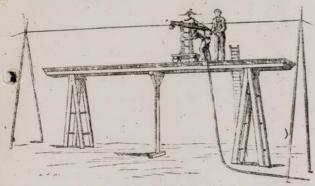
#### IS MECHANICAL FORCE TO BE REGARDED AS A TRUE SOURCE OF LIGHT?

Since the numerous experiments made at Shoeburyness with iron plates and heavy guns, it has been ascertained over and over again that heat and frequently light are produced at the moment the impact or blow is given by the shot. The mechanical force, in the abstract, may be regarded as the source of light; but not perhaps directly, as the blow develops heat, and the latter.



Figs. 10 and 11.-The Shadow Blondin.



Arrangement of Mechanism and Oxy-Hydrogen Light required to produce the effect of the Shadow Blondin. A, the mechanical figure; i, the lime-light, c, the handles used to produce the movements of the figure

probably, the light. It is found that almost all bodies which acquire phosphorescence by exposure to the sun, or insolation, or by heat, also become luminous by friction or percussion. Sometimes the light obtained by friction is simply electrical. The sparks from a flint and steel are due to the combustion of minute particles of metal accelerated by the heat eliminated at the

Shadow Bloudles

SOURCES OF LIGHT.

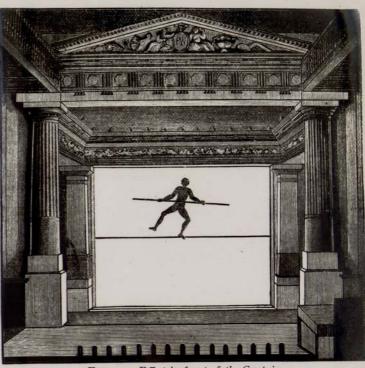


FIG. 12.—Effect in front of the Curtain.

moment the particle is struck off. Mechanical force can only be regarded as an indirect mode of producing light, because heat is first developed; heat is a source of light.

From what has been previously stated, it will be understood that all matter may be divided in relation to light into luminous and non-luminous bodies. The sun or a lighted lamp would represent the former, and the moon with the other planets, or a piece of whitened board, the latter, because our satellite shines by borrowed light from the sun, and not by any inherent self-luminosity; the piece of board will reflect and scatter the rays of light from the lamp, and whilst doing this appears very bright. At the same time the board obstructs the light and casts a shadow behind it and the same time the board

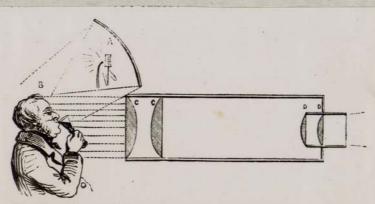


Fig. 299. A. One or more lime lights, throwing rays reflected by concave mirrors on to the face B, from whence they are reflected to c c, the first condensers. DD. Object glasses. This instrument is made by Mr. Collins, who has the tools for making the reflectors with correct curves. The picture of the face on the disc is covered with black spots if the reflectors are not perfect.

Physioscope



>



THE PROSCENIUM of the ENGLISH OPERA HOUSE in the STRAND, (LATE LYCEUM appeared on the Evening of the 21 March 1867, will Walker's Exhibition of the Eidoura

# The Mejalethoscope How it is clone



THE PROSCENIUM of the ENGLISH OPERA HOUSE in the STRAND, (LATE LYCEUM appeared on the Evening of the 21. March 1817, will Walker's Exhibation of the Endouro

Pictures, "Chang" and others, are always sure to draw a public of their own.

Going back to the earlier period of shows and showing, mention must be made of the Travelling Peep show man who toured the country villages with his show on his back, and this in many instances, was the only entertainment to be enjoyed in the more rural parts of England. One can imagine the joy of the young people, who having paid their pennies, were allowed to take a privileged peep into the Magic Box, whilst the showman told some thrilling story in conjunction with the various scenes he showed, finishing his entertainment by singing some absurd ditty, thus causing added enjoyment to his patrons and sending them away with a smile on their faces.

The direct descendants of the travelling Peep Show were the various similar forms of entertainment which were established in many of the leading towns throughout England, whilst for home entertainment, the The Megalethoscope, with its illuminated interior and wonderful scenes, was a thing of beauty and a joy for ever, showing pictures as it did, stereoscopically which stood out in relief as if in real life. There were also the penny broadsheets which were always popular amongst the youth of the middle of the 19th century and such subjects as "The Broken Bridge," "Waxy Wobbler the Cobler," "George and the Dragon", all made to cut out and fit up to form a Gallanty Show, where figures were shown in Silhouette form upon a screen, usually consisting of a pocket handkerchief with a tallow candle as the illuminant.

Perhaps the greatest exponent of this form of Entertainment known on the Music Halls as Shadowgraphy, was Felician Trewey, the entertainer who gave the first public show of movies at the Polytechnic, and he usually topped the bill at most of the leading music halls throughout England, his entertainment being both novel and comical, and his booklet issued in 1888 entitled "How it is done" was purchased by many members of the audience after seeing his shadow show enacted.

Turning over the pages of that delightful work by Warwick Wroth, F.S.A. entitled "London Pleasure Gardens of the Eighteenth Century" we learn much of the ways that the populace enjoyed their Pleasure Gardens which existed in many localities on the outskirts of London. Samuel Pepys writing in his Diary, tells how he took the waters at Fox Hall in June 1665, and there stayed pleasantly walking and spending but sixpence till nine at night.



Evidently Fox Hall, must have been the forerunner of the famous Vauxhall Gardens which became so popular about a century later. These gardens might be termed the forerunners of the Cinema as amonst other attractions they



Interior of Conservatory at The Collsenn Rejents Park 1840

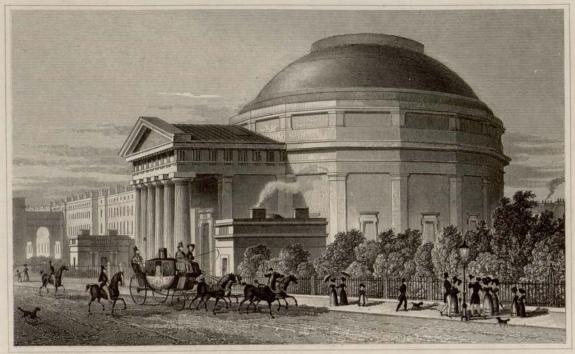
View of Condon and the River Thames frame the Youver of The Coliseum Resents Park Evidently Fox Hall, must have been the forerunner of the famous Vauxhall Gardens which became so popular about a century later. These gardens might be termed the forerunners of the Cinema as amonst other attractions they pwed illuminated transparencies, Dioramas, etc. ere was another popular pleasure garden at Ranelagh, called e Rotunda, also Cupar's Gardens, Marylebone Gardens, etc. ese gardens seemed to have formed one of the principle tractions of the period, and to attend these resorts from e middle of the eighteenth and well into the nineteenth htury was quite a formidable undertaking, judging from the aybills distributed, Highway Robbery with violence, seemed ite customary and abounded everywhere, and to ensure as far possible the safety of their patrons, many proprietors of easure resorts provided horse patrols to convoy them to eir homes in the City and West End of London.

le of these playbills makes interesting reading in the light present day events, as it announced the following:-

"The Proprietors of these gardens have retained the services of thirty stout fellows to patrol timid females, and ladies and gentlemen of quality, to their homes nightly."

he can imagine the looks of the thirty stout fellows, often igger scoundrels than the footpads they were supposed to rotect their charges from, and more often than not in eague with every footpad and highwayman on the road. Even n the gardens themselves, watchmen and vigilant officers ere kept busy by the numerous pickpockets of both sexes that nfested these resorts, so that apart from witnessing the ntertainment, there seems to have been plenty of excitement hen taking a visit to the "Pictures" at that period.

he names given to the various picture shows were multifarious and wonderful, amongst which may be mentioned such titles as, picrama, Cosmorama, Panorama, Miriorama, Eidophusikon, yclorama, Eidocuramian, Pansteorama and others, all of which alluded to some varied form of viewing pictures either as transparencies or in panoramic form. One title which must have caused real envy in the breasts of the rival showmen was the announcement of the wonderful "Heptaplasiesoptron" being nothing more or less than a series of painted canvasses, shown first with lights in front of the picture, and then as transparencies with lights behind, this being the true form of the Diore



Drawn by The! H. Shepherd.

THE COLISEUM, REGENT'S PARK.

Published April 21 1828 by Jones & Ct S. Acton Place Kingsland Road, London.



brewn by Tho! H.Shepherd

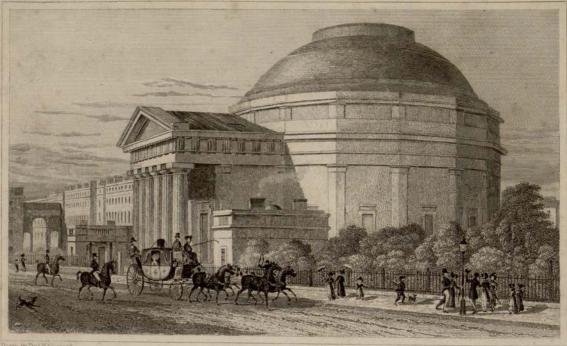
Engraved by Thu! Dale



THEATRE ROYAL, COVENT GARDEN.

Engraved by John Solph

Fublished Jane 12, 1826, by Jones & C\* 3 Acton Place, Kingsland Road London.



Drawn by That H Shapmerd.

THE COLISEUM, REGENT'S PARK.

Published April II 1817 by Jones 2: C5 3 Acton Place Mindslend Road London

18'30



EGTPTIAN BIALL, PICCADULIT.

ame. some scenes were also shown in panoramic form being painted upon huge canvasses mounted upon vertical rollers and when slowly unwound from one roller to the other, caused many thrills of excitement with the beautiful views and displayed.

It is interesting to recall the remarks of Dean swift in his writings to stella on March 27th 1793 when he makes the following statement:- I went to see a famous moving picture, and never saw anything so pretty, etc.

The Eidophusikon was originally painted and produced by De-Loutherberg the artist, and the meaning of the word was:"Atrue representation of nature." Amongst the many patrons who often visited this form of entertainment was Gainsboro, the great artist and painter, and so delighted was he with the panorama displayed, that upon one occasion, when a violent thunderstorm was raging outside, whilst a similar incident was being shown upon the canvas with the usual storm sound effects, he induced De Loutherberg to accompany him on to the roof of the building where they could both see and hear the natural thunderstorm raging in the heavens, and the imitation one given in the Hall, when Gainsborough turned to De-Loutherberg the producer, and said "I like your manufactured thunder the best."

The Panorama was also an entertainment using a huge painted back cloth with water effects and boats and characters in the foreground, oftentimes scenes in India were shown with horses and elephants parading in the foreground, and when these scenes were properly illuminated they presented a very wonderful and spectacular sight. Amongst the more popular of these numerous Panoramas, etc. was Daguerre's show in Paris 1816 to 1823 and Burford's Panorama in Leicester Square, which stood on the identical site now occupied by the Empire Theatre.

The last of this type of entertainment resolved itself into travelling shows for the Music Hall and amongst the most successful shows touring England were Poole's Myriorama and Hamilton's Excursions, both of which, were eventually run off the road by the popularity of the movies.

Leicester Square and its purliens seems to have always been famous for the various shows given there, and amongst the names which at one time were very popular were Linwood's Gallery, Panorama Royal, Wilde's Globe, and farther on down Piccadilly the famous Lowther Arcade.

The Cosmorama was formed by setting up a series of small views behind a partition each being shown in perspective and when brilliantly illuminated gave a colourable imitation of life in other lands. It might almost be likened to a series of Peep



# Burfords Panorama in 1854 exactly upon the site where "The Empire Theatre" now Stands

1854

CARPETS, CABINET FURNITURE,

GENERAL FURNISHING ESTABLISHMENT.



#### TO THE NOBILITY, GENTRY, AND THE PUBLIC. HAMPTON & RUSSELL

BEG to inform that they have now completed the RE-BUILDING of their NEW PRE-MISES, one of the largest and most commedious buildings in London; have Ware Rooms and Galleries built for the express coavenience of their numerous customers.

H. and R. now particularly invite all parties Fu ni-hing cracquiring CABINET FURNITURE, or CARPETS and RUGS, to visit this Establishment, and inspect the different articles, which will be found upon inspection, for style, quality, and prices, the best House for economy in the Metropolis; and the Largest Stock in England to select from, as a General Furnishing Warehouse.

N.B. Several large Winged Wardrobes; Pier, Chimney, and Toilet Glasses, in great variety. Telescope Dining, Circular, and Oval Drawing Room Tables, decided bargains.

#### Observe,-14 and 15, Leicester Square,

NEXT DOOR TO BURFORD'S PANORAMA.

NEOUS EXHIBITIONS.

267

#### CYCLORAMA,

An exhibition of singular novelty and he direction of the proprietors of the horama, unequalled in beauty, of Lisbon, he Tagus, and the fearful Earthquake of weetly serene and lovely than the waters id impressive than the noble buildings, othe the sides of the majestic heights; or lly agitated waves, amidst which numeolling madly on their mountain summits depths below. The dioramic effects of autifully varied, and the moving parts of eat cleverness, to re-produce the appalling

on takes place at two and half-past three g at half-past seven and nine o'clock. served seats, sixpence extra. Children

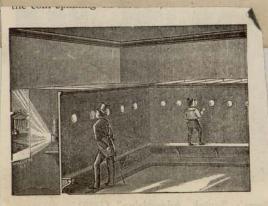
criptive guide, sixpence.

#### IE DIORAMA,

Messrs. Morgan and Pugin, in four This exhibition, which had long been ight at Paris, was opened in the Regent's ber, 1823. It differs from the Panorama of a circular view of the objects reprepicture at once in perspective; and it is the Panorama and Cosmorama, in the cts are depicted, and in the completeness

d by the disposition of the building, and ight and shade, that the optical deception cult for the spectator to persuade himself ing a work of art. Two views are exhiice a year

six o'clock. Admission, two shillings;



The Cosmorama, from an old advertisement. This was an early form of picture entertainment.

#### BURFORD'S PANORAMA,

Leicester Square. This exhibition is the oldest establishment of the kind in London, having been originally opened in 1790: it is under the proprietorship of Mr. Robert Butford, This gentleman's ever active pencil places before our view, in rapid succession, every spot celebrated in ancient or modern history, or deriving *eclat* from recent ET MANTLE. ICESTER SQUA STER STREET, E LEICESTER. TEN DETAIL.

LIE 1814. ETRANGERS.

de première qualité et de fabrique s et façonnées; nouveautés par jour, et de Mariage. Châler en p Pompadours, Velours, Popline n, Dentelles, Rubans, des Ar-friande de la première qualit. DE DAMES.

R HOUSE.

MANTLE, ESTER SQUAR

ER STREET, ND RETAIL

PERS, HABERDASE AND FURRIERS.

peen patronised by the Palit solved to continue the same ! distinguished preference. ranted of the best manufact cription, Hosiery, Lace, &c.

awls, Furs, Cloaks, &c.

introduced at this Emporiza D 1814.

MISCELLANEOUS EXHIBITIONS.

267

#### THE CYCLORAMA,

Albany Street, Regent's Park. An exhibition of singular novelty and attraction, produced under the direction of the proprietors of the Colosseum, consisting of a Panorama, unequalled in beauty, of Lisbon, the magnificent Scenery of the Tagus, and the fearful Earthquake of 1755. Nothing can be more sweetly serene and lovely than the waters of the Tagus; more grand and impressive than the noble buildings, churches, and castles, that clothe the sides of the majestic heights; or more terrible than the fearfully agitated waves, amidst which numerous gallant vessels are seen rolling madly on their mountain summits or plunging into the awful depths below. The dioramic effects of shade and colour are very beautifully varied, and the moving parts of the picture contrived with great cleverness, to re-produce the appalling scene in all its attractive horrors.

Open daily. The exhibition takes place at two and half-past three o'clock; and in the evening at half-past seven and nine o'clock. Admission, one shilling; reserved seats, sixpence extra. Children and schools, half-price. Descriptive guide, sixpence. 1755. Nothing can be more sweetly serene and lovely than the waters

#### THE DIORAMA,

Regent's Park. Erected by Messrs. Morgan and Pugin, in four months, at a cost of £9,000. This exhibition, which had long been an object of wonder and delight at Paris, was opened in the Regent's Park on the 29th of September, 1823. It differs from the Panorama in this respect, that instead of a circular view of the objects represented, it exhibits the whole picture at once in perspective; and it is decidedly superior, both to the Panorama and Cosmorama, in the fidelity with which the objects are depicted, and in the completeness of the illusion.

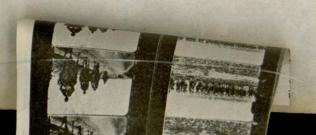
Such is the effect produced by the disposition of the building, and the various modifications of light and shade, that the optical deception is complete; and it is difficult for the spectator to persuade himself that he is only contemplating a work of art. Two views are exhibited, which are changed twice a year

Open daily, from ten till six o'clock. Admission, two shillings;

description, ratis,

#### BURFORD'S PANORAMA,

Leicester Square. This exhibition is the oldest establishment of the kind in London, having been originally opened in 1790: it is under the proprietorship of Mr. Robert Burford, This gentleman's ever active pencil places before our view, in rapid succession, every spot celebrated in ancient or modern history, or deriving eclat from recent







(Too late for the coach.)

readers as it may interest to Brand's Popular Antiquities, and Strutt's English Sports. A description of them would be out of place here; and we have mentioned them only as confirming a remark which we have elsewhere made; viz.—that in addition to such recreations as arise out of the season, or belong to it in a special sense,—whatever other games or amusements have, at any time, been of popular use, have generally inserted themselves into this lengthened and joyous festival; and that all the forms in which mirth or happiness habitually sought expression, congregated, from all quarters, at the ringing of the Chrismas bells.

To the Tregetours, or jugglers, who anciently made mirth at the Christmas fireside, there are several allusions in Chaucer's tales: and Aubrey, in reference thereto, mentions some of the tricks by which they contributed to the entertainments of the season. The exhibitions of such gentry, in modern times,

are generally of a more public kind,—and it is rarely that they find their way to our fire-sides. But we have still the galantee-showman, wandering up and down our streets and squares,—with his musical prelude and tempting announcement, sounding through the sharp, evening air,—and sammoned into our warm rooms, to display the shadowy marvels of his mysterious box, to the young group who gaze in great wonder and some awe, from their inspiring places by the cheerful hearth.

[Of the Illustrations we have left ourselves but little room to notice as they merit. They are—Christmas and his Children, including an imp with the Wassail Bowl, and Sir Loin with his banner; Heads of the family, a comely group; Merry Christmas to you, very characteristic; Old Christmas on a Goat, with the Wassail Bowl; the Baronial Hall, clever; Mummers; Enjoying Christmas; the Old English Gentleman's Gate, from the old



(Galantee Show.)

privilege of laughing just when it struck them to do so, without inquiring wherefore,

or caring how loud.

Then, what a festival they created! The land rang with their joyous voices; and the frosty air steamed with the incense of the good things provided for their entertainment. Every body kept holiday but the cooks; and all sounds known to the human ear seemed mingled in the merry pæan, save the gobble of the turkeys. There were no turkeys-at least they had lost their "most sweet voices." The turnspits had a hard time of it, too. That quaint little book which bears the warm and promising title of "Round about our Coal Fire," tells us that " by the time dinner was over, they would look as black and as greasy as a Welch porridge-pot." Indeed the accounts of that time dwell, with great and savoury emphasis, upon the prominent share which eating and drinking had in the festivities of the season. There must have been sad havoc made amongst the live stock. That there are turkeys at all, in our days, is only to be accounted for upon the supposition of England having been occasionally replenished with that article from the east; and our present possession of geese must be explained by the well-known impossibility of extinguishing the race of the goose. It is difficult to imagine a consumption equal to the recorded provision. Men's gastronomic capacities appear to have been enlarged for the occasion,-as the energies expand to meet great emergencies. "The tables," says the same racy authority above quoted, "were all spread from the first to the last; the sirloyns of beef, the minc'd-pies, the plumbporridge, the capons, turkeys, geese, and plumb-puddings, were all brought upon the board; and all those who had sharp stomachs and sharp knives, ate heartily and were welcome, which gave rise to the proverb

'Merry in the hall, when beards wag all !""

[Talking of Turkeys reminds us that-] Norfolk must be a noisy county. There must be a "pretty considerable deal" of gabble, towards the month of November, in that English Turkistan. But what a silence must have fallen upon its farm-yards, since Christmas has come round! Turkeys are indisputably born to be killed. That is an axiom. It is the end of their training, -as it ought to be, (and, in one sense, certainly is,) of their desires. And, such being the destiny of this bird, it may probably be an object of ambition with a respectable turkey, to fulfil its fate, at the period of this high festival. Certain it is, that, at no other time, can it attain to such dignities as belong to the turkey who smokes on the well stored table of a Christmas dinner-the most honoured dish of all the feast. Something like

an anxiety for this promotion is to be inferred from the breathless haste of the turkey of which our artist has here given us a sketch,-in its pursuit of the coach which has started for London, without it. The picture is evidently a portrait. There is an air of verisimilitude in the eager features, and about the action altogether, of the bird, which stamps it genuine. In its anxiety, it has come off, without even waiting to be killed ; and, at the rate after which it appears to be travelling, is, we think, likely enough to come up with a heavily laden coach. We hope, however, that it is not in pursuit of the particular coach which we have seen on its way to the "Swan with two Necks;" because we verily believe there is no room on that conveyance for a single adtional turkey,-even if it should succeed in overtaking it.

The average weight given for each turkey, of the number and gravity of those birds sent up to London from Norfolk, during two days of a Christmas, some years ago—is nearly twelve pounds; but what is called a fine bird, in Leadenhall Market, weighs, when trussed, from eighteen to one or two-and-twenty pounds,—the average price of which may be stated at twenty shillings; and prize turkeys have been known to weigh more than a quarter of a hundred weight.

Sports of the Season.

