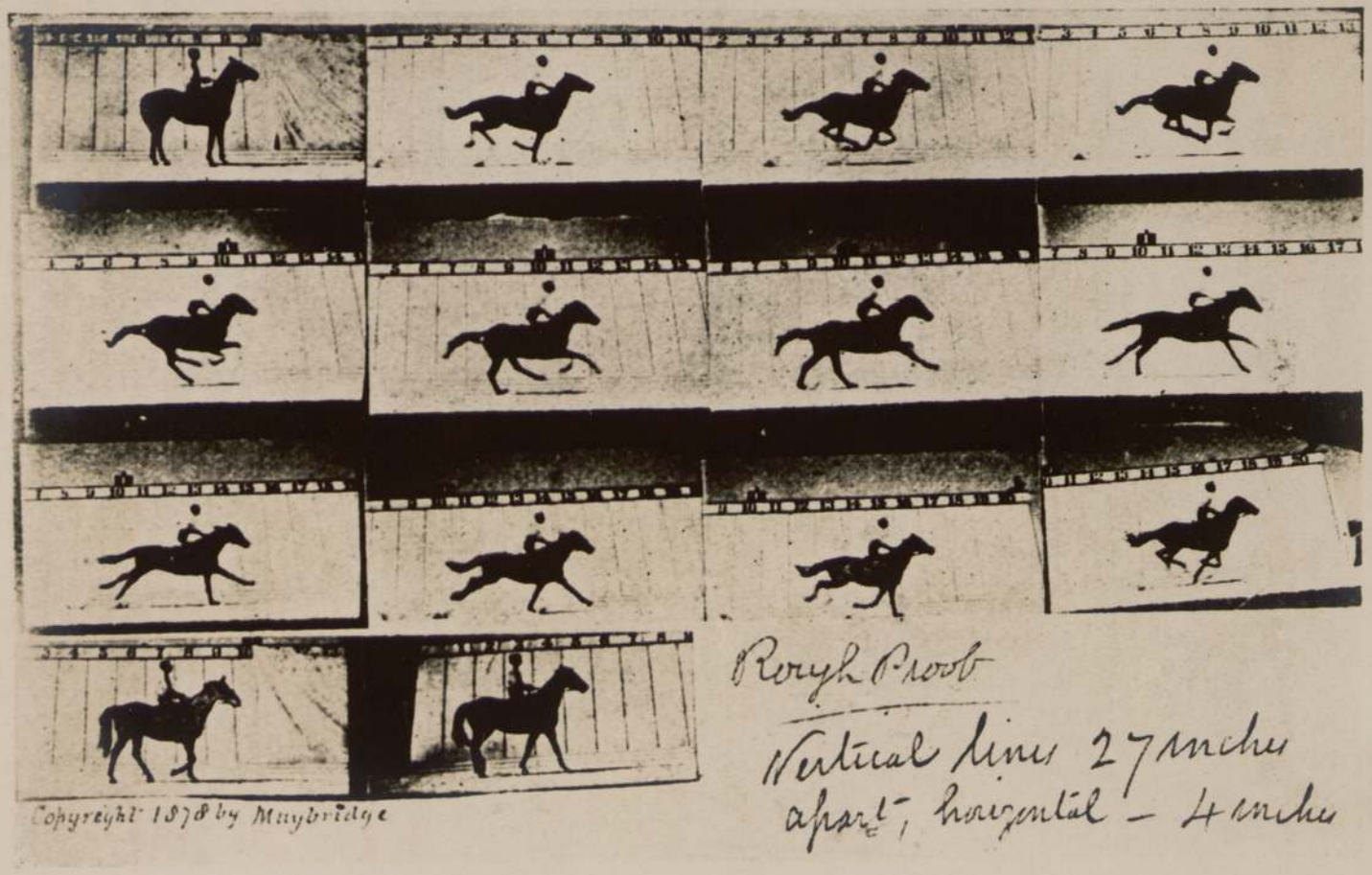
THE PIONEER WORK OF EDWARD MUYBRIDGE, A NATIVE OF KINGSTON-on-THAMES AND HIS ENDEAVOUR TO SHOW MOVEMENT BY PHOTOGRAPHIC MEANS.