Burton, in his Anatomy of Melancholy, mentions as the winter amusements of his day,-" Cardes, tables and dice, shovelboard, chesse-play, the philosopher's game, small trunkes, shuttlecocke, billiards, musicke, masks, singing, dancing, ule-games, frolicks, jests, riddles, catches, purposes, questions and commands, merry tales of errant knights, queenes, lovers, lords, ladies, giants, dwarfes, theeves, cheaters witches, fayries, goblins, friers," &c. Amongst the list of Christmas sports, we, elsewhere, find mention of " jugglers and jack-puddings, scrambling for nuts and apples, dancing the hobby-horse, hunting owls and squirrels, the fool-plough, hot cockles, (a stick moving on a pivot, with an apple at one end and a candle at the other, so that he who missed his bite burned his nose,) blindman's buff, forfeits, interludes and mock-plays;" - also of "thread my needle, Nan,"-" he can do little that can't do this," feed the dove, hunt the slipper, shoeing the wild mare, post and pair, snap-dragon, the gathering of omens,—and a great variety of In this long enumeration, our others. readers will recognise many which have come down to the present day, and form still the amusement of their winter evenings, at the Christmas-tide, or on the merry night of Halloween. For an account of many of those which are no longer to be found in the list of holiday-games, we must refer such of our

Peep Show Punch & Dudy Show



PUNCH AT MAPLES.

London, Published Nov" 1835 for the Proprietur, by Whitmker & Ct. Ave. Maria, Lanc.



Peep Show Punch & Dudy Show

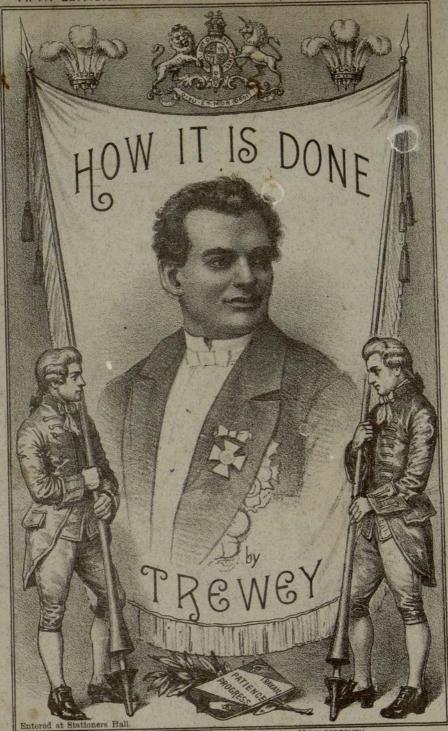


PUNCH AT MAPLES.

London Published New 1835 for the Proprietor by Whitmher & Ct. Ave. Maria Lane.

Original Punch + Budy show given at Maples by its author

> Galantee Show 1820



PRINTED AND PUBLISHED BY JORDISON & CO., LD., MIDDLESBROUGH.

HOW IT IS DONE

#### TREWEY,

AS HE DRESSED IN 1868 TO 1885.

Middlesbrough:
JORDISON & Co., Ld., Printers and Publishers.

#### PREFATORY NOTE.

THOUGH Shadowgraphy has been known from time immemorial, and as 'twere a thing of bye-gone days, Trewey's practice of the art comes as a novelty, and is highly entertaining, alike to the schoolboy and the lean and slippered pantaloon.

Many works professedly expositions of the mysteries of shadowland have already been written, but being in themselves mysteries, they have been to the uninitiated quite unintelligible. The object in placing this pamphlet in the hands of the public, is to illustrate and render practicable to the amateur the entertaining "Handicraft" of Trewey.

### SHADOWGRAPHY.

THAN to make "Shadows on the Wall" there is nothing more easy, but to reduce this to an art there must be called into play much practice and ingenuity.

The following eight positions of the hand and fingers being exercised, will give to the beginner very valuable assistance:—

The most convenient distance of the light from the hands is four feet, and about six feet from the hands to the wall or screen on to which the shadows are to be thrown.

It will often be found necessary, in order to gain a desirable effect, to turn the hands a little to the right or to the left.

Many persons use lime-light, which affords a good bold shadow if the chalk be cut in triangular form; otherwise, it is apt to cast a grey border round the edge of the shadow.

The amateur should be careful to cover any mirror in the room which would reflect the light and cause two shadows.

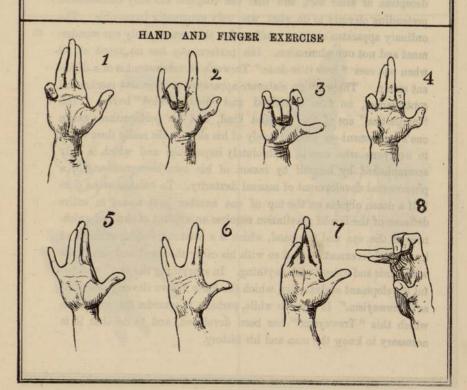


Fig. 9-The Rabbit-Many works have been produced to explain and illustrate "Shadows on the Wall," and almost invariably have begun with a rabbit. If there be any who do not know how to perform this, a glance at the illustration will suffice to instruct.

Fig. 10-The Swan.

Figs. 11 and 12-The Wolf is being performed by Campi and Frizzo, but

#### A FEW WORDS ABOUT TREWEY.

ONS. TREWEY, the original Fantaisist Humoristique, is now appearing at the principal Theatres in England. Those who see his entertainment cannot fail to observe that the merit of the performance lies in the marvellous skill which it demands. One sees many clever conjurers, men who produce strange and apparently impossible results by some inexplicable means. It is wonderful, but the audience knows always that the strange effect is only produced by a deception of some sort, and that the conjurer has only succeeded in pretending cleverly to do what was only apparently impossible. The ordinary apparatus conjurer excites for this reason only our wonderment and not our admiration. His performance has no merit at all when one sees "how it is done." Trewey's entertainment is of a different stamp. There are no elaborate apparatus or concealed mechanical contrivances, no false bottomed and double-lidded boxes. His "properties" are of the simplest kind, and his performances excite one's amazement on account solely of his skill. He really does what, to everyone who sees it, is absolutely impossible, and which is only accomplished by himself by reason of his own cleverness and of a phenomenal development of manual dexterity. To balance as he does half a dozen objects on the top of one another as it seems in entire defiance of the law of gravitation requires an amount of skill, of quickness of the eye and the hand, which is a most marvellous example of human achievement. And so with his other thousand and one tricks with cards and coins-with anything. In everything the same wonderful development of dexterity, which the Paris Figaro cleverly described as "Treweyism." It is worth while, perhaps, to consider the manner in which this "Treweyism" has been developed, and to do that it is necessary to know the man and his history.

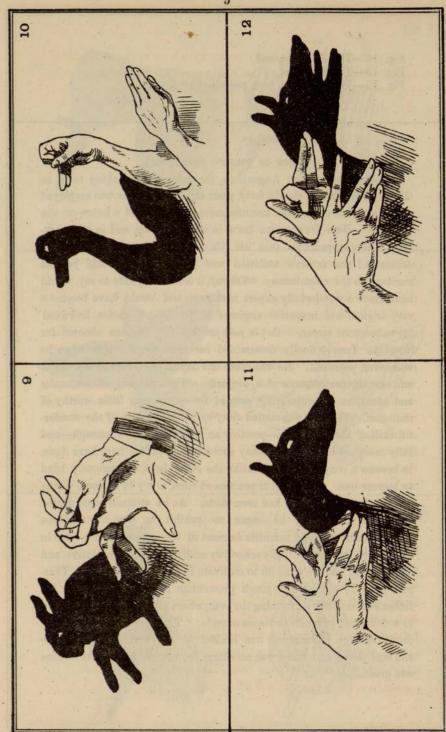


Fig. 13-The Elephant, and

Fig. 14-The Bird, and

Fig. 15—The Cat, have been perfected by Trewey.

#### (LIFE OF TREWEY CONTINUED.)

Trewey was born at Augouléme, the great paper-making town in the South of France, nearly forty years ago. His father was employed as machinist at one of the manufactories, and occupied a house on the premises. Here Trewey was born in the workshop, and in the workshop it seemed probable that his life would be spent; for the wild dreams of the father's ambition was that his son should become engineer to the manufactory. Trewey, it is tolerably safe to say, would have made a wonderfully expert mechanic, and would have become a very original and inventive engineer if the father's choice had fixed his subsequent career. But le pere propose and the son chooses for himself. Trewey finally determined his subsequent career when he was seven years old. He was taken one day to the circus at Marseilles and saw the performance of a conjurer. The wonders of mechanics and triumphs of engineering seemed by comparison little worthy of imitation. The boy was carried away by his admiration of the wonderful skill of the performer--possibly an ordinary fellow enough-and fully made up his mind, as many thousands of other boys have done, to become a conjuror. But, unlike the other boys, he seriously tried to become one. He began to practice at once, to try to do some of the juggling tricks which he had seen done. As he attained some degree of boyish proficiency he began to exhibit to his schoolfellows and playmates with an infantile forecast of the success which later in life he was to achieve. His schoolboy audience was appreciative and encouraging, and he went on to cultivate in a humble way the Thespian muse by rigging up a rough proscenium at a back window in his father's house, and performing the everywhere popular Punch and Judy to a delighted juvenile audience outside. The figures were his hands draped in rags. The music was limited to an overture on the comb and curl paper, and there was no charge for admission, but the success was great.

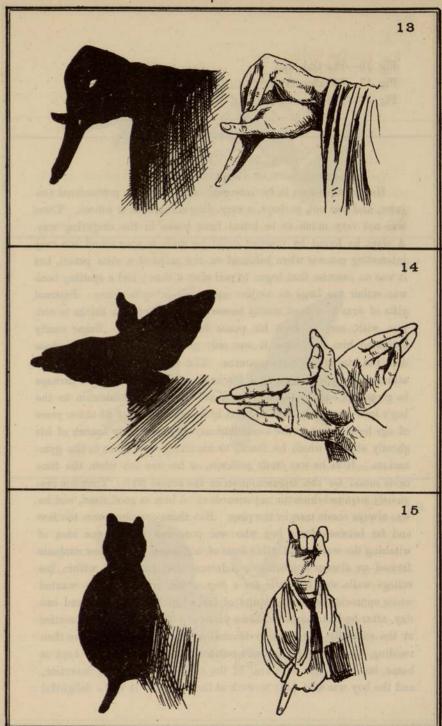


Fig. 16—The Old Man, Fig. 17—"Perfect Nose," Fig. 18—The Countryman, and

#### (LIFE OF TREWEY CONTINUED.)

He remained firm in his intention of becoming a professional conjuror, and was not, perhaps, a very diligent student at school. There was not very much to be learnt from books in the conjuring way. A slate he found by practice could be made to spin round in a very interesting manner when balanced on the point of a slate pencil, but it was an exercise that began to pall after a time; and a spelling book was rather too large to conjure up a tight juvenile sleeve Paternal gifts of sous he valued mostly because they were handy things to conjure with, and he kept his pence for that purpose. Sugar candy delighted him not, since it was only good to eat, and its purchase deprived him of his best apparatus. The father began reluctantly to acknowledge after a time that the engineer project had better perhaps be given up, and he decided to make some slight concession to the boy's love of mystery and to bring him up as a priest. So at ten years of age he was sent to the local seminary where the only branch of his ghostly studies which he found to his liking were those in the gymnasium. Here he was facile princeps, as he was too when the time came round for the representation of the school play. Then his previously acquired dramatic experiences stood him in good stead, and he was always comic man in the play. But these occasions were too few and far between for a boy who was possessed by the one idea of witching the world with noble feats of conjuring. His fellow students formed an always appreciative audience; but the world within the college walls was too little for a boy of his ambition. He wanted wider appreciation of the results of his religious education; and one day, after he had completed three years of constant conjuring practice at the seminaire, he went to Marseilles, where his parents were then residing, for a short holiday, and refused to return. He was kept at home, but there was a revival of the original engineering intention, and the boy was sent daily to work at the factory. It was a delightful

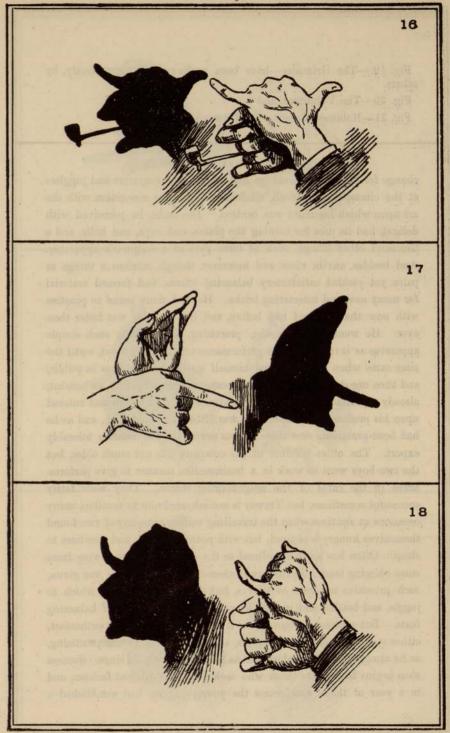


Fig. 19.—The Grimacer—have been performed, but imperfectly, by others.

Fig. 20-The Volunteer, and

Fig. 21-Robinson Crusoe-are Trewey's inventions.

#### (LIFE OF TREWEY CONTINUED.)

change for him. He could go and see all the conjurers and jugglers at the circus, and, after all, mechanics had some connection with the art upon which his mind was centred. The lathe, he perceived with delight, had its uses for turning the plates, and cups, and balls, and a thousand other things, such as form part of a conjurer's apparatus. And besides, anvils, vices, and hammers, though cumbrous things to palm, yet yielded satisfactory balancing effects, and formed material for many new and interesting tricks. He had more coins to practice with now than he had had before, and his progress was faster than ever. He went on practising, practising, and making such simple apparatus as is required for a performance of sleight-of-hand, until the time came when he considered himself qualified to perform in public, and then one day he suddenly disappeared in company with an acrobat, already a professional, whose acquaintance he had formed, and entered upon his professional career. He was fifteen years old then, and as he had been practising ever since he was seven, he had become tolerably expert. The other member of the company was not much older, but the two boys went to work in a business-like manner to give performances in the cafés of the neighbouring towns. They were fairly successful sometimes, but Trewey is not ashamed now to recollect many occasions at the time when the travelling variety company of two found themselves hungry and tired, but with nothing to eat and nowhere to sleep. Often has he been reduced to the necessity of borrowing from some obliging landlord of the café wherein his performance was given, such primitive apparati as knives, forks, and potatoes with which to juggle, and bottles and glasses to provide an exhibition of balancing feats. But success or non-success, it is all the same to the enthusiast, either stimulates to fresh exertions, and all the time he was practising, as he always had done before, and as he has always done since. Success soon begins to come to those who seek it in this diligent fashion, and in a year of these wanderings the young juggler had established a

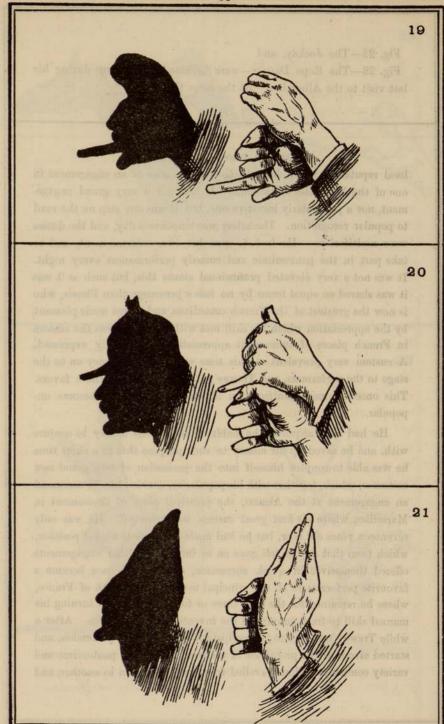


Fig. 22-The Jockey, and

Fig. 28—The Rope Dancer—were invented by Trewey during his last visit to the Alhambra. At the same time,

#### (LIFE OF TREWEY CONTINUED.)

local reputation which brought to him the offer of an engagement in one of the Marseilles music halls. It was not a very grand engagement, nor a particularly lucrative one, but it was one step on the road to popular recognition. The salary was tenpence a day, and the duties were multifarious. He had to give his own entertainment, and to take part in the pantomimic and comedy performances every night. It was not a very elevated professional status this, but such as it was it was shared on equal terms by no less a personage than Plessis, who is now the greatest of the French comedians, and it was made pleasant by the appreciation which his skill met with. And as was the custom in French places of amusement appreciation was warmly expressed. A custom very prevalent at this time was to throw money on to the stage to the performers, and Trewey got a good share of these favors. This once common manifestation of approval has since become unpopular.

He had long acquired the habit of saving his money to conjure with, and he saved up his money to such purpose that in a short time he was able to conjure himself into the posssssion of two grand new costumes, which, together with his popularity, enabled him to command an engagement at the Alcazar, the principal place of amusement in Marseilles, where his first great success was achieved. He was only seventeen years old now, but he had made for himself a good position, which from that day he has gone on to improve. Other engagements offered themselves in quick succession, and Trewey soon became a favourite performer in all the principal towns of the South of France, where he remained for the next three or four years, always turning his manual skill to fresh account in the invention of new tricks. After a while Trewey returned to the peripatetic branch of the profession, and started afresh as the proprietor of a travelling caravan pantomime and variety company. They travelled from one little town to another, and

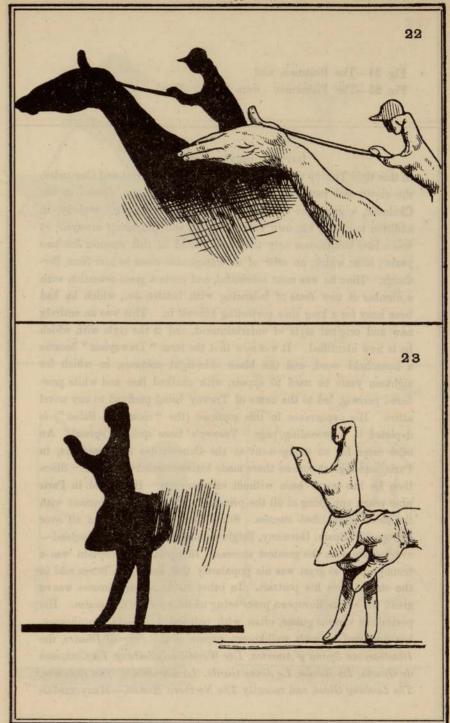


Fig. 24-The Boatman, and

Fig. 25—The Fisherman—were first produced.

#### (LIFE, OF TREWEY CONTINUED.)

in this time Trewey plays many parts, including Pierrot and Cassandre, the clown and pantaloon of French pantomime; he dances in the Clodoche, a grotesque quadrille; takes part in a "gag" comedy, in addition to giving his own entertainment, and practising always. It was a bare subsistence only that was gained in this manner for two years; after which, an offer of an engagement came to him from Bordeaux. Here he was most successful, and made a great sensation with a number of new feats of balancing with bottles, &c., which he had been busy for a long time perfecting himself in. This was an entirely new and original style of entertainment, and is the style with which he is now identified. It was now that the term "Treweyism" became a household word, and the black skin-tight costume, in which for eighteen years he used to appear, with chalked face and white powdered periwig, led to the name of Trewey being prefixed to any novel attire. His appearance in this costume (the "clown de Salon") is depicted in a preceding page. Trewey's fame quickly spread. An offer came for an engagement at the Concert des Ambassadeurs, in Paris, and a great success there made his reputation complete. Since then he has never been without engagements. He stayed in Paris nine years, appearing at all the principal places of entertainment with the most unqualified success. Since then he has travelled all over Europe-in Spain, Germany, Belgium, Austria, Russia, and Englandeverywhere with the greatest success. In Spain his reception was a triumph, and so great was his popularity that the match boxes sold in the streets bore his portrait. In other countries his success was as great, the entire European press being unanimous in his praise. His portrait in various guises, often with political and social significance, has appeared in such well-known papers as the Journal Illustre, the Illustrasiona Spana y America, Der Worstellung Zeitung, La Campana de Gracia, La Bombe, Le Jenne Garde, La Caricature, The Enti'acte, The Looking Glass, and recently The Northern Review. Many medals

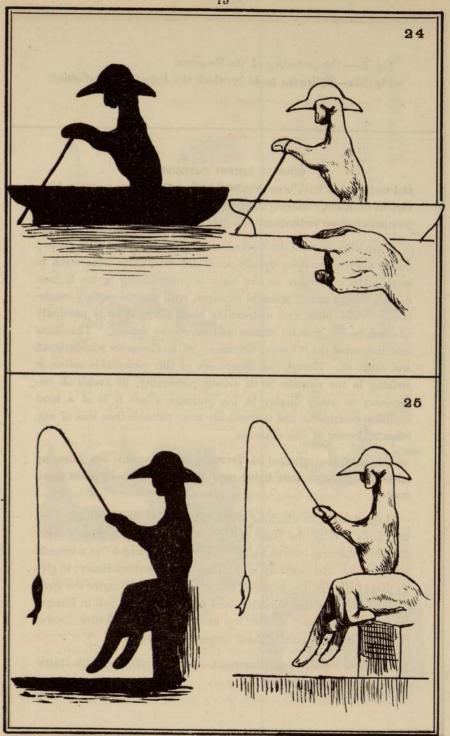


Fig 26—The perfection of the Preacher.

Fig. 26a—Shews the mode by which the Preacher is performed.

#### (LIFE OF TREWEY CONTINUED.)

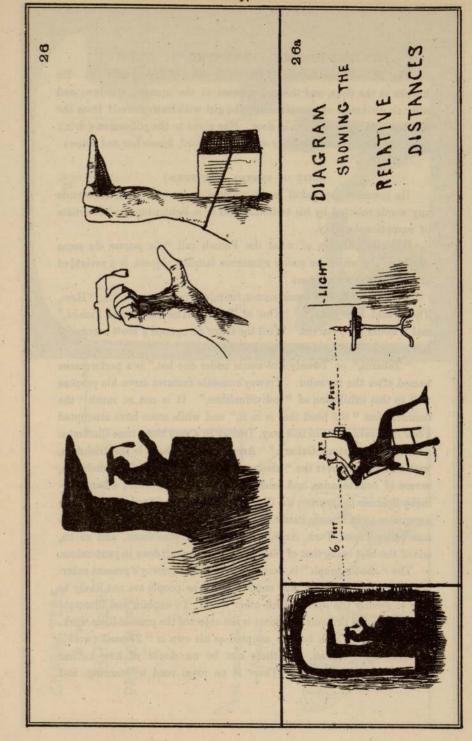
and testimonials have been presented to the subject of this sketch from various scientific, ethnographic and philanthropic societies, creating him member of these institutions.

Versatility is one of the most remarkable of Trewey's characteristics; he has always something equally novel and marvellous from week to week. His appearance on the stage is prepossessing in the highest degree, being a man of splendid physique, with a jovial smiling countenance. The plain and unassuming black Court dress is peculiarly adapted to his graceful stature and expressive actions. This dress was designated the "Trewey Costume" by the Costumier who designed and made it. Though the appearance of this remarkable artiste is striking in the extreme in its artistic personality, he avoids all unnecessary or gaudy display in his equipage, albeit it is of a most complete description, and undoubtedly more valuable than that of any other performer of this character.

Amongst the principal of Trewey's entertainments are balancing tricks of the most bewildering nature, and of which he is the grand master.

Legerdemain, in which he makes use of eggs, handkerchiefs, coins and cards. With the latter, using only one hand, he makes seven distinctly different cuts on a pack, "ringing the changes" in a remarkable fashion. His dexterity in throwing cards is extraordinary; to give an idea of the distance to which he can throw them, imagine the space from the stage of the Alhambra (said to be the largest hall in Europe) to the furthest part of the top gallery. At this theatre Trewey fulfilled a fourteen months' most successful engagement.

He gives a musical entertainment, sweet and Æolian, with instruments of his own invention.



#### THE PANTOMIME; INVENTED BY TREWEY.

Fig. 27.—The policeman is the "follower" of the servant girl. He knocks at the door, and the girl appears at the upstairs window, and after an exchange of compliments, the girl withdraws herself from the window and reappears at the door. She gives to the policeman a drink from the bottle; and he, after wiping his beard, kisses her and retires.

#### (LIFE OF TREWEY CONTINUED.)

He possesses great skill in the uncommon art of writing backwards any words selected by his audience, and is a lightening sketch artiste of exceptional ability.

His manipulation of what the French call "Le papier da papa Mathieu," by which he makes numerous familiar objects, is a revival of an old popular amusement

He is the author of comic scenes for mimic performance, viz., "Here, There, and Everywhere," "Out of Town, "The Persecuted Pianist," and "Boum (!!) Servez." With the latter he opened a most successful campaign in Paris and other large cities.

"Tabarin," or Twenty-five heads under one hat," is a performance named after the inventor. Trewey's mobile features serve his purpose well in this exhibition of "individualities." It is not so much "the bonnet," but "the head that is in it," and while some have attempted a few impersonations in this way, Trewey in a very short time illustrates a "National Portrait Gallery." Among others, there is the Irishman, with a broad grin over the "kissing of the blarney stone;" a Scotchman, severe of countenance, and calculating perhaps, the cost; a happy-golucky Spanish fisherman; the Chinaman, with both fingers up as a tally; a coquette (a la Minnie Palmer), Louis XI. (after Irving), the humorous man (after Toole), Turk, Arab, a Jesuit priest, schoolman, and so on, one of the best being that of Napoleon. They are all done in pantomime.

The "shadowgraph" is, perhaps, the part of Trewey's present entertainment that surprises and amuses most, as people are not likely to note so readily the *finesse* of his other work. To explain and illustrate the mysteries of this entertainment is the object of the present little work.

The motto which he has adopted as his own is "Travail (work), patience, and progress, and there can be no doubt of how he has followed out the precept. There is no royal road to learning, and

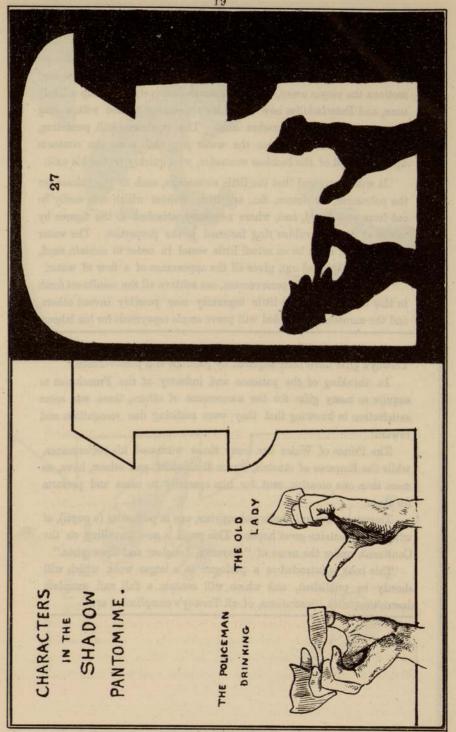


Fig. 28—Then comes the itinerant musician, playing a doleful air upon the clarionet. Paterfamilias comes to the bedroom window, and motions the player away, but the musician derisively strikes up a lively tune, and Paterfamilias now makes his appearance armed with a long broom, with which he thrashes him. The musiciam still persisting, Paterfamilias next produces the water jug, and pours the contents upon the head of the luckless serenader, who quickly makes his exit.

It will be noticed that the little accessories, such as the helmet for the policeman, the broom, &c., are little articles which may easily be cut from pasteboard, and, where necessary, attached to the figures by means of an india-rubber ring fastened to the properties. The water jug, however, must be an actual little vessel in order to contain sand, which, when poured out, gives all the appearance of a flow of water.

The amateur, with perseverence, can achieve all the results set forth in this book, and with a little ingenuity may possibly invent others, and the amusement afforded will prove ample repayment for his labour.

#### (LIFE OF TREWEY CONTINUED.)

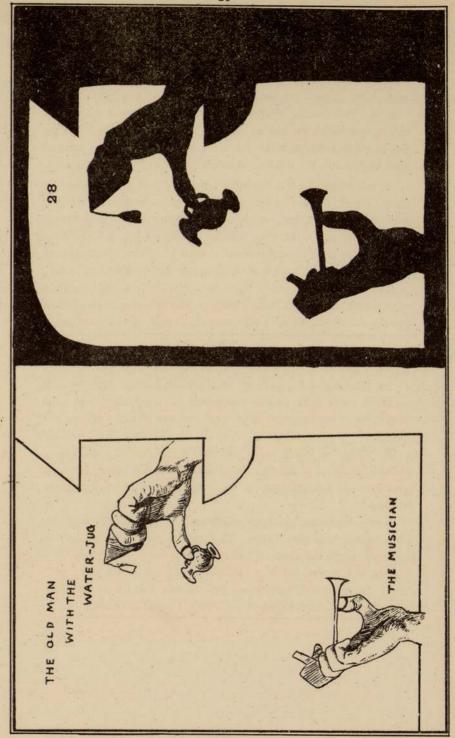
Trewey's gifts have been acquired by patience and perseverance.

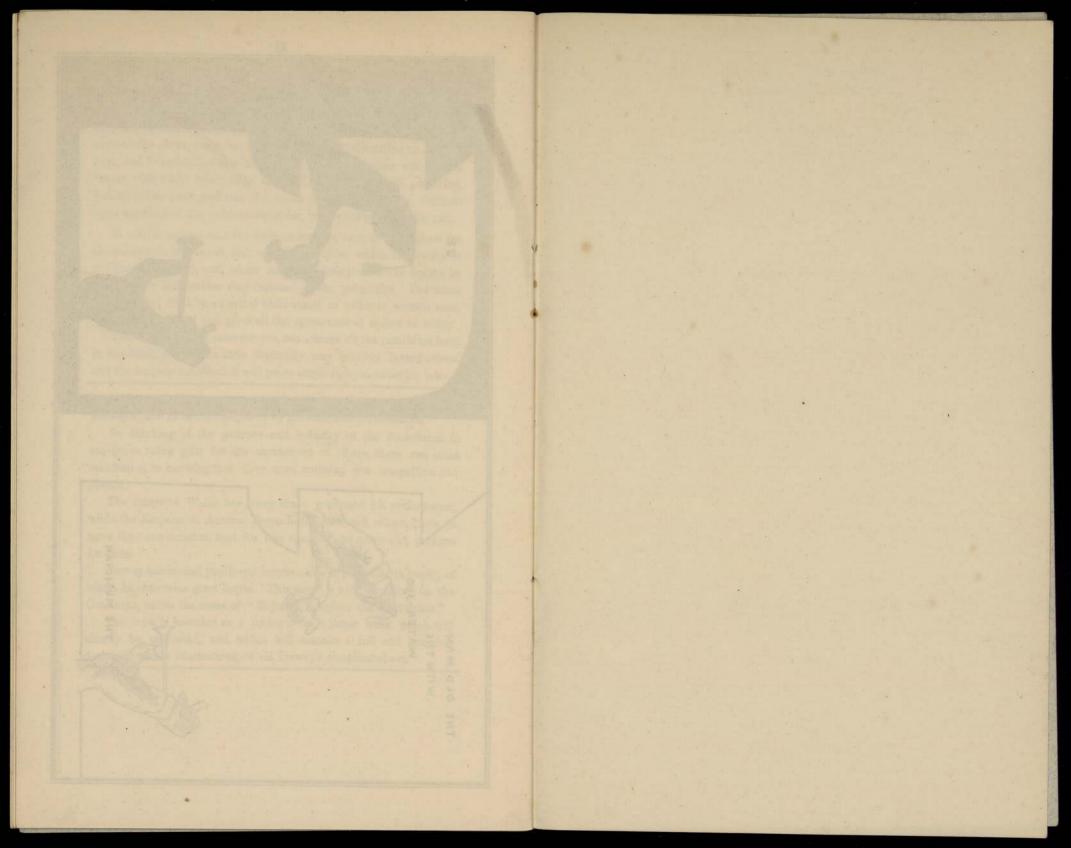
In thinking of the patience and industry of the Frenchman to acquire so many gifts for the amusement of others, there was some satisfaction in knowing that they were realising due recognition and reward.

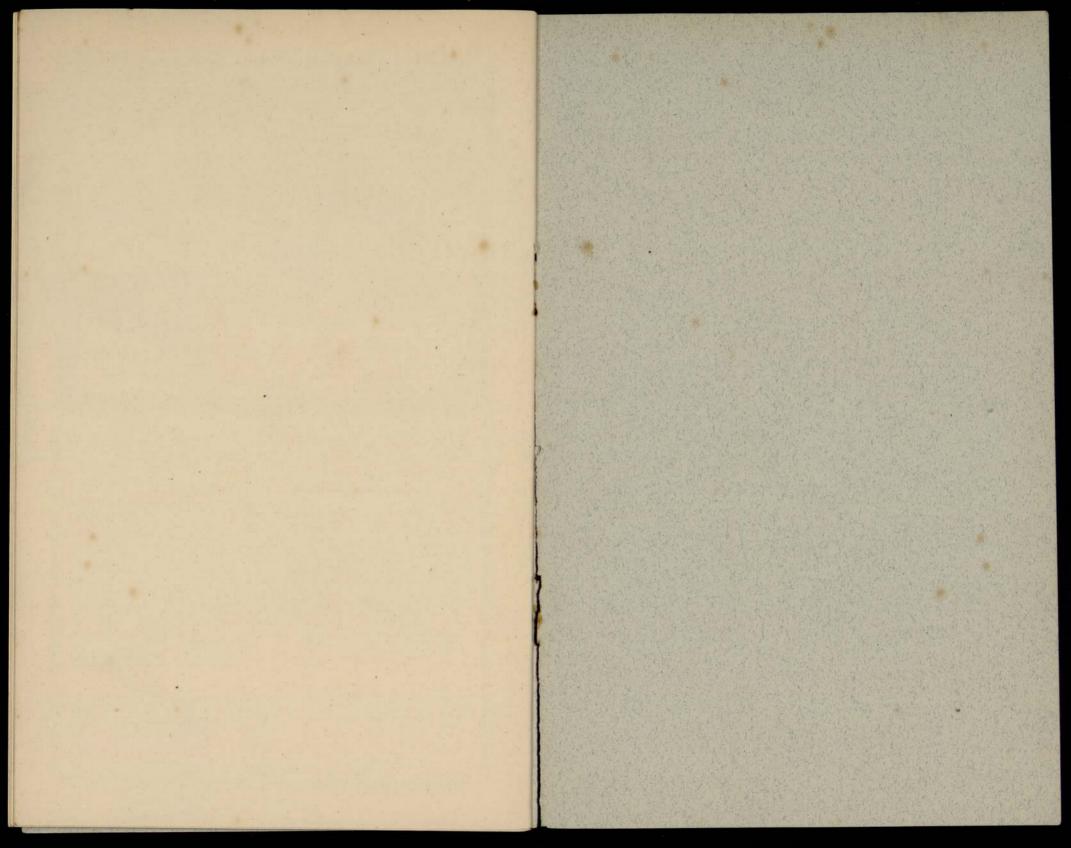
The Prince of Wales has many times witnessed his performance, while the Emperor of Austria, Baron Rothschild, and others, have, on more than one occasion, sent for him specially to come and perform for them.

Trewey has several pupils and copyists, one in particular (a pupil), of whom he entertains great hopes. This pupil is now travelling on the Continent, under the name of "Fayardx, Jougleur and Treweyiste."

This book is intended as a prologue to a larger work which will shortly be published, and which will contain a full and complete description, with illustrations, of all Trewey's complicated art.







# Millikin & Lawley's

## ENTERTAINMENTS

FOR

## EVENING PARTIES.

Conjurors, Ventriloquists, Punch and Judy, &c., provided.

TERMS ON APPLICATION.

price List of Conjuring Tricks, post free, 6d.

Millikin & Lawley,

165, Strand, LONDON.





Shows placed side by side.

and Panoramas. This building was erected in 1822 and showed a wonderful Panorama of London by day and by night, a series of lantern entertainments were also given here running contemporary to those given at the old Polytechnic, an advertisement culled from the "Times" newspaper of 1845 after telling of the numerous thrills to be experienced and the price of admission to be paid to see the marvels contained in this emporium states:that the Proprietors of the Coliseum have added a further GLYPTOTHECA attraction in the new Corridor by adding a "Glytotheca" which was an avenue of stone statues, and as coal gas had just been invented, it stated that the corridor was lighted by twenty six colossal tripods of gas jets. This should make some of our present day showmen quite envious, and all the thrills put together would scarcely be enough to startle a rabbit at the present time.

The Coliseum at Regents Park the main entrace to which was in Cambridge Terrace and the rear entrance in Albany Street, was another popular resort, wherein were shown many fine Dioramas

The Egyptian Hall in Piccadilly, which stood almost opposite the Lowther Arcade was another resort renowned for showing Panoramas of trips to other lands. The Ascent of Mont Blanc with its snow scenes, and the rescue of a traveller by a St. Bernard Dog, had a record run at this house. This building erected in 1812 was pulled down to make room for the present permanent stone structure known as Egyptian House.

Travelling showmen were much in evidence from the middle of the eighteenth century to the latter part of the nineteenth century, when for an agreed fee they would attend parties and receptions, entertaining the guests with Gallanty Shows, Shadow Shows and Marionettes and a popular item always included in their Programmes was the story of the Broken Bridge. Jointed dolls and Puppets have been in use right from the time of the Egyptians to show life-like movements and to enact little plays, and in the British Museum can be seen some clever examples of jointed dolls discovered in the buried cities of Herculaneum and Pompeii.

From the time of Vulcan onwards, there are records of the construction of wonderful mechanical Puppets, these finding much favour with the ancients, where they were used to represent living characters. The ancient Chinese also used similar figures for their Ombres Chinois or Shadow Shows of 5000 B.C. Greek dramatists were masters in the Art of Puppet Shows or Marionettes and several writers attribute the original conception of the Punch and Judy Show to this source. The squeaking voice of



C. Marshall

C: Moturani

Will Day.

Peep Show in operation 18th Century

View of Vacexhall Gardens in the





LARGE Theatre to the Right, UP STAIRS, in the Local lighted with one CHANDELINA of Hefferd Smooth



The Artist Kingle and the Bowe, 21 Stor Light, and 22 Fort mile,

### ERGASCOPIA,

PHANTASMAGORIA.

### LARGE THEATRE, LYCEUM, STRAND.

Mesers. Schirmer and Scholl, Professor of PHYSICS, OPTICS, ACOUSTICS,

Professors of PHYSICS, OPTICS, ACOUSTICS,
MECHANICS, AEDISTATICS, SO,
HAYCCHRONIC THE CONTROL OF THE CONTROL OF

The LABOR. There is now your XVERT UNIXAG.
ACT 1—The case must design from the case of ACT 1—The case must design from the case of ACT 1—The case must design from the case of the case of

their Specific or the second control of the



1808.

By Mr. BOLOGNA, Jun.

This and every Evening till further Notice.
TAKE NOTICE,
the Real and Original PANTASCOPIA is at the



Strand, opposite the Adelphi, Licenfed by the Rt. Hon, the LORD CHAMBERLAIN.

This Evening, Monday 17th November, 1806, And every succeeding Evening, (Sender on

This New Theater will continue Open, with the Amusements, as under: PART THE FIRST,
MENT, comissing of RECITATION and SONG, entided,

- Ditta.
- Ditta.
- Copan Clark.
- Has to prevent Mariny.
- Italel.
- Revit. Sad Song Finals.

The Whole Written, Composed (with the estitation of 1500 Sangi) and will be Spoken, Sung and Accompanied, by A LADY, being her First Appearance on any Stage. PART THE SECOND,

### ERRIFIC,

rd, Earl of Northumberland.

The Menioc, Apothesis of a lamented Hero. An animated Effey.

### PART THE THIRD,

### The Vision in the HOLY LAND,

Or Godfrey of Bouillon's Dream, An ANCIENT GRAND BATTLE IN SHADOW, the shadow of the shado

### Artificial FIRE-WORK,

In a TEMPLE Superbly Illuminated.

The Whole accompanied with appropriate Music. of Adminion. BOXES So. PIT So. Locre upon at Seten, begin at Eight.



INTERIOR OF THE REGENCY THEATRE, TOTTENHAM STREET, TOTTENHAM COURT ROAD

Punch has been handed down through the centuries and is supposed to be the invention of a Greek showman of the period who used a small speaking trumpet to alter the tone of his voice each time he brought the figure of Punch into operation. The Wayang Purwa or Marionette shows of the Javanese are the direct descendants of the similar characters used by the Ancient Chinese 5000 B.C. whilst the Burmese in their Marionette Shows used the title "Yotthe-Pive" and these entertainments always proved extremely popular through all the countries of the East.

It has been very difficult to try and arrive at the correct date at which this form of Entertainment entered England, but it is quite possible for the Romans to have been responsible for its introduction. Peppy's in his wonderful diary quotes many instances of visits to Bartholomew Fair to witness Puppet Plays, whilst in a visit to Lord Brouncker on October 'th 1662 he states:- At night by coach again to my Lord's, but he is still at Whitehall with the King before whom the Puppet Plays I saw at Covent Garden are acted this night."

The great Ben Johnson makes mention of the fact that he twice visited the Puppet Show to witness one play "Everyman out of his humour" and in his writings of Bartholomew he speaks of one John Littlewit who speaking to his wife, Nell Wynne, the fight, he says:- "Nell wilt come with me to the Fair I'the day, I go to visit the motion man for whom I have writ a play. There are many other learned men that allude to these various forms of entertainment, and even at the present time the Music Hall is not above including in its programme an item by the Marionettes.

Thus we see the various forms of entertainment which preceded the Movies, all of which used Magic Lanters, Shadow Shows and Moving Figures, in their endeavour to amuse the public, all of which played their several parts in preparing the way for Kinematography or Moving Picture Shows to follow. LIGHT AN ILLUMINATING STORY.
LIGHT AND THE VARIOUS ILLUMINANTS USED THROUGHOUT
THE AGES TO SHOW PICTURES AND MOVEMENT.
THE INVENTION OF ELECTRICITY: CARBONS? ARC LAMPS:
THE DYNAMO, ETC.

### Chapter Five.

Light, which plays such an important part in the Science of Photography in general, and Kinematography in particular, may be described as the transverse vibrations in the ether. It is the agent, which, by its action on the Retina, excites in us the sensation of vision.

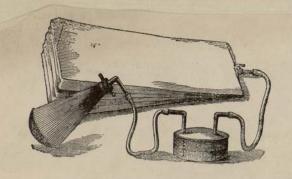
In 1672, Sir Isaac Newton, laid down the emission theory of light, as opposed to Huygens, who favoured the undulatory theory. Although all scientists have abandoned Newton's Corpuscular theory of light, there is no query regarding the existence of the Electron, which, without any great stretch of imagination, might be likened to the corpuscules of Newton's theory.

It is unnecessary to weary the reader with a long discourse on the theory of light, as so many learned scientists have devoted their lives to the subject and have written numerous books on their various theories. The velocity of light is enormous, and according to several eminent scientists travels at the rate of nearly 190,000 miles per second.

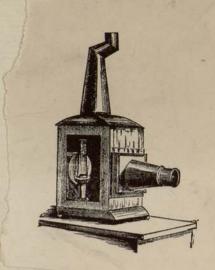
The first illuminant used for the projection of an image upon a screen was the sunlight, as used by the ancient Chinese some 5,000 years B.C., when they showed their "Ombres Chinois" or Chinese Shadow Shows upon a screen of parchment. This was followed again by the use of sunlight, cleverly projected on to the desired object with the aid of mirrors and condensers by the Maji of Ancient Egypt, giving a reflected image from a plaster cast, on to a cloud of steam or incense in their Temples at Isis and Tyre, and so apparently showing in shadow form the spirit of a departed ancestor.