Dwellers in the Royal and Ancient Borough of Kingston-on-Thames, should ever be justly proud of the achievement of one of their illustrious townsmen, EDWARD MUYBRIDGE. He was the son of a well known and highly respected tradesman who owned a corn chandlery business in the Market Place of that town, and whose correct name was MUGGERIDGE. Having made a study of photography and achieving much fame for his endeavours, he evinced a desire to travel, and in 1868, journeyed across to the United States of America to seek fame and fortune in a country which he considered offered scope for his attainments.

He was not long in gaining recognition for his talents and was appointed Official Photographer to the Survey Department of the United States Government, securing for them, amongst other subjects, a magnificent series of views of the Yosemite Valley, which brought him great fame and popularity.

In the year 1872, a controversy arose between Fred McCrellish the Editor of a paper called the "Alta California", and Senator Leland Stanford, a millionaire and a great lover and breeder of race horses. The controversy, which led to a ~~great~~ discussion in the press of the period, was with regard to the position of a horse's feet when trotting, as to whether all four feet were lifted off the ground at the same moment, or not. It was stated that a wager for £5,000 was made between these two gentlemen, but there were no proofs of such a wager being laid.

During the course of the controversy a suggestion was made, that if it were possible, the services of the State Photographer, Mr. Muybridge, should be secured in an attempt to settle the argument conclusively by means of photography. This suggestion met with the approval of Senator Stanford, who agreed to bear all the expenses entailed and an agreement was entered into with Mr. Muybridge to undertake the task.



The first rough proof of the first photographic experiments, at the Palo Alto farm, in California, in 1878, the forerunners of an amazing industry in which the Pacific Coast produces 80% of the world's supply

Patent —
212,865

1st Patent
June 27th 1878

2 Sheets—Sheet 1.

E. J. MUYBRIDGE.

Method and Apparatus for Photographing Objects in Motion.

No. 212,865. Patented Mar. 4. 1879.

Fig. 1

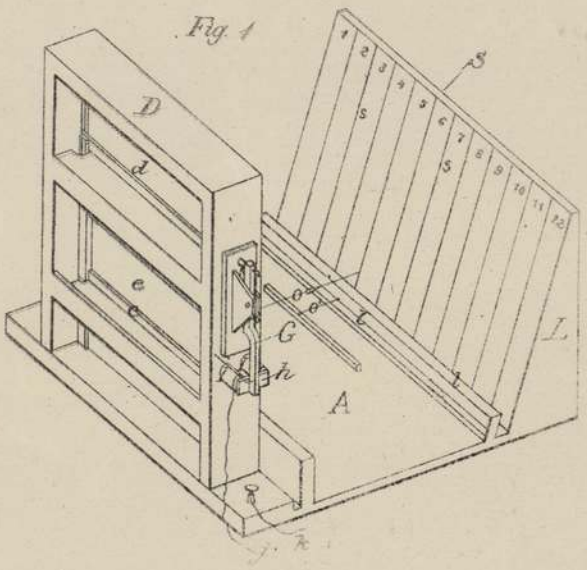
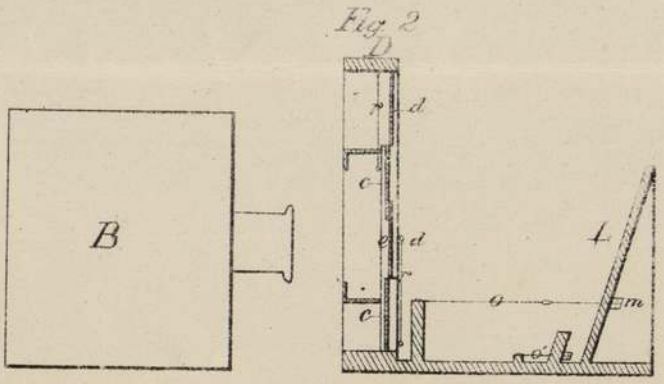


Fig. 2



Witnesses
D. B. Lawler
W. F. Clark

Inventor
Edward J. Muybridge
per Jno L. Borne
Attorney

2 Sheets—Sheet 2

E. J. MUYBRIDGE.

Method and Apparatus for Photographing Objects in Motion.

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Fig. 1

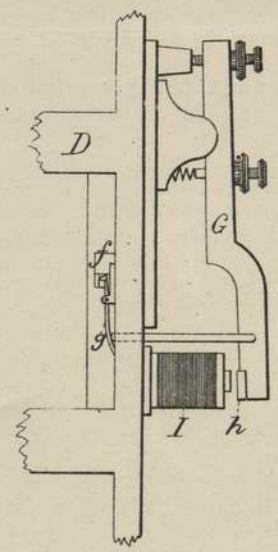


Fig 3

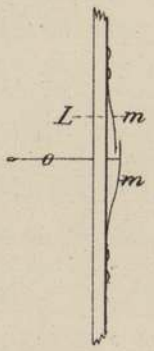
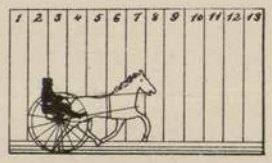


Fig. 2



Witnesses
D. B. Lawler.
W. F. Clark.

Inventor
Edward J. Muybridge
per Jas. L. Boone
Attorney

UNITED STATES PATENT OFFICE.

EDWARD J. MUYBRIDGE, OF SAN FRANCISCO, CALIFORNIA.

IMPROVEMENT IN THE METHOD AND APPARATUS FOR PHOTOGRAPHING OBJECTS IN MOTION.

Specification forming part of Letters Patent No. **212,865**, dated March 4, 1879; application filed June 27, 1878.

To all whom it may concern:

Be it known that I, EDWARD J. MUYBRIDGE, of the city and county of San Francisco, State of California, have invented certain Improvements in Taking Instantaneous Photographs of Objects in Motion; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to certain drawings accompanying this specification, and forming a part of the same.

My invention has reference to that branch of photography which is known as "instantaneous photography," and it applies more particularly where the object to be photographed is in rapid motion.

The principal object which I have in view is to take photographic views of horses that are moving rapidly under speed, in order to determine the posture, position, and relation of their limbs in different portions of their step or stride.

My invention relates to a double-acting slide, with the means for operating the same, and to a novel background, which is graduated or marked so as to gage the position of the horse and the posture of his limbs, all as hereinafter more fully described.

Referring to the accompanying drawings, Figure 1, Sheet 1, is a perspective; Fig. 2, Sheet 1, is an end section, showing camera-slides, track, and background. Fig. 1, Sheet 2, is a section of slide-frame, showing trigger, lever, armature, and magnets. Fig. 2, Sheet 2, represents a photograph. Fig. 3, Sheet 2, represents a contact-plate.

Let A represent the track along which the horse is made to pass under speed. On one side of the track I place the photographic camera B, the tube of which is directed across the roadway or track. Immediately in front of the camera-tube I place the frame D, in which my double-acting slides *c d* are arranged. The two slides are mounted in the frame side by side, in parallel planes, so as to stand across the end of the camera-tube. Each slide has an opening, *e*, in it, which will usually be as wide as the diameter of the camera-tube, but in some instances I shall make it less.

The slide *c* is connected by one or more springs, *r*, with the top of the frame D, while the slide *d* is similarly connected with the bottom of the frame, so that when the two slides are drawn to their respective inactive positions the solid portion of each slide is opposite the opening in the adjoining slide, and a solid plate is presented in front of the camera-tube. To set these slides the upper one is drawn down and the lower one is drawn up until the openings *e* pass each other and the solid portions come opposite the openings again, thus straining the springs *r*, in which position both slides are secured by a single lever, *f*, and trigger *g*. The lever *f* catches lightly upon the trigger *g*, and the opposite end of the trigger is connected with a lever, G, which is pivoted at its middle to the outside of the frame, and the opposite end of which carries an armature, *h*. I I are electro-magnets, which are attached to the side of the frame under the armature. A wire, *j*, leads from these magnets to the battery, which may be conveniently located, while another wire, *k*, leads across the track, either underground or overhead, as hereinafter explained.

The background L is placed on the side of the track or roadway opposite that on which the camera and slide are located, so that the horse must pass between them. I prefer to paint this background white, so that the horse will stand out in better relief and his position and posture be more distinctly shown in the photograph. I also whiten the track between the camera and background. Near the bottom of this background I paint or otherwise delineate several lines or stripes, *l l*, at different calculated spaces apart, so that the distance of the horse's feet from the ground at the instant the photograph is taken will be shown upon the picture by the position of the feet with relation to the lines.