One of the first known forms of artificial illuminant for projection purposes was the tallow candle, consisting of melted mutton-fat, dipped round a wick, which by being frequently dipped into a Vat of fat, gradually took on the desired thickness at each dip. The light from a candle was very poor, and although enhanced by the introduction of a mirror behind it, by Anthanasius Kircher, the inventor of the first optical lantern in 1640, it left much to be desired.

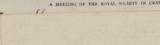
# Limelight

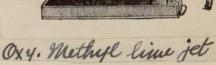


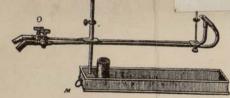
oxygen



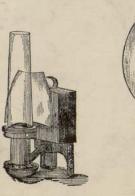




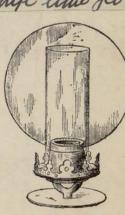




Blow through Line light jet

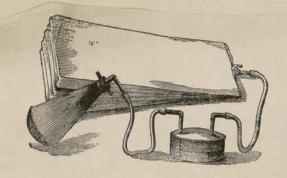


dryand lump for Sperm oil

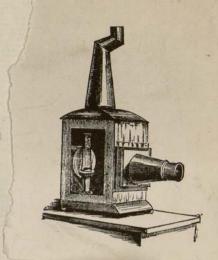


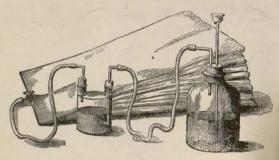
Rusip for

# Limelijht

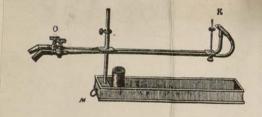


cxygen

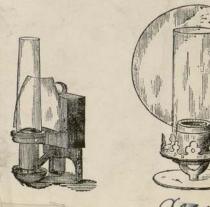






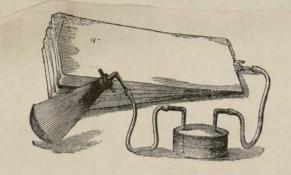


Blow through Line light jet Oxy. Methyl lime jet

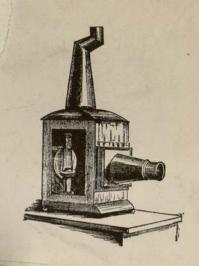


dryand lump for Sperm oil Radisp for

# Limelijht\_

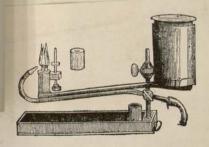


oxygen

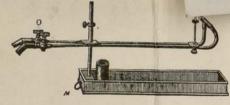


Lauter with dryand Camp

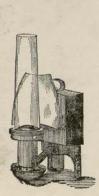




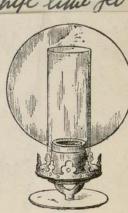
Oxy. Methyl lime jet



Blow through Live light jet



dryand lump for Sperm oil



Russip for

This was followed later, again by Kircher, who adopted a Sperm Oil Lamp, and although the light was kept more central and burned longer through a wick, the illuminating power was little greater.

These systems remained in use until the early part of the eighteenth Century, when Magic Lanterns came into more general use, and therefore a better form of light became a necessity. Professor Gravesand, who used the optical lantern largely in his lectures, sought about for the best means of illumination; but find nothing suitable for his needs, he produced a large reservoir lamp burning Parrafin Oil, and having four wicks side by side, the two outer wicks being inclined towards the centre, the wicks being about four inches in length. This was a decided advance and with the addition of a mirror gave a light of approximately 100 candle power.

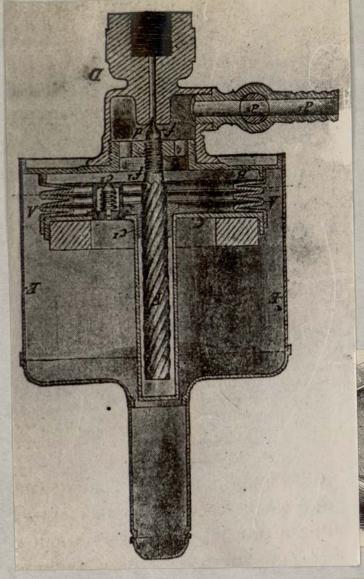
A still further advance was made in 1879, when Mr. Argand produced an atmospheric burner using sperm oil from an ingentious float feed resevoir, this was later improved by Mr. Bude who introduced a supply of Oxygen into the centre of the light in place of air.

The discovery and invention of Gas as an illuminant dates back to the earliest known times, as natural gas has ever issued from fissures in the earth, and becoming ignited sent forth huge flames of fire. The Greek fire alters were stated to have taken their supplies of gas from the Bituminous Coal Beds of the earth, and a very alarming sheet of flame issued from the shaft of a coal mine at Whithaven in England 1773. The Chinese after locating Coal Gas seams, tapped the sources and carried the gas as required in bamboo pipes for their use, using Jets made of burnt clay to light their Cities.

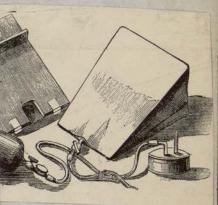
The first man to manufacture Gas artificially was Mr. Murdoch a native of Soho, Birmingham, England, who in 1792 carried out numerous experiments with Carburetted Hydrogen which resulted in making his Gas in iron retorts, and collecting it in a Gasometer where it was cooled and purified, and then carried in Iron pipes wherever desired, to illuminate his mines at Redruth in Cornwall. The first public display given by Murdoch of his invention, was at the public rejoicing for the Peace of Amiens in France and again in 1802, when the works of Boulton and Watt at Soho, Birmingham, were brilliantly illuminated.

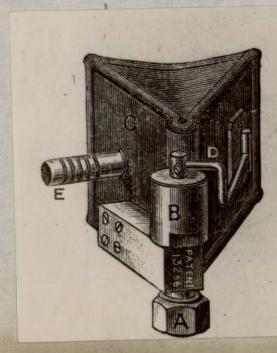
There was much prejudice against the use of Gas in London, people pointed out the danger of fire and explosions, and the

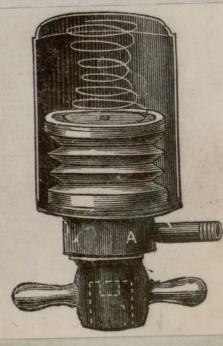
## Limelight Pegulators



Beard's original Oxygen Regulator



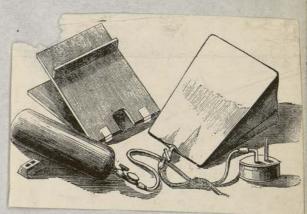


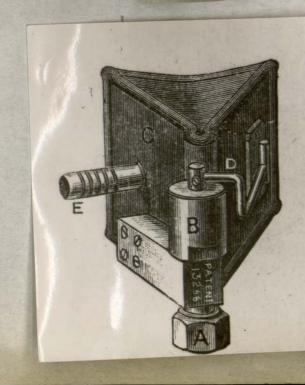


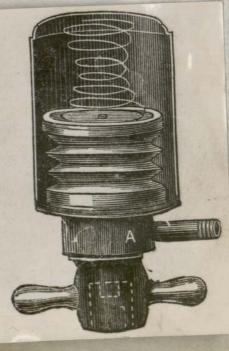
Beards Hydrogen Regulator Regulators

Beard's original Oxygen Regulator

Hydroen Gas in Bag. Oxygen in Cylinder







Beards Hydrogen Regulator one person who was so persistent in his demands to give this new illuminant a trial was Mr. Winsor who lit Pall Mall with a series of Gas Jets in 1807, and who later in 1816 formed the National Light and Heat Company for supplying the whole of England with Coal Gas. This popularised the use of Gas and gave a great impetus to the use of the optical lanter, as it was found that both Coal Gas or Hydrogen and Oxygen could be rendered portable and stored in stout linen bags lined with rubber, which method was supplanted later by compressed Gas stored in iron cylinders, the supply of these gases being regulated by means of specially constructed regulators introduced between the cylinder and jet.

Bude's idea of introducing a stream of Oxygen into the centre of a light was not long in use, before a much more effective means of using the two mixed gases was invented by Lieutenant Drummond in 1826, who first introduced his Oxy-Calcium light using a cylinder of lime and a mixed Jet for his Gases to impinge on to. This gave a huge increase in candle power, and it also gave a greater concentrated form of light, the luminous spot when correctly adjusted being about \$\frac{1}{8}\$ of an inch in circumference, and giving an effective light of over 200 candle power.

Mr. Gurney also carried out some successful applications, which were again improved upon by Professor Daniels who, by using a special High Power Jet, succeeded in giving a light of 300 candle power by using both gases under pressure. This method of lighting was universally adopted for nearly all the first exhibitions of moving pictures, as it was readily portable and as available halls in 1896 were only of small dimensions, this form of illuminant proved adequate and gave quite good results upon the screen.

The Ether Saturator was another form of lighting used for the display of animated pictures, which used Ether in place of Hydrogen in conjunction with Oxygen, but as this mixture was highly dangerous, it was banned from use after several disastrous fires and explosions had occurred with much loss of life.

One of the most terrible disasters which occurred through the explosion of an Ether Saturator, was that of the holocaust at a Charity Bazaar in Paris, on May 4th 1897, when 178 persons lost their lives, the film became ignited, and in a few minutes the whole building, which was built almost entirely of wood, was one mass of flames. It was this terrible conflagration that caused the County Council and other authorities to issue stringent restrictions safeguarding addiences against fire, and rendering all buildings wherein films were used, as nearly fireproof as possible.

Having explained the use of limelight for projection purposes, it is interesting to recall an episode which happened to a well known exhibitor of Moving Pictures who received a Royal Command to appear before the Prince of Wales (later King Edward Vll). Arriving at his destination, the exhibitor set up his apparatus ready to give the entertainment, when to his dismay he found he had forgotten to bring the very necessary pillar and tray upon which to mount his Oxy-Hydrogen limelight Jet for use inside the lantern As there was no time to return and get the missing articles, he thought he could manage to hold the Jet steady enough for a sufficient length of time to show each of his moving pictures, which at that time were only 40 feet in length and lasted upon the screen about one minute. Upon H.R.H. the Prince of Wales entering the room and taking his seat, the signal was given to commence. Not realizing the intense heat created by the Oxy-Hydrogen Jet, the Exhibitor found it an impossibility to hold the light steady, as it was burning his hand. This produced the disastrous result of simply showing flashes of light upon the screen with a glimpse of a picture now and again. The Prince after witnessing several abortive attempts rose from his seat, and in his usual good natured mannfer, turned to his host and said "You call them Moving Pictures, Well : ! let them move", after saying which he at once left the room.

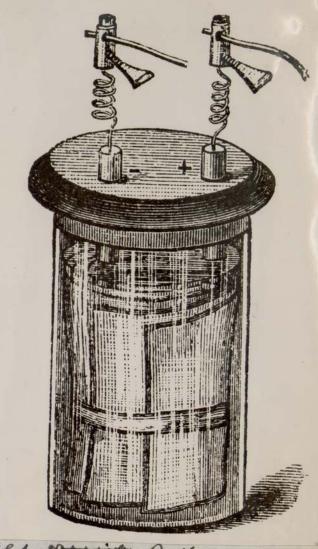
It was not very long before the electric Arc Lamps ousted all other forms of artificial light as an illuminant for Motion Pictures. As none of the Music Halls or Theatres in 1896 had any other form of illuminant than Gas, it caused many of the first exhibitions to be given under very trying and difficult circumstances. In many instances a set of accumulators weighing over one ton, had to be conveyed to the Theatre or Hall, often travelling a great number of miles, to find upon arrival at their destination, the whole effort was useless, as it was a common occurrence to find the paste in the grids had washed out by the slopping of the Electrolite, thus causing the battery to short out, and become useless, when a hurriedly obtained limelight outfit had to be pressed into use, or the exhibition abandoned altogether.

As electricity plays such a large and important part, both in the taking and exhibiting of moving and talking pictures

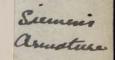
Electricity

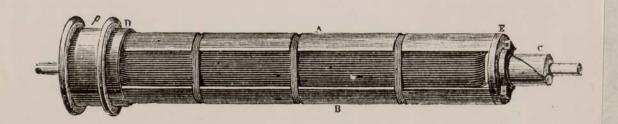


101 Farraday. F.R.S



Groves Battery





at the present time; a short history of the numerous inventions leading up to the perfection of the Arc light and generators will prove of general interest, as it has such an important bearing upon the perfection of the results that have been achieved.

### ELECTRICITY IS DISCOVERED.

Thales of Miletus is stated by the early historians to have discovered electricity in a very simple manner, at a period about 300 B.C.

It is recorded that whilst this great philosopher was taking an early morning stroll along the sea shore, he picked up some pieces of amber which he saw lying upon the beach. Being interested in this substance, and wishing to know more about it, he rubbed a piece of the amber upon his garment, when to his astonishment he found it attracted many light substances towards it, such as dead leaves, pieces of papyrus, etc.

Thus was frictional electricity first discovered, and by the writings of this great philosopher, the earliest known principles of this all powerful force were laid, without which it would be impossible to project the moving pictures upon the screen at the present day, and which has proved itself to be a power that has since grown to vast magnitude, and may be said to be almost a necessity to our very existence.

Although electricity had been discovered long before the Christian era, it took many decades before it was adopted as an illuminant.

### THE FIRST EXPERIMENTERS.

We know how much we have to thank Sir Isaac Newton, also Andre Marie Ampere, Count Allesandro Volta, whose two names were perpetually honoured in the terms used for recording electric current pressure, volts and amperes, the great Professor Farraday for his discoveries in electricity and their applications to light by the use of sticks of charcoal for the element, also the splended results achieved by Sir Charles Wheatstone and others.

One of the first commercial applications of these learned men's discoveries was the introduction of an electric light by

Mr. Jacobi who derived the necessary supply of current from a battery of 12 Groves Cells using two sticks of charcoal for the Electrodes, which, when approached within 0.0013 of a millimeter to each other it was reported gave a most beautiful electric light. Sir Humphrey Davy carried out many experiements with electricity and in 1801 introduced elements made of gas coke and other admixtures for his Electrodes and as he found the elements burned away rapidly when exposed in the air he introduced a glass globe to encompass them, which caused them to burn for a much longer period. For these experiments he used a battery of 3000 plates each 4 inches square.

Many others entered the active arena as experimentalists in the use of electricity, as a medium for light. Mr. Edland stated that a continuous Arc could only be maintained by using a regular supply of current of considerable electro motive force. Focault carried out many valuable experiements with the use of sticks of carbon carefully noting the disintegration of these elements at the Arc point when burning. It was Focault who discovered that the negative pole was the first electrode to become luminious and that the positive pole burned away with twice the rapidity of the negative. Many types of Arc Lamps were produced, one of the first being a plain vertical lamp with a carbon holder for each pole. The elements being pushed towards each other by hand upon the rod to which the holders were attached.

### FIRST ARC LAMP.

A clever automatic clockwork Arc Lamp was next produced by Soliel puboscq of Paris which fed the carbon elements together in unequal ratio with velocitudes proportional to their waste.

### DUBOSCQ ARC.

With this lamp Duboscq claimed to be able to carry out all optical experiments for which the sunlight had hitherto been considered essential and he also claimed to be able to successfully illuminate all scenes and objects for photogenic purposes thus introducing the Arc Lamp for the first use in studio work. Then followed a clever electro-Magnetic feeder Arc Lamp invented by Mr. John Browning which being fitted with a magnetic detractor caused the carbon elements to be dutomatically brought together, as they were burned away.

### BROWNING ARC.

The next invention to be introduced was the invention of Mr. Jablochoff known as the Jablochoff Candle. This consisted of two rods composed of gas coke carbon from two to four millimeters in thickness separated by a 2 millimeter thickness of china clay which upon the application of the electric current were caused to burn down. This lamp was started by placing a small piece of carbon across the two carbon elements before switching on the current, and was designed for use with alternating current.

There were numerous other types of lamps such as Reynier's, Von Heffner's, etc. some were mechanically and others hand operated. One of the earliest hand feed arc lamps to be used for Kinematograph projection purposes was the large scissor pattern arc lamp made by Moltini of Paris for use in the Lumiere Projector although there were several types of hand feed arc lamps produced for search light work in the Royal Navy.

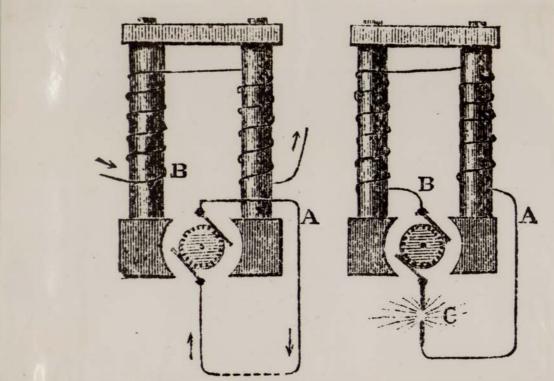
Perhaps the most practical and certainly the most universally adopted and hand feed are lamp for projection purposes was that designed and produced by Mr. Cecil Hepworth, which had a special spring, quick striking attachment. This lamp was sold by Chas Urban R. W. Paul, The Warwick Trading Co. Ltd. and others and was used by nearly all the early exhibitors of Motion Pictures.

Other popular hand feed arc lamps were the Brockie-Pell, Chard, Beard, and Wrench, all of which had their own particular arrangements for feeding and centering the light. The latest type of projection arc lamp is the high intensity arc with a mirror application as shown herewith, which was first introduced by the Sperry Gyroscope Co. Ltd. Amongst the early experimenters and the introduction of the use of batteries, it affords much interest to read of the

### MIRROR HIGH INTENSITY ARC.

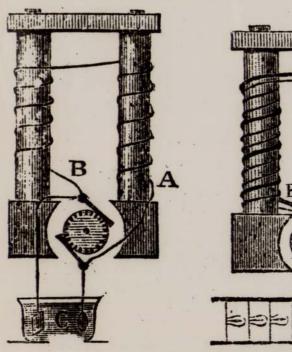
many heated arguments that arose from time to time between Volta and Galvani, regarding the conditions of the negative and positive poles. Dr. Wollaston and De La Rive also delved deeply into the same subject whilst Dr. Farraday proved by his experiments that electricity produced in voltaic action was of purely chemical origin. Lord Kelvin carried out many experiments which gave definite results of different metals electrically charged to form negative and positive plates.

Electricity

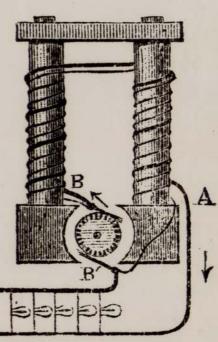


Seperately excited Electrical Generator

Series Wound Dynamo

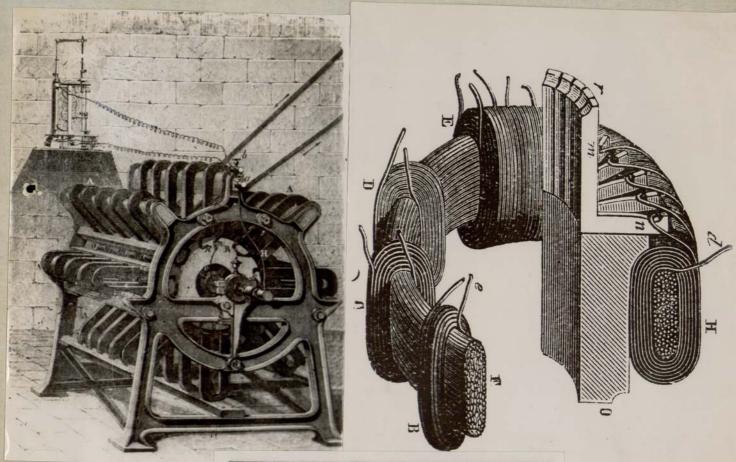


Shunder ound



Compound Wound

## Electricity



Molletts Magneto Electrical Machine With First Olec Lamp.



Paccinotti's

dudre

Professor Lodge also wrote several interesting papers on the Voltaic Pile or Battery. The various batteries produced by Dr. Wollaston, Daniell, Groves, Marie, Davy and others, were all used to advantage in the first experiments in producing electric arc lighting. The first storage batteries or accumulators so largely used for many purposes at the present time were produced by Plante, Faure and others and have proved a valuable adjunct in many theatres to act as a supplementary source of electric current supply in case of generator failure.

The advent of electrical generators was the result of great research by many early scientists who discovered that the lines of magnetic force could be affected by a rotating copper plate. This magnetic action was first observed by Arago in 1824 and was afterwards modified by Dr. Babbage and Lord Herschel. Dr. Farraday was the first scientist to give an explanation of the phenomenan of magnetism by rotation, in which he reversed the original experiments of Arago.

Pixie and Ritchie devised and produced the first magnet electrical machine which was quickly improved upon by Saxon, Ettinghausen, and Clarke, and an illustration of Clarke's machine using a powerful horse shoe magnet is shown herewith.

The next electrical generator to be used expressly for generating current for use with an arc lamp was Nollett's machine introducing the transformation of power into electric current by the induction of magnets on coils in motion.

### ELECTRICAL GENERATORS.

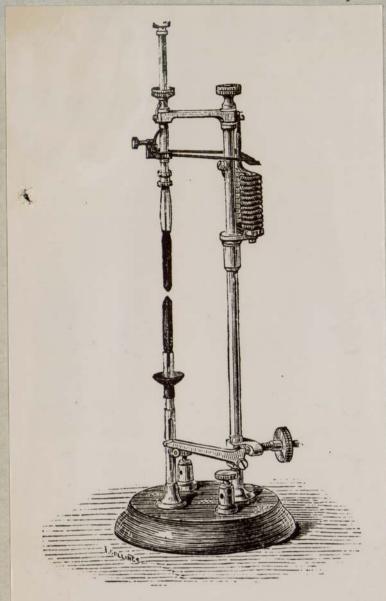
### CLARKE'S MACHINE. NOLLETT'S.

The next important step towards an efficient electrical generator was the invention of the cylindrical armature by Dr. Werner Siemens. This was composed of insulated wire wound lengthwise on a core instead of transversely.

### SIEMEN'S ARMATURE.

Then followed an improved machine by Wild to be still further advanced by the principle of the reaction of a current upon itself by Dr. Werner Siemens and Sir Charles Wheatstone, which was named the Dynamo Electrical Machine. The first Dynamo to be produced was by Mr. Ladd and was exhibited at the Paris Exhibition of 1867.

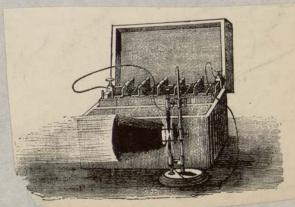
## Electricity





alessandsWolta

Automatie Fred are Camp With Magnetic Detractor



CHARCOAL STICKS PRC LAMP AND A SIX GROVES CELL BATTERY

### LADD'S DYNAMO.

The invention of the Ring Armature by Pacinotti, Gramme, and Siemens, gave another advance by showing an enormously increased output of current, also the Brush system, somewhat akin to the former but having a different system of coiling. Several distinctive types of generators were afterwards produced which are the standard generators in general use and are briefly described as follows:-

The first may be briefly explained as the separately excited machine, invented by Wild in which the wires from a separate machine excite the field magnets.

### WILD'S MACHINE.

The next illustration shows the original form of the dynamo which is series wound, in which the current from the armature passes directly from one brush into the wire of the field magnet and from thence into the external circuit, and by way of the other brush subsequently returning to the armature.

### SERIES WOUND DYNAMO.

A still different type of generator known as the shunt wound dynamo in which the current was made to divide at the armature, one portion passing through the field magnet wiring which was composed of a large quantity of thin wire and the other through the external circuit.

### SHUNT WOUND DYNAMO.

A fourth example is that of the compound wound dynamo in which the field magnets are wound with one wire as in an ordinary series wound dynamo, and in addition to a large quantity of thin wire is also wound round the field magnets and passes to the other brush as shown in this illustration:-

### COMPOUND WOUND DYNAMO.

Many of the early exhibitions of Kinematography in the years 1896 and 1897 were given under very difficult circumstances, as several of the Halls and Theatres were not equipped with Electrical installations and a set of accumulators weighing approximately one ton was conveyed to the Theatre, often to find upon their arrival that the paste had washed out of the grids and caused the battery to short circuit itself out.

One of the most popular types of dynamos in use in the early days of pictures was the "Manchester" sold by the Manchester

Dynamo Co. This consisted of a large pair of field magnets with a small armature and was series wound, being generally belt driven from an engine.

### MANCHESTER DYNAMO.

The early fairground showmen used this type of generator usually placed in front of the smoke stack on a Burrell Tractor. When the various corporations put down generating stations the motor generator was introduced for taking a high voltage supply from the mains on the primary circuit, which energized a motor direct coupled to a dynamo for delivering a low voltage and high amperage on the secondary or output side.

### MOTOR GENERATOR.

There were many theatres that installed their own generating sets and these were worked sometimes belt driven by steam or gas engines, but more often direct coupled to a high speed petrol engine, and amongst the most popular types of generators of this description might be mentioned the Kelvin or Aster Sets.

### KELVIN SET.

The usual necessary controls such as Rheostats switch gear and Distribution Boards were supplied by the various electrical firms and were generally found very satisfactory in governing the somewhat heavy loads supplied to the arc lamps.

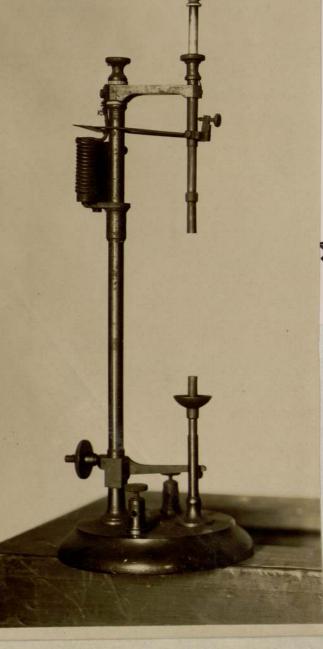
### CARBONS.

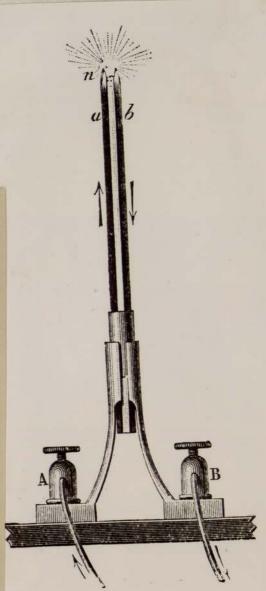
The carbons for projection use were first composed of charcoal but as already explained were found to decompose too rapidly when burned unprotected in the atmosphere and Davy, Edland and others found that gas graphite or to use the more common term coke, lasted longer and held a better crater of light.

With the greater use of electricity as an illuminant for search light purposes, and other uses where a large current consumption was needed, it was found necessary to use a solid carbon on the negative pole, whilst a softer carbon having a diameter of about double that of the negative was found necessary for the positive pole, and to keep the crater of light central, a softer core was introduced composed of a special admixture of lamp black and charcoal with water glass or silicate of lime. This type of carbon sufficed for a time, but as it was found to produce a red light, the various makers carried out numerous experiments with the result that

Electricity

Browningo original dre Ramp, worked off a sia cell Grove's battery and used z slicks of Thoroad for the elements.





Sablakoffi Candle

Messrs. Conradty placed upon the market a negative carbon which was copper coated, and later added a copper core, by which means a far more intense light, and of greater value for projection purposes was obtained. The admixture was also greatly improved of which the carbons were composed, and the ingredients consisted of very finely ground coke-breeze, charcoal and lamp black, being made into a stiff paste by the introduction of coal tar, and moulded into the necessary rods for use in the arc lamps. The core composed of a special admixture was pressed into the centres of the positive carbons, which were moulded hollow for that purpose, and the carbons, after being formed, were baked in an oven.

There have been many makers of carbons, and the bulk of the early supplies came from either Conradty's works or the Schiff factories at Nurenburg in Germany, but as these supplies were naturally cut off during the War with Germany a large works was inaugurated by the General Electric Co. Ltd. at Witton, England, which not only made the carbons for the Government's use for searchlights, etc., but also produced the Kinarko carbons for cinema projection purposes.

The latest firm to put down an all-British factory, making a large proportion of the carbons in use for the high intensity arc lamps, as used at the present time, are Messrs. Champion & Co. Ltd. whose famous brand of "Ship" carbons are now of world-wide reputation.

Although there have been many half-watt projection type incandescent lamps produced, the light from which has been greatly enhanced by the use of Mangin mirrors, these are only suitable for use where a short throw of picture is needed, and are used generally for home projection purposes.

With the advent of Talking Pictures the use of Arc Lamps with the noise of the spluttering carbons had to be abandoned, and high power incandescent lamps came into universal use for Studio lighting.

It was not until the numerous Theatres and Music Halls installed their own Electric Generating Plants, and the various Town Councils supplied Electricity from their mains, that electric light came into general use for projecting Moving Pictures. This could be said to have occurred about 1910 when the average maximum amount of current used was about 50 amperes, whilst today with the new high intensity ARCS 200 to 300 amperes are used, there being no limit to the candle power of the light required, for the extremely long distances the pictures have to be projected.

THE SUN AS AN ARTIST.

HOW THE CAMERA CAME INTO BEING AND WAS APPLIED
TO PHOTOGRAPHY AND KINEMATOGRAPHY.

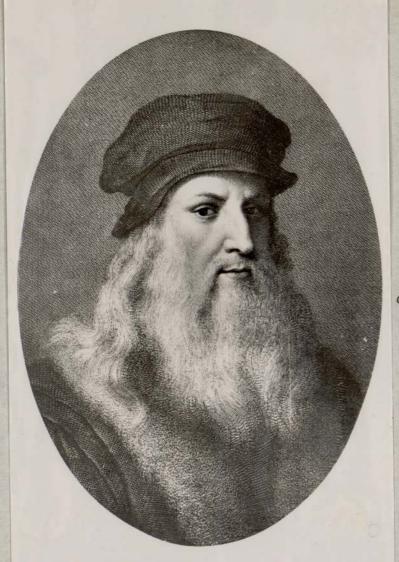
### CHAPTER No. 6.

Many of the earlier scientists gave a great amount of study and thought to the phenomenon of a reflected image and many writers give credit for the first description of the effects of the Camera Obscura to the learned English Monk, Roger Bacon in 1297. Levi Ben Gerson in a work translated in A.D. 1343, entitled "De Sinibas et Cordis" makes mention of the effects produced by the Camera Obscura.

The next genius to note and record many applications of the science of optics, was Leonardo-de-Vinci, who was a clever Painter, Philosopher, Mathematician and expert mechanic. To him should be given the credit of giving a clear and lucid explanation of the Camera Obscura in his book Trattato-della-Pittura written by him about 1470. Therein he gives a vivid description of the owner of a dog seeing his animal shown on the wall of a darkened room, being projected through a hole in the wall by the bright sunlight outside. He also compared the Camera Obscura to the human eye as he noted that all images were seen inverted, and suggested that perhaps the crystaline lens of the eye, re-inverted the image and that was the reason we saw objects in their correct position.

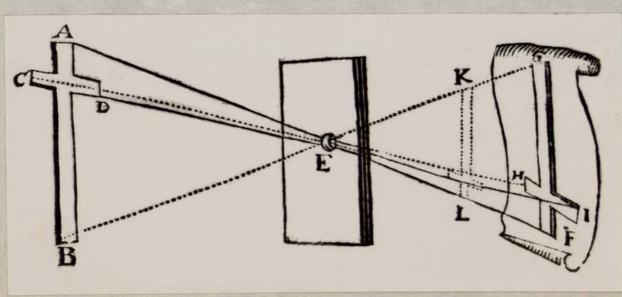
Here then we can say the actual seed was sown for the later growth of the Camera itself. Many writers followed Leonardode-Vinci and perhaps a short explanation of the Camera Obscura will prove of interest. One of the most popular forms of this instrument is that usually to be found at seaside resorts, exhibitions and similar gatherings. An old engraving printed in 1840 gives a very good description of a Camera Obscura as well as the drawing; therein it states, that it is of such simple construction as to be easily understood, and represents the objects subjected to it in all their vivid colours, with so unerring a fidelity, that it has always been a favourite amusement to view its varied and animating pictures. The engraving shows a circular room, into which the light penetrates only through a top opening, all the rest of the chamber being made light proof and quite dark. A small box like structure fitted with a lens in front and a mirror inclined at an angle of 90 degrees inside is fastened to rotate upon the top opening, and when directed towards a distant object or scene, it is reflected upon a white screen below prepared to receive it.

### Leonardi - da - Vinci



Opties + the Camera Camera Obsensa

From his book Trattata-Della-- Pitura



Camera Obsceva

This scene can then be viewed by all those assembled in the dark chamber to witness it. Now, if we imagine the dark chamber in the form of a box, and having a lens mounted in front, with a mirror inclined at an angle of 90 degrees inside at the back, and an opening cut in the top of the box directly over the mirror, with a sheet of ground glass placed thereon, we get a fair idea of the Camera Obscura in portable form, which was the actual forerunner of the present day Camera.

The first records of making the Camera Obscura into a separate form are given by Giovanni Baptista Porta in his book "Magica Naturalis" published at Frankfort in 1558. Therein he makes mention of a picture formed with a lens of convex formation, which gave an outline that was perfectly clear and distinct, and his explanation of the apparatus, when in use, might almost be likened to a motion picture entertainment, the following passage being an extract from his writings:-

"Nothing could be more pleasant for great men and scholars " and ingenious persons to behold that in a darkened chamber "by white sheets objected, one may see as charly and per-"spicuously as if they were before his eyes, hunting banquets, "armies of enemies, plays and all things that one desireth. "Let there be over against that Chamber where you desire to "represent these things, some spacious plain where the sun can "freely shine. Upon that you shall set trees in order, also "woods, mountains, rivers and animals that are really so or "made by art of wood, or some other matter, you must frame "little children in them, as we used to bring them in, when "comedies are acted, and you must counter feit, stags, boars, "rhinocerets, elephants, lions, and what other creatures you "desire, then by degrees they must appear coming out of their "dens, upon the plain. The hunter, he must come with his hun-"ting pole, nets and other necessaries that may represent "hunting. Let there be horns sounded, with trumpets and cornets " those that are in the chamber shall see trees, animals, hunters "faces and all the rest so plainly that they cannot tell whether "they be true or delusions. Swords shall be drawn and shall "glitter in at the hole, that they will make people afraid. I "have often showed this kind of spectacle to my friends, who "much admired it and took pleasure to see such deceit."

As previously stated the foregoing extract might almost be mistaken for the explanation of a moving picture with sound effects, only that it was written nearly 400 years ago.

There were many early makes of lens suitable for use with the Camera Obscura, and to get a replica of the scene, or image



PORTA.

29.5

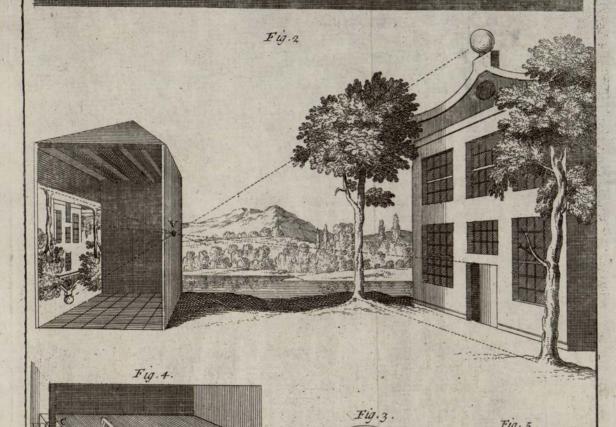


Fig. 1

shown upon the ground glass screen of the instrument, it was only necessary to place a piece of transparent paper over the glass and sketch the subject in. This method sufficed until the advent of Tom Wedgewood the clever son of Josiah Wedgewood, the well known potter, who in 1800 succeeded in obtaining a Sun Picture or Photogenic drawing, with the aid of common salt and silver nitrate, upon a sheet of paper, leather and other substances, when using the Camera Obscura, but although he could take the pictures, which were in reality photographs, he could not fix them, and he was unable to accomplish this all important process before he died, he death occurring while he was still quite a young man, at 35 years of age in 1805.

The next man to construct a camera for securing photographic pictures and portraits was Neicephore Neipce in France, whose process was taken up later by Daguerre, with whom he entered into a partnership; producing the wonderful single specimens of portraiture known as Daguerrotypes. The first man to really effect in a commercial form the transition from the Camera Obscura to the Camera proper was William Henry Fox-Talbot an Englishman of Laycock's Abbey, Wiltshire, who, in 1839 produced the first camera for commercial use and was the first man to produce a negative upon a glass plate from which any number of subsequent prints could be made. This was first called Calotype, afterwards being altered to Talbotype, being so named after its inventor.

Fox. Talbot's first cameras were constructed of mahogany and consisted of approximately a square box, with a focusing lens in a brass mount on the front, and a back opening which allowed of a glass screen being inserted for forcussing upon, this being withdrawn and a sensitized negative plate inserted in it's stead for receiving any image it was desirous to secure.

Many books were printed giving the fullest possible explanation of the marvellous invention Fox-Talbot had accomplished, and the magazine of science published in May 1840 gave a very explanatory and detailed article together with several actual reproductions of both negative and positive photogenic drawings as they were then termed. Thus it may be truthfully said, that William Henry Fox-Talbot was the first many to bring the photographic camera in to being.

One of the first men to manufacture and exploit the sale of cameras in England was Mr. Hamilton, who carried on a very comfortable business about 1845. Photography soon became a popular pastime, and it was not long before Mr. Hamilton was imitated by numerous makers of similar instruments all over the world. The evolution from still photographs to photographs apparently in motion, was quite a natural one,

more especially as Fox-Talbot claimed in his original patent to be able to accomplish this, but as he could not give proof of his ability to put his precept into practise, he was forced to delete this portion of his original claim for a patent. There were many enthusiasts who endeavoured to accomplish the invention that Fox-Talbot was forced to relinquish.

A Frenchman named Du-Mont in 1861 was granted a patent, in which he outlined the first principals of Chromo-Photography using a number of separate glass Negative Plates, dropped from a magazine above, into a receptable below, in a specially constructed camera.

Ducos-du-Hauron, a native of France applied for a patent in 1864 for the photographic reproduction of any scenes or objects with all the changes they may have undergone through a specified period of time. Although this invention has been cited in many famous law cases, the Patentee never completed his invention and the patent specification was never printed.

J. A. R. Rudge of Bath, England, began to take a keen interest in the recording of movement by photographic means when he was 25 years of age in 1863. Several attemps were made by this keen enthusiast and in 1868 he succeeded in securing a series of photographs taken in sequence, alternately, upon two circular glass plates, from which he printed two positives, and in a rather eleborate form of mechanical lantern slide, showed a zeries of life like movements upon the screen. This invention he completed in 1870 giving it the peculiar title of the Bio-Phantoscope.

Some years later he produced a machine somewhat nearer to a motion picture machine, which used seven glass slides shown in rapid sequence, enough to give a fair impression of a given phase of movement, such as man apparently taking his own head off his shoulders and placing it under his arm. It was these simple efforts that taught the original inventor and first patentee of Kinematography how to make a photograph live upon the screen.

Dr. Marey of Paris was also a great enthusiast in the pursuit of showing movement by photographic means and in 1868 with the aid of his clever mechanical engineer, Georges Demeney succeeded in making a camera somewhat akin to an ordinary whole plate studio camera fitted with a handle at the rear, which rotated a shutter to give a number of separate exposures upon a single glass plate, not in any sense a motion picture,



## Geovanni Baptista Porta

1601

THE

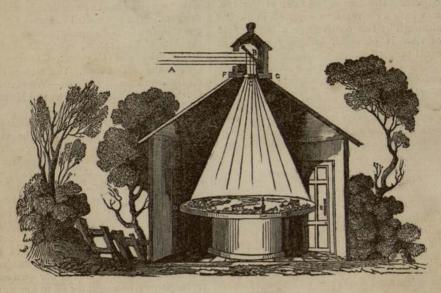
## MAGAZINE OF SCIENCE,

And School of Arts.

No. I.]

SATURDAY, APRIL 6, 1839.

[PRICE 11d.



THE CAMERA OBSCURA.

This instrument, the object of the above engraving, and present description, was invented by Friar Bacon more than five hundred years ago. It is of such simple construction as to be easily understood, and represents the objects subjected to it in all their vivid colors, and with so unerring a fidelity, that it has always been a favourite amusement to view its varied and animating pictures. The following is an explanation of its construction:—

The engraving represents a room, into which the light penetrates only through the top at C. The rays of light A, tinged with the color of the objects reflected, pass through a hole in the side of the upper part of the instrument, and strike upon the looking-glass or reflector B, from this they are cast down upon the double convex lens C, fixed in the cross partition F G—here they diverge in proportion to the focus of the lens, and passing onwards are last met by the white table below, D E, where the original objects are vividly depicted. The accuracy of proportion and truth of per-

spective will, however, not be ensured by a flat table, as will be evident upon considering that on a flat surface the rays of light passing through the lens will be shorter in the centre of the picture, than those that reach the sides, (as is seen in the figure;) in consequence, the representation will be somewhat distorted, and also more brilliant towards the centre than near the circumference of the field of view. To remedy this, two methods suggest themselves; one, to have the table D E part of a hollow sphere of a radius according to the distance of the lens. This arrangement has a serious objection in delineating the objects represented, because of the impossibility of laying a sheet of paper on a spherical body. An alteration, therefore, of the lens itself is the only remaining resource; if this, instead of being double convex, be a meniscus glass, (that is, like a watch glass, thick in the middle,) having its concave side next the object, and if radii of the two surfaces be as 1 to 2, the outer rays will be rendered longer than those near the centre, and by

[THIRD EDITION.]

this means the correctness and brilliancy of the picture will be greatly increased.

The upper part of the instrument is made to turn round upon a groove at F G, by which means the reflector may be directed to any side of the landscape; the reflector B is also moveable on a joint near the centre of its sides, like a dressing-glass, and thus it is made to reflect either distant or near objects. The hole in the side, at the top. may have a convex lens inserted in it, but although by this contrivance a larger field of view is obtained, brilliancy is lost in equal proportion.

The Camera Obscura has many modifications: the above construction may be adapted to a large conical box, there being one hole or more cut in the side of it, to view the objects represented on the table within; or it may be made still more easily in that form usually called a Portable Camera.

#### ADDRESS.

The increasing desire among all classes for rational and scientific amusement, induces the Proprietors to offer to the Public this cheap and useful publication.

It is not intended to interfere with any of the mechanical magazines which periodically issue from the press—its object being very different from theirs, and its design much greater and more comprehensive.

The intention is three-fold. First, to record, explain, and illustrate all useful discoveries made from time to time in the MECHANICAL and PHYSICAL SCIENCES, and

MECHANICAL and PHYSICAL SCIENCES, and to give full and accurate descriptions of all new and interesting Philosophical Apparatus and Experiments. Besides which this part of the work will contain critical and popular Papers on every division of Natural Philosophy and Chemistry, Electricity, Galvanism, Magnetism, Electro and Thermo-Magnetism, will meet with especial attention; and here we flatter ourselves we have some strength of experience and correspondence.

ASTRONOMY, particularly in the making of Illustrative Apparatus—an account of which is given in no work whatever.

OPTICS and OPTICAL INSTRUMENTS, with the recent improvements and discoveries in MICROSCOPIC SCIENCE, now of such paramount value in understanding the works of nature. That new and wonderful Science, the POLARIZATION OF LIGHT, will receive adequate illustration, as well as the valuable

Sciences of Mechanics, Hydrostatics, Hydraulics, and Pneumatics, with their application to Manufactures, to Locomotion,

and to the Steam Engine.