On the rear side of the background I secure two metallic spring-plates, *m m*, so that one will be slightly distant from the other. The wire *j*, which leads from the magnets I, I attach to one of these plates, and the other plate I connect by a wire with the battery. For a running horse I then attach one end of a strong thread, *o*, to the outside plate, *m*, and stretch it across the track at the proper height, so that the horse will run against and break it as he passes. The strain upon the thread when the horse runs against it will draw the

outer plate, *m*, against the under plate and complete the circuit, thus electrifying the magnets so as to draw the armature against them and release the trigger. The instant the trigger is released the springs *r* draw the slides *c d* in opposite directions, so that the sensitive plate in the camera is instantaneously exposed as the openings *e* pass each other. The camera is so located with reference to the slides that it is directly opposite the openings when they coincide with each other, so that a full exposure is had.

For a trotting horse I operate the outer spring-plate, *m*, to make the connection with the under one by causing one of the wheels of the sulky or vehicle to pass over the connection that draws the plates together.

In order to take several successive views I employ a number of cameras and slides in connection with a single background of the required length. In this case I place the cameras at regular intervals apart and make a separate circuit and operating device for each. I also paint or otherwise mark the background with vertical lines *s s* at regular intervals apart, and number them successively by painting the numerals upon them. These vertical lines will then show the position and progress of the horse and his posture at each exposure.

I am aware that a graduated background used in photography for the purpose of ascertaining the velocity of a moving object in a given time is not new, and I do not, therefore, desire to be understood as claiming such a background, broadly; but,

Having described my invention, what I do claim as new, and desire to secure by Letters Patent, is—

1. The background L, provided with vertical lines or gage-stripes *s* and horizontal stripes or lines *l*, arranged substantially as shown and described, for the purpose of obtaining horizontal and vertical measurements of the passing object, as set forth.

2. The slides *c d*, set by means of the lever *f*, trigger *g*, and centrally-pivoted lever G, with its armature *h*, in combination with the electro-magnets I I, wires *j k*, and metallic spring-plates *m m*, constructed to operate substantially as and for the purpose described.

In witness whereof I have hereunto set my hand and seal.

E. J. MUYBRIDGE. [L. S.]

Witnesses:
D. B. LAWLER,
W. F. CLARK.

Patent

Muybridge

2nd Patent

July 11th 1878

E. J. MUYBRIDGE.

Method and Apparatus for Photographing Object in Motion.

No. 212,864 Patented Mar. 4, 1879.

Fig. 1

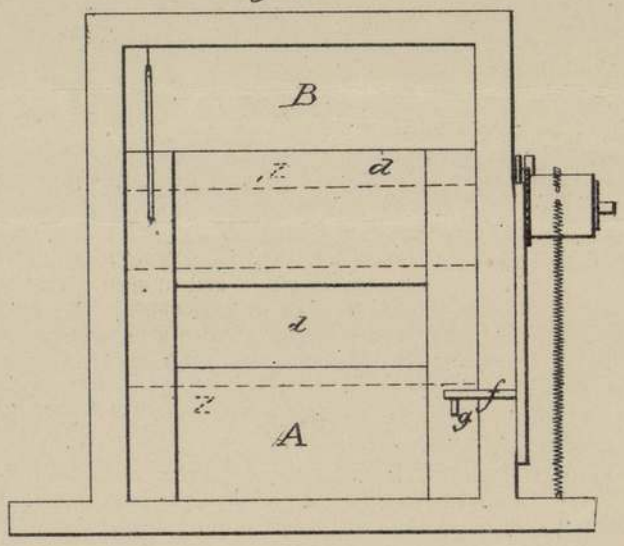
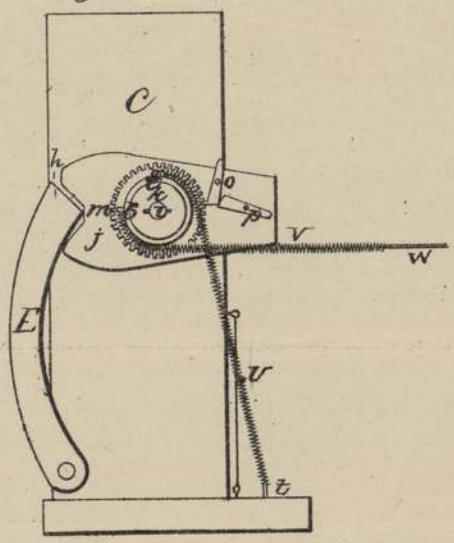


Fig. 2.



Witnesses
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I. Saxon Taylor

Inventor
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Attorney