Secondly. — Our intention is to supply what we have long considered to be much wanted, a School of Arts, or a manual of the processes of manufacture and of manipulation, employed in the Fine and Ornamental Arts, as well as in the more strictly scientific subjects. Thus we shall endeavour to give plain instructions to perform with success the Arts of Metal and Wood Engraving, Modelling and Casting, Carving and Ornamental Turning. The various styles of Drawing and Painting—Working in Glassand Japanning—Buhl and Mother-of-Pearl Work, &c. &c.

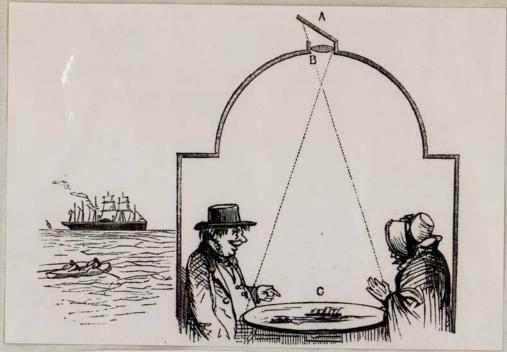
NATURAL HISTORY, though forming no essential part of our plan, will not be wholly neglected. It will, indeed, be necessary to allude to many natural objects when treating of the Microscope. Also, the collecting, the preservation, &c., of ANIMALS and PLANTS, as well as the cleaning and beautifying Shells and Minerals, will legitimately come witthin the class of the Ornamental Arts. Beyond this, we cannot at present, promise-unless, indeed, to give from time to time such short and incidental notices of the productions of our own country, as it may be useful for all to know, and others, which do not interfere with the more immediate objects of our Publication.

Thirdly —To give a CRITICAL REVIEW of such New Publications on Science and Art, as fall under our notice, that the student shall have a guide to his choice of books, and that the stranger at a distance may learn

what to purchase with advantage.

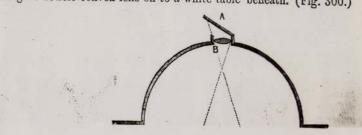
Thus we hope to enlist among our readers every class of persons. The gentleman who employs his leisure hours in works of genius or fancy, equally with the artizan who lives by his manual dexterity-the lecturer who explains the intricacies of science, and the student who is but entering its intricate paths-begging to assure them all, that what will be offered as original is mostly the result of long experience, and what is taken from others shall be only from the most authentic sources. We shall be especially solicitous that nothing trivial or incorrect be presented to our readers at any time; for, however much we may endeavour to render a subject familiar, (and this we always intend to do,) we shall still examine the mathematical principles upon which it depends, and the philosophical facts connected with it, and where tests like thes

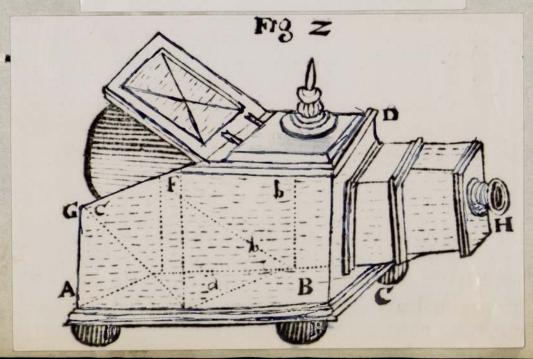
## Camera Olescura



### V. The Camera Obscura.

A "dark chamber" is the name of a most amusing, and now, in the proved form, extremely valuable instrument for photographic purposes. It is occasionally to be met with in public gardens, and there is a very good one on the Hoe at Plymouth. The construction of the camera for observing the surrounding country is very simple, and merely consists of a flat mirror placed at an angle, by which the picture is reflected through a double-convex lens on to a white table beneath. (Fig. 300.)





as his efforts were all diagramatic. Marey did eventually succeed in producing a Moving Picture Camera in 1886, with which he took a sequence of pictures of the Champs Elysees in Paris calling this his Chrono Photography, but this was on a strip of celluloid 1/32nd of an inch in thickness. This same genius was the first man to secure ultra rapid photographs up to 10,000 per second.

The first man to construct and patent a camera to take a sequence of photographs in rapid succession upon a band of celluloid film using one lens, and taken from a single view point was William Friese-Greene a native of Bristol, England. This wonderful invention he accomplished after many failures in 1889. The camera was in the form of an oblong box, somewhat in appearance like the early magazine cameras placed upon the market by George Eastman. The mechanism was of a peculiar type being fitted with feed and takenoff sprockets and a long Presser Arm to push the film into a loop, sufficient for each Photograph, and although this first camera was lost to posterity the actual films taken with it still remain.

Augustin-Le Prince also succeeded in taking a series of pictures in rapid sequence in 1888 but as his patent specification only mentions the use of gelatine fitted in fibre holders, it could hardly be calimed that this was a commercial form of Kinematography.

Thomas Alva Edison has ever been put forward as the inventor of moving pictures as we know them today. If we take the actual facts and look into this matter thoroughly, we find Edison did not patent his Kinetoscope which was the first instrument he produced, until 1891 and then only in America, thus the credit for making and using the first perfect camera using celluloid film must be accorded to William Friese-Greene, a native of Bristol, England.

## TRAPPING A SHADOW. THE INVENTION OF PHOTOGRAPHYAND KINEMATOGRAPHY.

### CHAPTER No. 7.

If the story of the invention of the reproduction of a scene of the portrait of a person by photographic means were fully told, it could quite easily be made to fill a work of several volumes, but as my object in this instance is to be as brief as possible, I shall content myself by giving an explanation of the more principle inventions relative to the birth of the photographic art.

The Camera Obscura was the first instrument to be constructed to reflect an image upon a screen of ground glass, thus condensing a scene of any magnitude into a small focus or picture. The alchemists practising in the sixteenth century found by exposing a solution of white chloride of silver, mixed with chalk; to the sun that it very quickly oxydized, and was turned into black oxide of silver.

Few of the thousands of people who gaze daily at the huge bottles of coloured fluid seen in a chemists shop, connect these emblems of the past with the invention of Photography, yet such is a fact. The Alchemists used to fill these glass bottles with white chloride of silver, and hang a cross or a crescent in front of the bottle, which of course excluded the sun's rays from penetrating at that particular spot, and great was the mystification and amazement of the uninitiated and credulous people, when they were shown the silver pattern of the cross or crescent, which had remained unchanged, whilst the rest of the surrounding solution had turned black.

More than two centuries elapsed before this chemical transformation was put to a practical use. The first claim made for the invention of using this knowledge was by a German, Dr. John Hermaun Schulze, who cut various stencil patterns from opaque paper, and reproduced those patterns upon the surface of a bottle of silver nitrate and chalk.

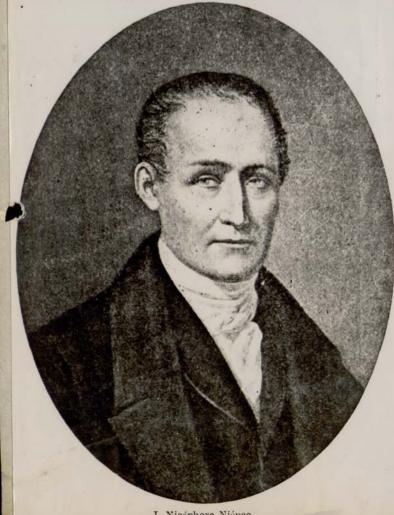
In a paper written by Schultze in 1727 he only states that he used this method to determine the action of light upon his silver nitrate mixture, he does not lay claim to have applied this knowledge to any other purpose.

A Sweedish Chemist named Scheele next took the experiment a step farther forward, as he coated some pieces of paper with silver nitrate, and chloride of sodium in combination, and Wanted Photos of Daguerres apparatus also Jon Talloto Cameras and other early Cameras.

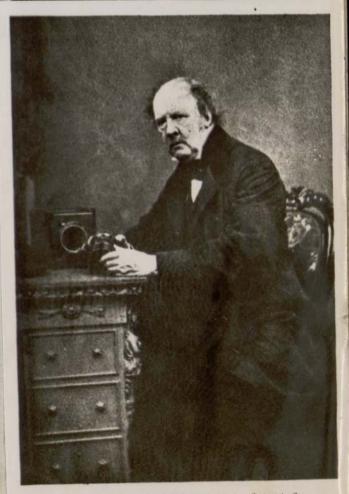
Som Wedgewood Photography Daguerre







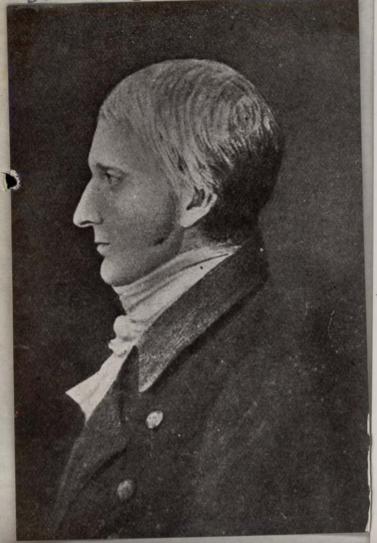
J. Nicéphore Niépce.



WILLIAM HENRY FOX-TALBOT. \*1800+1877 From a photograph by Moffat, Edinburgh

Som Wedgewood Photography

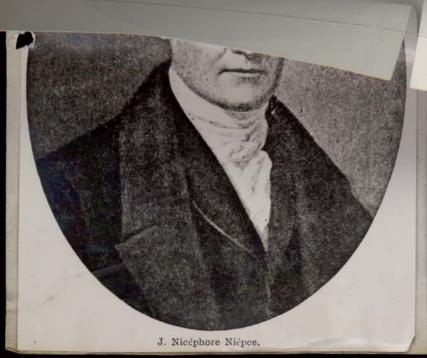
Daguerre





1.. J. M. DAGUERRE. \*1787+1881

From a daguerreotype by Charles Meade. 1848 (usually erroneously ascribed to Mayall)





WILLIAM HENRY FOX-TALBOT. \*1800+1877 From a photograph by Moffat, Edinburgh

placed his cut figures upon the surface of his sensitized paer, when, upon exposure to the sun, the portion covered by his paper patterns remained unchanged, whilst the surrounding surface had turned blac.

In 1777 Scheele discovered that the blackening process of the Silver Nitrate, was due to the reducing power of light, and that the black deposit was reduced silver. This is precisely the same effect as the action of light, passing through the various densities of the photographic negative that produces the beautiful photographic prints now so readily obtained. In this work accomplished by Scheele, we therefore have the germ of the birth of the great art of photography. The germ thus discovered was quickly followed up by others, Mr. Senebier and John W. Ritter corroborated Scheeles experiments, and made further observations of their own.

In 1798 Count Rumford carried out many experiments with Chloride of Gold, the results of which were used later to increase the surface brilliancy of Daguerrotype Photographs.

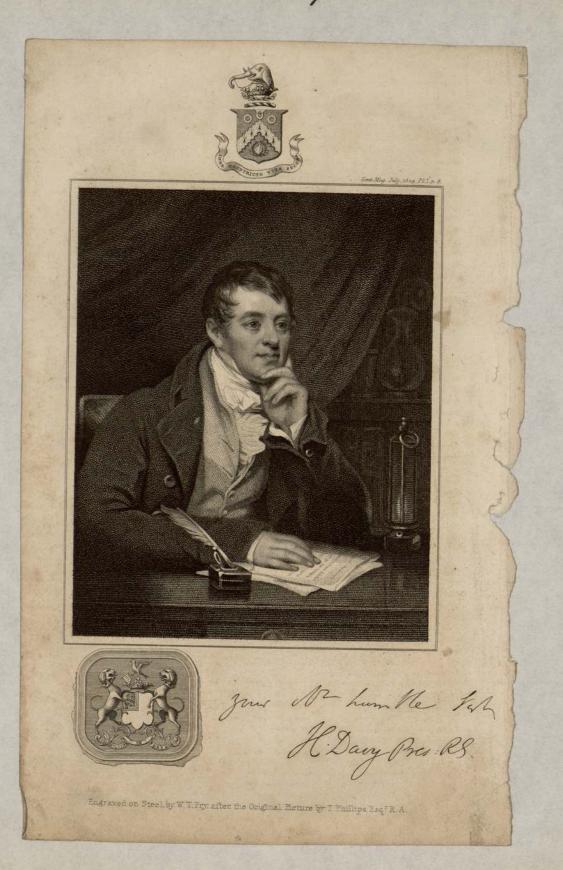
In 1800 Dr. Herschell published his memoirs on the heating power of the Solar Spectrum, the result of which was the adoption of the use of yellow or ruby glass as a safe light in the dark room.

The credit for the first invention for recording the action of light, to retain by the aid of chemicals, the shapes of objects and scenes upon leather, paper and other substances, must undoubtedly be given to our Englishman, Mr. Thomas wedwood, the fourth son of Josial Wedwood, the famous potter, who commenced his experiements with the effects of light upon various chemical compounds in 1792. With the aid of a Camera Obscura in box form, he succeeded in securing photographic images or as he called them, Sun Pictures, and a letter written by him upon his experiments to James Watt in November 18th 1800, fully confirms this statement.

Tom Wedgwood used for his experiments, several different substances, and found, for many of his best results that leather and paper were ideal, in securing images of the various objects he desired to make into his sun pictures. He first coated the leather or paper with a solution of common salt, afterwards dipping the surfaces so prepared in a solution of silver nitrate, which upon being exposed to brilliant sunlight in his Camera Obscura, received an image.

Although he was suggessful in securing the image, he was unable to fix it, with the result, that upon exposure to light,

# Sie Humphrey Dayy. assisted Tom Wedgewood



Drawing of alchemist

it at once faded and turned black. He took into his confidence Sir Humphrey pavy, and through his kind offices wrote an article upon his discoveries, which was published in the first volume of the journal of the Royal Institution in June 1802, which appeared under the following heading:-

An account of copying paintings upon glass and of making profiles by the agency of light upon nitrate of silver. Invented by T. Wedgwood, Esq. with observations by H. Davy.

One passage in the article is significant of the success of his experiments as it states:-

That a white surface is covered with a solution of nitrate of silver......and when a shadow of any figure is thrown upon the prepared surface, the part concealed by it remains white, and the other parts speedily become dark.

Thus, under this somewhat peculiar title, can photography justly and truly claim to have received its birth. One is apt to pause and wonder what Tom Wedgwood would have given for a handful of hyposulphite of Soda, with the knowledge of its use as a fixing agent, as this would have given to the world the perfection of the art of photography, in which he had achieved so much, but was destined never to complete. Tom Wedgwood died three years after the publication of this paper, without recording any further developments of his invention in 1805, when only 35 years of age, having been an invalid all his life.

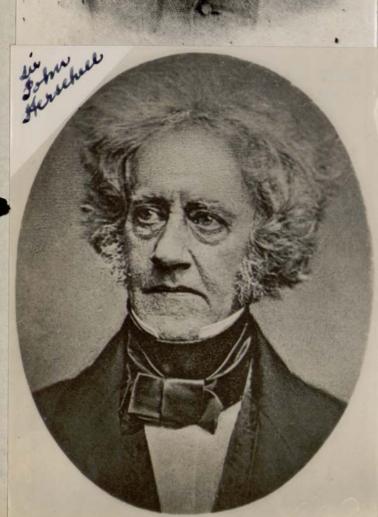
A rather amusing incident is recorded of his experiments by his wife, who could not understand why she was always losing her white kid dress gloves, which were worn at that period, up the full length of the arm, until, happening to enter his laboratory unexpectedly she caught him in the act of cutting up a new pair of gloves purchased by her the previous day, which he told her gave him better results than any other medium he had tried. This was explained, although unknown to Tom Wedgwood, by the fact that they contained tannic acid, which afterwards proved such a valuable agent in the photographic art.

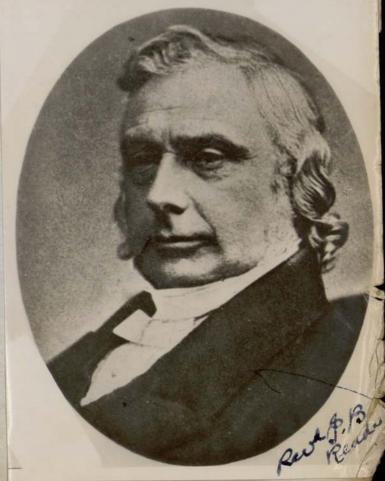
In 1810 Dr. Seeback of Jena carried out many experiments with light which may be said to have laid down the basic principles for colour photography to follow. In France a claim was put forward that Professor Charles had used a paper which was sensitive to the action of light in the eighteenth

# Photography

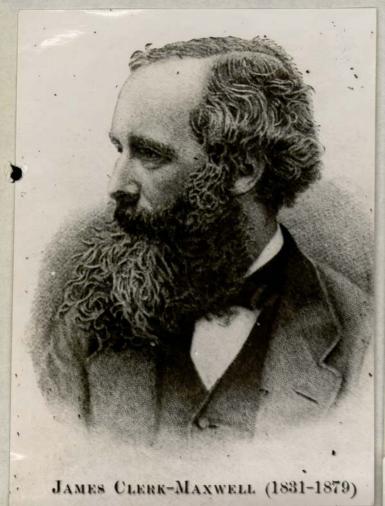




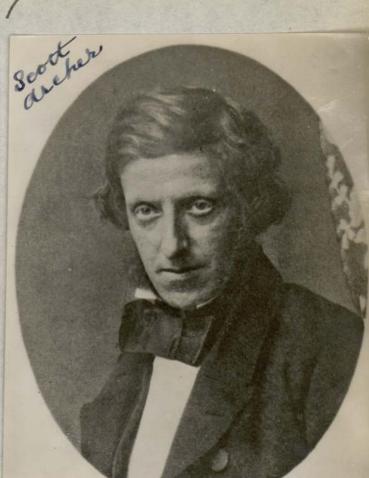


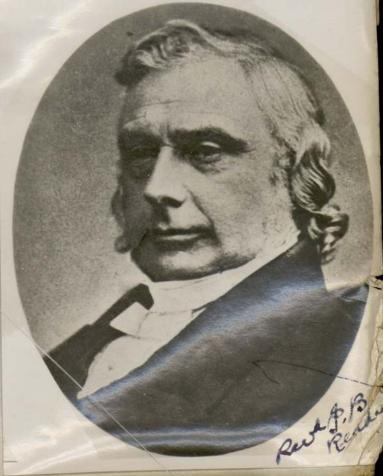


# Photography









century, but there is not anything to substantiate such a claim, and therefore, the credit must remain with Tom Wedgwood.

The year 1814 is a memorable one, as it saw the entry of Joseph Neicephore Neipce into the active field of photographic experimenting. He was a native of France, being born at Gras near Chalons-Sur-Saone not far from Dijon, and he carried out a vast amount of research with the aid of various resins, with the definite object of securing and retaining in a permanent state pictures produced in the Camera Obscura.

In the year 1824 Louis Jacques Maude Daguerre, a scenic painter, and proprietor of a large Diorama in Paris, also carried out numerous experiments of a similar nature, although neither knew each other, or had any knowledge of the experiments they were conducting. In the year 1826 these two enthusiasts were introduced to each other and after comparing the results that had been achieved, they expressed their mutual admiration for the work each had accomplished, in their efforts to secure a permanent photographic image, resulting eventually in a deed of partnership being drawn up between them in 1829.

In 1827 Niecephore Neipce visited England and in December of that year showed several pictures he had produced upon metal plates to the members of the Royal Society. Some of these were etchings, which had been subjected to an acid process, after the design had first been impressed by the action of light, and several of these original speciments are still to be seen in the British Museum, the name given to them by their inventor being "Heliography". Neipce met with much disappointment in England as the Royal Society refused to receive his invention as a secret, he therefore returned to France very disconsolate.

In 1829 Niepce had perfected his process of photo etching by coating a metal plate with bitumen, which he exposed to the light, beneath one of his transparent engravings. Where the light passed through the transparency and acted upon the bitumen, the latter became changed in its solubility, and no longer dissolved readily when sprayed with oil of lavender, with the result that the unaltered bitumen left the design of the engraving in unaltered resin.

Neither Niepce or Daguerre did a great deal of work during their partnership agreement, as it was always Neipce's idea to perfect his process to produce a humber of copies from an original, whereas Daguerre, always asserted that it was

## MAGAZINE OF SCIENCE,

And School of Arts.

No. V.]

SATURDAY, MAY 4, 1839.

[PRICE 11d.



ERITH CHURCH, KENT.



FAC-SIMILE OF PHOTOGENIC DRAWING.

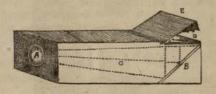
#### PHOTOGENIC DRAWING.

(Resumed from No. 4, Page 28.)

WE have hitherto considered this art as applicable only to the delineation of flat and trivial objects, and as rather conducive to amusement than utility; but as paper acts not only by direct but reflected light, it may be made subservient to much more important uses, by the asssistance of such lenses and mirrors as reflect the images given to natural objects upon a screen or medium. chief instruments of this character are the camera obscura and the solar microscope. The former is applicable to take views of scenery, equally with small objects, and to diminish the view according to the desire of the operator, by removing the camera more or less distant from the object represented-or by using another camera with a

lens of longer focus.

We have already described this instrument at page 1: but to make the construction of it more clear, the following is a figure of the box or portable camera obscura, described at bace 12 in which A is the doubly convex lens, the rays of light C passing from the object, through the lens to the plain reflector or looking glass B. Here they are cast upwards to the under side of the piece of ground glass, placed at D, upon the upper side of which the picture is seen, and E is the moveable flap or shutter of wood, used to shut off extraneous light. When used in ordinary circumstances the doubly convex lens may be ten or twelve inches focus, but for photogenic purposes the focus should not be more than six inches, the whole box being so much the shorter. The ground glass medium should be removed, and a pane of unground or common glass be put in its place; if also the lens be fitted into a sliding tube, as in the magic lanthorn, it will be a much superior instrument, as then the focus can be so well adjusted.



To take a prospect, &c., on photogenic paper.—Point the portable camera towards the required view or object, and place a piece of the paper (prepared side downwards) upon the glass where the picture is seen, and immediately shut down the upper flap close upon it. In half-an-hour the color of the paper will be changed, in proportion to the strength of the light passing through the instrument upon it, and thus a delineation of surrounding objects be obtained, though of course the lights and shadows seen in the original will be reversed in the picture.

To take a microscopic object. — Place a piece of very sensitive paper, a short distance, (as eight or ten inches) from the object glass of a solar microscope; in a few minutes any object placed in the usual situation of the instrument will be depicted on the paper placed to receive it, and will be seen with infinitely greater exactitude than the most expert draughtsman can depict it. With the oxy-hydrogen microscope from ten to twenty minutes are necessary to produce the requisite effect.

To fix the Drawings.—To do this with certainty is most difficult. Mr. Talbot says that to dip the drawings into a saturated solution of salt and water is sufficient to fix them, that is, to prevent change when the finished drawings should afterwards be subjected to light. This receipt may succeed occasionally, but it does not always, though certainly it retards, at all times, further discoloration.

Iodide of potassium, or as it is more frequently called, hydriodate of potass, dissolved in water, and very much diluted, is a more useful preparation to wash the drawings with —it must be used very weak, or it will not only dissolve the unchanged muriate as is intended, but the blackened oxide also, and the drawing be thereby spoiled.

The most certain material to be used is one of the hyposulphites, as proposed by Sir W. Herschell, who, very many years since, showed the peculiar effects of these salts in decomposing the nitrate, muriate, and carbonate of silver. Washing the photogenic drawing with a solution of hyposulphite of soda, no matter as to the strength of the solution, the muriate which lies upon the lighter parts of it will become altered so much in their nature as to become unalterable to light, while the rest remains dark as before.

Before using either of these preparations for fixing the drawings they should be soaked for a minute or two in hot water, which of itself removes a large portion of the muriate of silver that is to be got rid of.

Suppose the drawings when taken are to be seen only by candlelight, or are required only to put in a portfolio, that they may be sent to a distant place, no preserving preparation will be necessary; thus travellers need not trouble themselves to wash their pictures, till at a future time when they may

have greater leisure.

Application .- Mr. Talbot has recorded so many applications of his process that little can be added to his list. The first advantage which he alludes to is taking of portraits or silhouettes, by means of the shadow thrown upon the paper by the living face. Second—the copying of paintings on glass by the light thrown through them on the prepared paper. It may be remarked that the effect in this case is very singular, as may be tried with a magic lanthorn slider, for as some of the colors intercept the violet rays of light, the effect produced is often contrary to that expected; for example, if a part of the glass be yellow, as this is the lightest color, we might suppose the paper beneath would become very dark, but in truth the paper beneath, will scarcely be changed at all, for the yellow glass will intercept all the violet rays. another imitation is that of etchings; this was suggested by Mr. Havell, and since claimed also by Mr. Talbot. This is done by painting a piece of glass with a thick coat of white oil paint; when dry with the point of a needle lines or scratches are to be made through the white lead ground, so as to lay the glass bare, this being done, place the glass upon a piece of the paper, and of course every line will be represented beneath of a black color, and thus an imitation etching will be produced. This has been thought by some a valuable discovery, how can it be so, when with precisely the same skill and labour a real etching on copper or steel can be prepared, and may be printed afterwards infinitely cheaper than the mere cost of the photogenic paper.

Fourthly-Microscopic objects, and here the art is indeed valuable; Mr. Talbot truly says, "The objects which the microscope unfolds to our view, curious and wonderful as they are, are often singularly complicated. The eye indeed may comprehend the whole which is presented to it in the field of view, but the powers of the pencil fail to express these minutiæ of nature in their innumera-What artist could have skill ble details. or patience enough to copy them? Or granting that he could do so, must it not be at the expense of much most valuable time, which might be most usefully employed?" Fifthly—the delineation of architecture, sculpture, landscapes, and external nature. Sixthly - the copying of engravings and

the tracing of various flat objects, such as the plants in an herbarium, pattern of various tissues and fabrics, and many other things incidentally alluded to in these papers; and taking into account the discovery of Mr. Francis (whose plates adorn our present number) of forming these various objects at once upon box wood, as described in our last, we cannot but conclude that notwithstanding the uncertainty there exists in the effect of the process, the dimness of the copies, and the difficulty of fixing properly what has been obtained, that in a short period, this art uncertain as it at present is, and as all infant arts must be, will soon arrive at a degree of certainty and perfection, which will render it of the utmost consequence to the artist, the traveller, and the naturalist; more especially as all the philosophers and chemists of our own country, of France, and of Germany, have their attention so forcibly drawn to the subject, in hopes of explaining the still more important discoveries of M. Daguerre, who produces pictures in their proper lights and shadows, and the valuable process of M. Neipce, who could, even many years ago, impress them at once upon a copper plate, engraving them there, in all their beauty, and with scarcely any expenditure of either money, time, or talents.

(Continued on page 59.)

#### REPRODUCTION OF STATUARY.

A French Artist, M. Colas, has found the means of applying to sculpture a process which has much connection with M. Daguerre's invention. By this contrivance the Venus of Milo, for instance, is identically re-produced in all its dimensions, from the original size of the statue to the statuette of three feet, an inch, or even six lines; and moreover, it may be done in marble, stone, ivory, wood, alabaster, &c. M. Colas's process employs the hardest as well as the softest substances, and his copies of statues and bas-reliefs are so complete that the imperceptible alterations of the marble worn by time are exactly re-produced.

MAGIC LANTHORN AND PHANTASMAGORIA.

(Resumed from No. 3, page 18.)

Screens and Media.—For receiving the images cast by the common magic lanthorn, which are viewed on the side of the medium upon which they are cast, little difficulty can

stop

be found, it being only required white and smooth. Thus a clean-washed sheet, stretched tightly upon a wall answers the purpose well, or could a room be devoted to the purpose of exhibition, as at public institutions, the whitened wall itself is an appropriate object screen, whether painted in water or turpentine (oil is improper as it produces a glossy surface.) This kind of screen is best adapted to exhibit the solar, lunar, and oxy-hydrogen microscope, and is

that employed for the purpose.

For the use of the Phantasmagorial Lanthorn a transparent screen is necessary, because it is placed between the spectator and the lanthorn, the objects being thrown upon one side of the screen and seen through it on the other. It is therefore to be so far transparent as to permit the colors and form of the objects to be seen perfectly and distinetly, yet not so much as to show the brilliant spot of light which the lens of the lanthorn casts. In other words, it should be of such a nature that if you look at a candle through it, you may see a diffused light but not the flame itself. There is but one common substance which will fulfil this condition, and this is tissue paper in its usual state. Some persons have advised to oil the paper, but it then becomes too transparent. Others have recommended muslin wetted, and indeed it makes a tolerably good medium, but by no means equal to the tissue paper, though its greater strength of texture renders it available in circumstances where paper would be inconvenient. Mr. Childe uses waxed muslin when exhibiting his "Dissolving Views" at the theatres, but the astronomical lecturers commonly employ paper in preference.

Another sort of medium was once used, and to the effect of which we are indebted for the Phantasmagoria itself. This instrument was used in the first instance rather to inspire terror than to excite mirth, and the principle upon which it acts is but a modification of the ancient method of using the Magic Lanthorn, which also once was an apparatus used for the worst purposes of superstition and trickery. Its images were usually thrown upon smoke rising from a chafing dish, and when the image was terrific, the apartment cold and gloomy, the air redolent with essences, and the mind of the spectator previously prepared to witness a miracle, we cannot be surprised that such an exhibition worked intensely upon the imagination, and that the Magic Lanthorn was a powerful instrument in the hands of

the crafty and the designing.

It is obvious that no rules can possibly be given to teach the artistical part of painting: a knowledge of effect—of perspective—of

Painting the Sliders .- Few instructions can be given upon this part of the subject beyond the mere naming of materials, these are few and easily procured. The brushes to be used are common hair pencils, which may be cleaned from time to time with turpentine. All the colors must be transparent, carmine and lake, Prussian blue, Indian yellow, burnt sienna, burnt umber, and verdigris, are the colors most employed for the pictures. They are ground in oil, as sold in bladders by the artists' colormen, and mixed before using with mastic varnish, which dries quickly and is colorless; white is produced by leaving certain parts of the figure entirely without color, that the light may have no impediment in passing through. The half colors are produced by a proper mixture of red, blue, and yellow; thus purple by uniting blue and red, orange by red and yellow, &c. The shadows may be managed by a stronger tint of the proper color, or else by brown or blue, according to the effect required. The outlines of the figures also may be made first by a fine camel-hair pencil, dipped in black color. In painting slides, the chief rule to be observed, is, to allow properly for the change of color produced by the light itself, which has a tendency to cast a yellowish tint upon every part, and thus, paintings that appear in proper colors by daylight, will often fail when illuminated by candles or a lamp: the color of the sky, therefore, must be painted of a moderately dark blue, the trees, grass, &c., of a bluish green, the reds, never shaded, with blue, and purple used very sparingly; for the blue and red, which produces this color being united to the yellow light, form the mixture called neutral tint, a color that is dull and heavy for this purpose. The use also of opaque colors, even in producing shadows or tints is carefully avoided, thus, white lead must never be used, either alone. or in combination. It is sometimes desirable to remove a part that has been painted, after it has become dry, this may be easily done by a penknife point, and in those slides which show clear lines on a dark ground, as in astronomical diagrams, the effect is produced by painting the whole black, suffering it-to dry thoroughly, and then scratching the lines through the black ground with a needle or other point; should the lines, thus made, be desired of any certain color, it is only requisite to paint them with the proper tint, after being scratched through.

graphic processes, such as carbon, gum bichromate, and collotype.

During the present year the museum of this Society has had presented to it by Miss Talbot an extremely interesting collection of the apparatus and results illustrating the various phases of the work of her grandfather. This was formally handed over to the Society on July 8th, on the occasion of the visit to Lacock Abbey



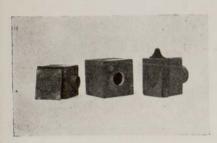
FIG. I.



FIG. 2.

of the Members of the Photographic Convention of the United Kingdom, and I feel sure that I am voicing the opinion of not only the Council, but of the general

and also his solar microscope (Fig. 2), both of which played a prominent part in his initial work. Various experimental cameras for the production of prints upon paper (Fig. 3); cameras in which to ensure correct focus—spyholes blocked with



F.G. 3

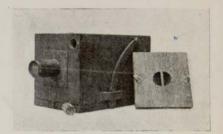


FIG. 4.

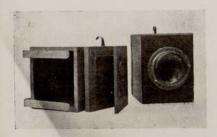


FIG. 5.

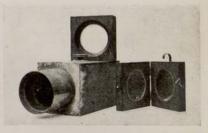


FIG. 6.

corks are provided in the front panels—(Fig. 4); a camera with arrangements for taking a picture upon a saucer-shaped sheet of paper, so as to correct spherica aberration in the lens (Fig. 6). These, amongst others, will well repay the

better to secure one perfect result, rather than a number of inferior copies. Many experiments were subsequently carried out, with the final result of the very beautiful Daguerrotype Photographs which were produced by this process.

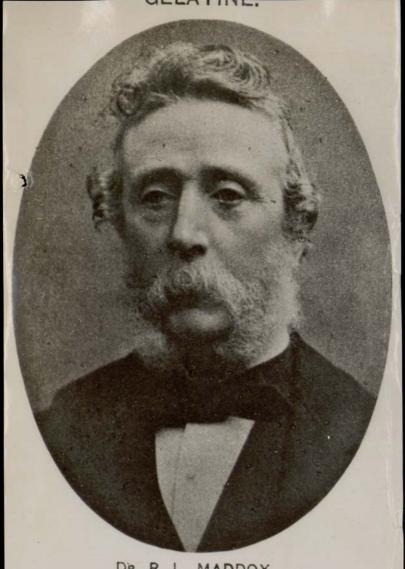
On the death of Niepce in 1833, Daguerre entered into an agreement with his son, and they continued together until 1839, when they agreed to disclose full particulars of their secret process to the French Academy of Science, which they accordingly did, receiving a substantial pension from the French Government for so doing.

In the year 1839 Mr. Goddard invented the Petzval system of Lens, which reduced the very long time of exposure necessary to secure a Daguerrotype photo, to half, which meant that instead of a person sitting for anything from half to three quarters of an hour in a good light, the same results were achieved in fifteen minutes. Compare this with the speed of today when 100,000 photos can be taken per second.

It was in 1839 that Sir John Herschel published a paper, explaining the use of hyposulphite of soda as a fixing agent, which had also been used by Daguerre. To return to the British school of Photography, there is no doubt that the success of Daguerrotype Portraiture gave a stimulus to other inventors, and in 1833 we find that William Henry Fox Talbot of Lacock Abbey, Wiltshire commenced to experiment with the applications of the Camera Obscura.

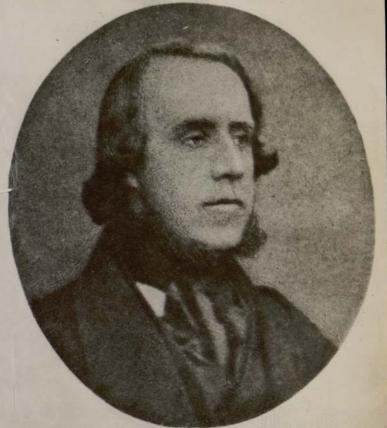
He first used this whilst on holiday in Italy for sketching purposes, but being dissatisfied with the results obtained, he made it his endeavour to attempt to secure the picture exactly as shown on the glass screen. After two years close application, he at last achieved success, being mentioned by Dri Farraday at the Royal Institution on January 25th.1839, thus preparing the way for Fox-Talbot to give a paper in person which he did explaining his wonderful discoveries a few days later.

In referring to a scientific magazine published in 1840, we find Fox-Talbot's invention referred to as Photogenic Drawings, and although no particulars of the process were divulged, it was made quite clear that he had definitely succeeded in making his results permanent. His process consisted of first placing a sheet of paper in a strong

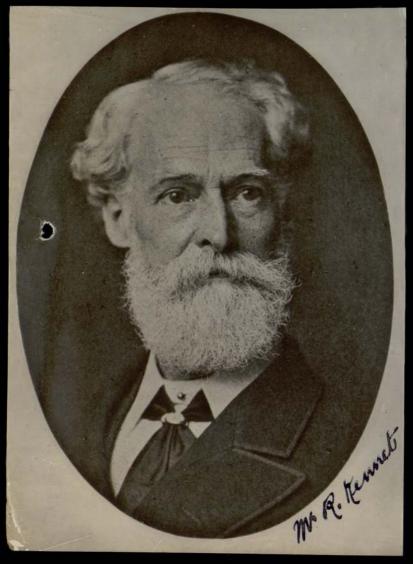


DR. R. L. MADDOX.

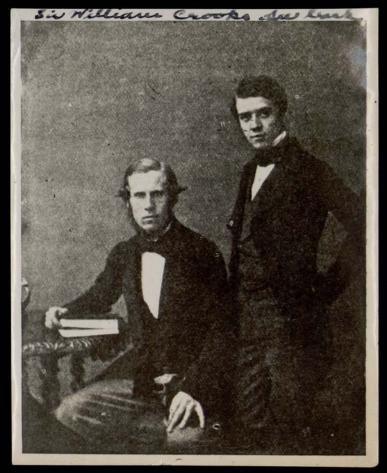
### John Frederick Goddard



John Frederick Goddard



R. Termett



Sie William Prooks keated and Mr John Apiller about 1855 from a print by R.C Marsey solution of salt and after allowing this to dry, to immerse the paper in a bath of silver nitrate. The fixing agent was mentioned as potassium iodide, or common salt, which was used to remove any excess of silver nitrate, and proved quite effectual for the purpose.

The whole process of Talbotype differed entirely from that of Daguerre, whereas the former method was the first to produce a negative on paper from which any desired number of prints could be obtained, the latter only produced one single photograph, which it was impossible to duplicate. Thus was commercial photography brought into being, and Fox-Talbot also explained his process further, by stating how it would also act on a copper plate, wood blocks, etc. which gave the printer a long sought medium, whereby a vast number of prints could be produced in a very short period of time.

The advent of Fox-Talbot's photographic process, soon induced a large number of others to carry out further experiments and the Revd. J.B. Reade made a very remarkable discovery which did a great deal towards furthering the science; when he applied tannic acid as an accelerator, and hyposulphite of soda as a fixing agent, he was also the first inventor to obtain an ineffacable photograph upon paper, which placed his name upon the roll of fame as having accomplished a wonderful invention, that did much to give perfection to the art of photography.

The Revd. J.B. Reade also produced paper negatives by means of gallic acid and nitrate of silver in 1837, a process that Fox-Talbot patented in 1841. It is interesting to recall the original invention by Tom Wedgwood, who used leather gloves to produce his best results, this led the Revd. J.B. Reade to conduct experiments in this direction, and he quickly discovered that tanned paper and silver was far more sensitive to light than ordinary paper coated with nitrate of silver.

On June 10th 1841 Fox-Talbot gave a paper before the Royal Society describing in full his latest process which he called "Calotype" although the name "Talbotype" had been suggested by no less a personage than Sir David Brewster. This process he patented, and granted licenses for the use of it. From Calotype paper negatives, prints could also be made upon the same paper using the ordinary printing method usually employed.

Several influential gentlemen suggested to Fox-Talbot that if he relinquished his rights to his photographic processes, which they argued should be for the benefit of mankind in general, it might be within the bounds of possibility that a baronetry would be offered to him, and a paper was prepared and sent round to several of the leading members of the Royal Society to sign, but when Michael Faraday was asked to put his signature to the document, he flatly refused to have anything to do with it, stating that he did not hold with anyone who patented scientific discoveries.

In 1852 Fox-Talbot discovered the gelatine process which in its day played such a large part in the rapid production of illustrations for newspapers and periodicals, and he showed how a mixture of bichromate and gelatine when exposed to light became insoluble in water, almost identical with the Photogravure process still in use. Fox-Talbot fought many law actions in endeavouring to uphold his patents, which made him extremely unpopular, and he certainly did not appear to have made much money from the various processes he produced, his later hobbies in life were the collection of antiques, and the translation of Assyrian inscriptions, he died September 17th 1877.

Sir John Herschel in 1839 read several papers before the Royal Society describing various methods he had evolved for use in Photography, and in 1840 he described a method showing how a silver print could be bleached by Chloride of Mercury, he also invented the Ferro-Prussiate or famous blue print paper, a process so largely used at the present time for the copying of plans and drawings. Perhaps the greatest boon ever conferred upon the photographic industry was his invention of the glass photographic negative plate. Up till this time, all negatives were produced upon transparent paper, so it can be readily understood when Sir John Herschell made known his discovery in 1839 how it was received with acclamation by the whole photographic world, as being the most revolutionary invention connected with the science.

In 1850 Alphonse Louis Poitevin introduced gelatine as a medium to carry the sensitive silver salts upon a glass plate. The name of Mons Hippolyte Bayard will ever be remembered as an extremely clever French Inventor, which added many new charms to the art, and was honoured by being elected secretary to the French Photographic Society as a mark of the esteem in which he was held by his countrymen.

In 1839 Mungo Ponton invented his Bichromate of Potash paper. The discovery of Collodion as a medium to carry the silver salts was perhaps one of the greatest factors in advancing photography ever known. This was the invention of Messrs. Schonbien and Bottger, two swiss chemists of Basle who in 1846 used the name pyroxiline for their discovery, this was greatly improved upon



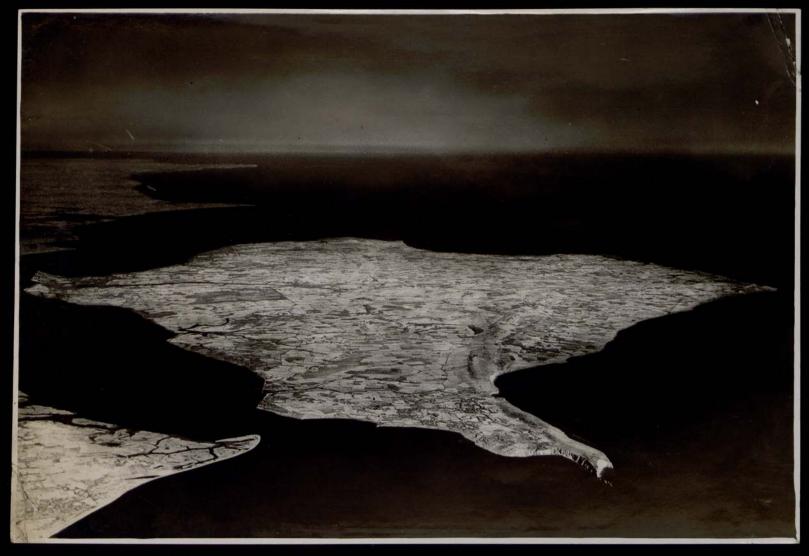
Tel.: CENTRAL 2001 (17 lines) Extension No. 130

Telgs.: "TIMES, LONDON."

THE TIMES PUBLISHING COMPANY, Ltd.
PRINTING HOUSE SQUARE
LONDON, E.C.4

With the Compliments of the Photographic Sales Department

In! Bogaerde



THE TIMES COPYRIGHT

THE PHOTOGRAPH MUST NOT US REPRODUCED OR USED FOR ADVERTISING PURPOSES WITHOUT PERMISSION.



THE TIMES COPYMENT
THIS PHOTOGRAPH MUST
NOT BE REPRODUCED
OR USED FOR
ADVERTISING PURPOSES
WITHOUT PERMISSION.

by several eminent chemists in 1847, and the name collodion was adopted for general use.

A name that is a household word in the history of photography is that of Frederick Scott-Archer, who invented a new process for the use of Collodion which was positively revolutionary in its character, and remains much the same as originally invented at the present day. There is scarcely a newspaper published that does not use the Collodion process, which consists of coating a glass plate with Collodion to which has been added some iodide of ammonium or potassium first dissolved in alcohol, which, after being allowed to become quite dry is rendered sensitive to light by being immersed in a bath of Silver Nitrate thus forming silver iodide with the collodion film. The plate thus prepared is exposed immediately in the camera, after which, it is developed in a solution of pyrogalic acid, or sulphate of iron, to which has been added a little acetic acid.

Frederick Scott Archer persued the dual occupation of Sculptor and Photographer, and although he conferred such a great boon for the use of mankind he died practically a pauper in May 1857, a public subscription being raised for the benefit of his wife and children.

A french Engineer, Alphonse Louis Poitevin was the first to disclose a process and give the relative facts for the production of prints, consisting of a pigment, this he did in 1855.

Many learned men were experimenting with the production of a dry plate for photography, but the first man to produce a really satisfactory dry plate was Major C. Russell in 1862, using a solution of tannin to preserve the sensitized plates, he also succeeded in producing an alkaline developer.

In 1871 a hint was given by Dr. R. L. Maddox of a coming revolution in Photography, Wherein an article from his pen, we read of an experiment he carried out with gelatine-Bromide, and the explanation given of the process showed that he had arrived at a state of perfection, which has only needed a little modification of detail, in the many makes of dry plates, which subsequently found their way upon the market.

Mr. R. Kennett experimented and perfected a Gelatino-Bromide pellicle as it was then termed, where several others had failed, for which he secured a patent. In 1877 Mr. F. Wratten published an account of his method of washing the emulsion by the addition of a large quantity of alchohol to the emulsion which assisted to lessen the bad effects of decomposition and frilling in its unwashed state. Mr. Wratten together with

Mr. Wainwright then proceeded to place their then famous dry plates upon the market, being followed by J. W. Swan, later Sir Joseph Swan whose dry plates met with a ready sale.

There were many minor inventions and improvements which followed and in 1882 Sir William Abney published his first description of a practical means of preparing gelatine chloride of silver paper, which may be said to have laid the foundation of the printing out paper in use today. This records the principle inventions which made Photography an established industry, and gave rise for many clever and wonderful processes to follow, such as Tves photography in Natural Colours, and the various processes as applied to Art Printing and Photo Etching, X Ray and Infra-Red Photography, but as the object of this present wark is only to show how photography came into being there is not space to give even a few outlines of these later inventions.

Kinematography was simply a natural evolution from still Photography, as once clarified celluloid had been placed upon the market in the form of dry plates, substituting this commodity for glass by J. Carbutt of Philadelphia, it did not require a great deal of imagination, when the need arose to produce celluloid in ribbon form, and coat it with emulsion in the usual manner.

Dr. Marey succeeded in producing a sequence of moving pictures upon celluloid in 1886, which he purchased from Mr. Blair of Footscray in Kent, whilst the first man to patent Celluloid film in ribbon form was the Revd. Hannibal Goodwin in America in 1888, this was followed by Mr. Geo. Eastman in the latter part of 1888, who with the aid of his clever chemist, pr. Reichenbach produced thin celluloid, sensitized for filming purposes in a commercial form, and supplied Edison with all his film.

W. Friese-Greene the original patentee of Kinematography in 1889, clarified his own film, and coated it with sensitized emulsion, upon which he produced the first moving picture to be patented in the world.

Many other manufacturers followed but these were the first people to prepare films for Kinematography, and so in these inventions, did the great art of Photography for still and moving pictures come into being.

# Photography Ingra Red

Having noted in the previous chapter the principle inventions relating to Photography, many of which were considered in their time, both wonderful and astounding. It has been impossible to enumerate every new feature and development of the various processes enumerated, as to do so, would require several large volumes, and be altogether outside the scope of this present Work. Any history of Photography at the present time would be considered incomplete without an allusion to the really marvellous Infra-Red Photography in and perfected by Olaf F. Bloch F.I.C., F.R.P.S. the chief chemist of Ilford Ltd., and past President of the Royal Photographic Society. In writing of this new phase of the Photographic Art, the author has been graciously granted permission by the transfer to reproduce the paper given before the Royal Society of Arts and published by them, Vol. L.XXXI Feb. 3rd 1935.

### Follow here with booklet and insert.

it will be seen how vast is the field Red Photography and the numerous uses, THE PHOTOGRAnd. Photography in a dense fog, or in ce hitherto thought impossible, is now I thus a new era opens for an art that



Fig. 5. High-speed photograph, 1/75,000th second. Golf ball photographed at moment of impact by mashie. Note flattening of ball. High intensity spark discharge automatically fired by interrupted light beam and a photo-electric cell. Output of cell amplified sufficiently to trip the spark. Photograph by H. E. Edgerton and K. J. Germes-Lausen, Massachusetts Institute of Technology. Courtesy Arthur D. Little, Inc., Cambridge, Mass.

160

Having noted in the previous chapter the principle inventions relating to Photography, many of which were considered in their time, both wonderful and astounding. It has been impossible to enumerate every new feature and development of the various processes enumerated, as to do so, would require several large volumes, and be altogether outside the scope of this present Work. Any history of Photography at the present time would be considered incomplete without an allusion to the really marvellous Infra-Red Photography in the angle perfected by Olaf F. Bloch F.I.C., F.R.P.S. the chief chemist of Ilford Ltd., and past President of the Royal Photographic Society. In writing of this new phase of the Photographic Art, the author has been graciously granted permission in the inventor to reproduce the paper given before the Royal Society of Arts and published by them, Vol. L.XXXI Feb. 3rd 1935.

## Follow here with booklet and insert.

From the foregoing paper it will be seen how vast is the field for research wich Infra Red Photography and the numerous uses, to which it can be applied. Photography in a dense fog, or in the dark and at a distance hitherto thought impossible, is now an accomplished fact, and thus a new era opens for an art that is a Century old.

159

3, when it was oved that the ms only about a the earth's nat the atmosquantities of at there is no Jupiter, on the ammonia gasult to explain wed that three ness of the sun oms (Sci. Newsey, 293). Thus plate is finding the astronomer

pears to expandents granted on hay be regarded one in this field of the problems of photographic

# RECENT DEVELOPMENTS IN INFRA-RED PHOTOGRAPHY

By OLAF F. BLOCH, F.I.C.

President of the Royal Photographic Society

Photography is a means of recording, and a most convenient means, since it is rapid in operation, permanent in its results, and possesses, in addition, the supreme merit of being impersonal and hence impartial. It is so docile a servant that its universal employ-

ment is not surprising.

Now photographic recording is effected by differentiation, and the sensitive materials employed are not only able to differentiate intensities of radiation, but also radiation of varying wave-lengths. This has been made possible by the discoveries of the organic chemists who have built up a large number of dyestuffs, mostly of complicated structure, which are capable of making a photographic emulsion responsive not only to those portions of the visible spectrum to which it is normally insensitive, but also to the invisible infra-red region. The ordinary emulsion already possesses high sensitivity

to ultra-violet light, an amount inconveniently large for some purposes.

Visible light occupies an extremely limited portion of the radiation spectrum, the visibility limits being only from about 3,900 Ű at the violet end to about 7,600 Ű at the extreme red, and the useful sensitivity of a normal brom-iodo emulsion is from about 3,200 Ű to about 5,400 Ű with a maximum sensitivity at 4,600 Ű, so that the two sensitivity ranges differ markedly. When we seek to modify the colour response of an emulsion, the usual method of employing the specific dyestuff is to add a solution of it to the emulsion before coating, or, alternatively, it may be used in the form of a dilute solution in which to bathe the photographic plate. For each dyestuff and each emulsion there is usually a relationship between the amount of dye to be used and optimal sensitising. In whatever manner we effect this optical sensitisation, the original spectral sensitivity of the emulsions remains and indeed often preponderates.

#### HISTORICAL

In 1800 Sir William Herschel, using a delicate thermometer, found that heating effects were at a maximum beyond the visible red of the spectrum, and in 1840 Sir John Herschel painted a paper with a mixture of gum and lamp black and dipped it when dry into alcohol; when this was exposed to the infra-red region of the spectrum he found that it dried in patches, thus proving the existence of groups of absorption lines.

Ampère, in 1835, appears to have been the first to have supposed that heat rays were

of the same nature as light, differing only in wave-length.

In 1840 Herschel also discovered that if photographic sensitive material which had been exposed to blue light was exposed subsequently to red light, a reversal of the first effect took place. This is known as the Herschel effect and a modification of it, together with allied methods, has been used by Millochau and others for photographing the

spectrum up to 10,000 A°.

Another indirect method of infra-red spectrography was employed by Lehman who got as far as 20,000 A°. This process depends upon the power of infra-red light to destroy phosphorescence. An excited phosphorescent screen when placed in the spectrum has its luminosity diminished or destroyed wherever infra-red lines fall; after exposure such a screen is rapidly placed in intimate contact with an ordinary photographic plate and the effect recorded.

The first calibration of a prism spectroscope in the infra-red was done by Mouton in 1879 employing interference methods. With the introduction of the bolometer by Langley in 1881, quantitative work received a new impetus. Rubens was a prolific worker in this field and by employing wire gratings was able to measure down to

3,240,000 A°, that is, wave-lengths of nearly a third of a mm.

Paschen investigated the normal emission spectrum from a black body at various temperatures, and later work has still further increased the sensitiveness of the methods employed.

Vogel was probably the first to employ dyestuffs for optical sensitisation; his work is well-known and deservedly so, as it gave rise to a method yielding important results.

Other early workers in this field were Becquerel and Ducos du Hauron who used chlorophyll in order to red sensitise collodion emulsion; the latter employed it in the three-colour process of which he may well be said to be the father.

Abney, arguing from the fact that the absorption and sensitising regions were close together, came to the conclusion that if he could prepare a silver bromide emulsion absorbing blue light, it should be red-sensitive. He made, in 1880, a collodion emulsion sensitive down to 20,000 A° with its maximum in the neighbourhood of 7,600 A°. He also published a map of the infra-red solar spectrum from 7,160 to 10,000 A°.

Ritz repeated Abney's work in 1906 and claimed to have made a similar emulsion in gelatine. Abney is supposed to have photographed a black kettle at the temperature of boiling water, which would mean that his emulsion was able to utilise wave-lengths in the neighbourhood of 30,000 to 80,000 A°. In the light of more recent work this appears doubtful and, so far as can be ascertained, no one has been able to repeat Abney's results.

In 1891 Higgs employed Alizarine Blue Bisulphite and prepared plates sensitive to 8,400 Ű, whilst in 1900 Lehman used the same substance in conjunction with other dyes (e.g., Nigrosine) and produced plates sensitive to 9,200 Ű and even 10,000 Ű with long exposures. The effect of Alizarine Blue Bisulphite is probably of a different type (chemical sensitisation), the action in this case being similar to that of a sulphite or a cyanide.

Vogel employed cyanine, one of the first of this important group of dyestuffs, in 1875. In 1904 Miethe and Traube used ethyl red, and about the same time Koenig of the Hoechst Works prepared a set of important sensitising dyes of the cyanine group (Orthochrome T., etc.). Homolka discovered Pinacyanol in 1906 and Dicyanine was first made in the Hoechst Works at this period; it was the first infra-red sensitiser of this class. Using it, Meggers and McClennan photographed down to 10,000 A° with long exposures. This dye normally sensitises up to 8,000 A° with a maximum at 7,100 A°.

Adams and Haller described Kryptocyanine in 1919. This dye sensitises at 8,000 A° and has its maximum effect at 7,500 A° just at the beginning of the infra-red. It has been much employed in the production of commercial infra-red emulsions.

In 1925 Clark of the Eastman Kodak Company noticed that a new dye was present in preparations of another dyestuff. This was isolated by Dundon, Schoen and Briggs in 1926 and called Neocyanine. It functions from 7,200 Ű to 9,100 Ű, and has its maximum at 8,300 Ű, extending to 10,000 Ű with long exposures. Recently (1932) two new infra-red sensitisers have been synthesised by the Eastman Kodak Research Laboratory, Mesocyanine, which sensitises from 6,800 Ű to 9,400 Ű maximum at 8,800 Ű, and Xenocyanine, sensitising from 7,700 Ű to 10,300 Ű, maximum at 9,400 Ű. The latter dye is very unstable and plates containing it rapidly become veiled and useless unless they are kept in cold storage.

Recently, a new dye has been discovered in the Ilford Research Laboratories; it has the particular merit of permitting the preparation of infra-red emulsions of considerably higher speed and general cleanliness in processing than has hitherto been possible. Its maximum is at 8,100 Ű and it is effective up to 9,000 Ű. The preparation of photographic material of far higher speed in the infra-red is responsible for the great revival of interest in the subject and the widening of its practical applications, since work which before was not practicable on account of the prolonged exposures involved, now becomes comparatively easy.

The sensitiveness in the spectrum has gradually been extended by means of research upon all organic sensitising dyestuffs.

THEORETICAL

A few words must be said on the theory of the process of optical sensitising.

The Grothüss theory, based upon the idea of depolarisation, requires that optical sensitisers must be depolarisers, and it has found supporters in Bancroft and others. Sheppard has attacked the problem from the point of view of electrostatic attraction and,

later, ideas of intra-molecular electrolysis are introduced, but the evidence is at present slender for any particular theory. Certain facts, however, are known. First, the dye adsorbed to the silver bromide is not firmly attached, since it can be washed out in the cold by employing suitable solvents, which vary in the case of particular dyestuffs. Secondly, although the dye sensitises in the region of its absorption (always with a slight shift towards the red end of the spectrum), yet the amount of dyestuff necessary to give optimal sensitising is often so small that its specific absorption must be very slight indeed. Yet it is sufficient to start a train of action similar both qualitatively and quantitatively to that produced by the light to which the silver halide was originally sensitive. In the case of one infra-red emulsion, for instance, the gram-molecular weight relationship between the dye and the silver bromide is in the ratio of 1: 357,000. Attempts to measure the infra-red absorption of the same emulsion sensitised and not sensitised completely failed to reveal any difference between the two. Thirdly, the effect depends by no means only upon the absorption of light of specific wavelengths, since dyes of the same chemical class, and possessing the same spectral absorption, vary enormously in their sensitising power, in some cases possessing none at all. In not a few instances the mere substitution of a dimethyl for a diethyl grouping can produce marked deterioration in this respect. Fourthly, there is no evidence that there is preferential absorption on to the sensitive nuclei of the silver halide grains. It will thus be seen that little is known as vet of the mechanism of the process.

Sources of Infra-Red Light, etc.

If we pass an electric current through a filament, molecular oscillation takes place, the wire becomes heated and radiation occurs; whilst the current is small and the temperature low, this radiation is confined to the longer wave-lengths, but as the current is increased and the temperature rises, radiation of shorter wave-lengths is emitted, together with the longer ones. When the filament is at a temperature of 400° C., no visible light of any kind can be seen, but some radiation in the neighbourhood of 9,000 A° is now present. Dull redness occurs round about 500°C. Some experiments with an electric flat iron into which a thermo-electric recording thermometer had been inserted are not without interest. It was found that the iron could just be perceived as a grey body by the dark-adapted eye at as low a temperature as 420°C., but at 400°C. nothing whatever was visible. The iron was run at this temperature for 14 hours and the invisible image of it focused on an infra-red plate using the camera lens at an aperture of f/4.5.

The original negative an excellent reproduction of the heat gradient in the iron, and from a measurement of the photographic densities one could interpret the heat distribution in the iron.

Daylight contains ample infra-red light for photographic purposes, especially when the sun is shining, and all high temperature artificial light sources contain more or less, varying with the temperature of the emitter. A convenient source is the ordinary gas-filled electric lamp. It is necessary to use a light filter in conjunction with the lens, which absorbs all the visible light and transmits infra-red light only. With artificial illumination an alternative method may be followed, the illuminant itself being enclosed in a lamp house which is glazed with a filter of the same type as that used in the camera. If high power illuminants are used, the heat becomes very great and it has been found advisable to install a small fan blowing a current of air through the lamp houses if these are to be kept running for any length of time. One of the infra-red light filters in common use transmits from about 7,300 A° onwards; this filter therefore passes the extreme visible red.

Dyestuffs in general do not possess sharply bounded absorption bands; in consequence, attempts to restrict still further the red transmission by increasing the dye concentration, would so greatly increase the absorption of the infra-red itself that exposures would be unduly prolonged when such a light filter was employed. The exposure depends, as with all other photographic material, on the intensity of the illuminant, the character of the objects to be photographed, their distance from the camera and so forth.

A certain number of dyes when in solution transmit infra-red light freely, as does also a solution of iodine in carbon disulphide, certain glasses containing oxides of iron

and manganese, etc., and these can serve as light filters.

Lenses do not all behave alike in their covering power, or in the distance of the image plane from the nodal point. Lee has shown that, theoretically, the image plane should be about 1/200 of the focal length further away from the lens than for white light, but some lenses show practically no difference. Recently, two English firms have placed upon the market lenses which cover well and whose infra-red and visual foci are alike.

As most infra-red plates possess very feeble green sensitivity, a fairly bright yellowgreen safelight containing a substance which absorbs the infra-red can be employed,

and handling and processing are thus rendered easy.

A few words should be mentioned about materials. No substances which are transparent to infra-red radiation must be employed in the construction of the camera or dark slides, or if used must either be of such a thickness that they no longer transmit the radiation with reasonable exposures, or they must be backed up with material which is opaque.

#### THE USES OF INFRA-RED PHOTOGRAPHY

It should be clearly understood that the matters discussed in the following sections refer only to that portion of infra-red radiation to which the photographic material

used was sensitive, namely: from about 7,500 A° to 8,600 A°.

Distance and aerial photography—The air is seldom really clear in England because a considerable amount of water vapour is usually present; consequently, long distance vision is rare. It is well-known that the shorter wave-lengths comprising the blue and violet constituents of light are more readily scattered by small particles than the longer wave-lengths constituting red light, and infra-red light is scattered even less. This principle has been adopted in the orange and yellow filters employed for motorcar headlights, but it is doubtful if these are generally sufficiently red to be of great practical value. The use of infra-red photographic material thus enables one to employ a greater proportion of the direct image-bearing light, and it becomes possible to take distance photographs in hazy weather and even to secure images of objects which are invisible to the eye because they are lost in the prevailing haze or mist. One of the earliest of these photographs, taken in 1924, is due to Dr. Wright of the Lick Observatory and shows the Sierra Nevada mountains at a distance of 150 miles. More recently, Stevens has taken an aerial photograph from a height of 23,000 feet in what must have been an extremely clear atmosphere, showing Mount Shasta, at a distance of no less than 331 miles, whilst another photograph taken from the air, also by Stevens, shows the haze of the pampas against the Andes Mountains at a distance of 310 miles in such a way as to demonstrate the earth's curvature. There is as yet no exact information about the effect of varying atmospheric conditions on this class of work, and fuller knowledge is necessary regarding the action of variation of the dimensions of the water particles which constitute mist or haze, and also in what direction the additional presence of carbon particles constituting fog modifies the transmission of infra-red light.

Much beautiful work has been done and a few slides will be projected in illustration.

The method has found some application in press photography, a notable instance being the photograph of the Cenotaph taken on Armistice Day which appeared in several newspapers. The weather was foggy, but the infra-red photographs are remarkably clear, giving a view up Whitehall to Trafalgar Square with an almost complete absence of mist. Little is known about the infra-red content of daylight, but it has been found that the time necessary to secure correct exposures can vary without any change which can be appreciated by the eye. By the kindness of Dr. G. B. Harrison I am able to show photo-electric cell records of the visible and infra-red content of daylight taken simultaneously during three days. These were made by means of two cells, one of which gaue gives approximately visual daylight response, whilst the other possesses high infra-red

sensitivity; the cell aperture of the latter was covered with an infra-red filter. The galvanometer mirror movements are recorded on two revolving drums covered with sensitive paper. It will be seen that whilst an increase in the amount of visible deletes

thous made

insert Technique there

daylight is sometimes accompanied by increased infra-red content, at other times there

no proportionality between the two.

Aerial photography presents a useful field for work and, though the photographic material at present available is somewhat slow, interesting results have been obtained under favourable conditions. The combined study of photographs taken on ordinary or panchromatic plates and those taken on infra-red plates promises to be serviceable since each photograph reveals details which are lacking on the other.

Foliage—It is well known that when foliage is photographed by the infra-red process it is always rendered darker in the negative and lighter in the print than is normal. Indeed, when the sun is shining it photographs so dark that the prints have somewhat the appearance of a co

#### **TECHNIOUE**

1. USE OF THE INFRA-RED FILTER. The infrared plate is generally used along with an infra-red filter. This may be in the form of gelatine film between the lens components, or as a sealed filter in front of the lens. As lenses are not corrected for red light the focus is altered by this procedure and it is necessary to scale the camera. Some help may be obtained by focusing with a red filter, such as the Ilford Tricolour Red, when an approximation to the correct position can be found.

N.B.—This plate is of no use without the filter unless the objects to be photographed are illuminated with infra-

2. SPEED OF PLATE. In conjunction with the infra-red filter the plate has a speed of about 10 H. & D. to daylight and about 100 to half-watt light. 20

The infra-red speed tends to fall on keeping the plates. It is therefore necessary to use reasonably fresh material.

3. HANDLING AND DEVELOPMENT. photographic technique employed is precisely the same as for Panchromatic plates, except that it is possible to employ a brighter safelight of suitable composition. Ilford Limited supply the Infra-red Dark-room Light Filter for this purpose.

" BHS Dark Black BS >> Steel Black 6BS 22 CR Black D " AzBN Coomassie Navy Blue GS CR Burl Black RMW 23 Lissamine Violet 10BS Black ES " SDS 33 Fast Black BKS 33 Black PBS 33 Solway Blue RS " LFS Dark Green PLS Naphthalene Black 12BS 23 CR Fast Green Green GS 22 22 " BNS 33 33 Blue 2RS Dark Blue BS 33 Fast Blue FFRS ,, Blue 3BS 22 " RWS Acronol Indigo Blue AS Caledon Olive RS paste

cause nothe of a

isons. aplete rences

ark or warm Little ing, in nvesti-1 were te and n profra-red inceivs were e been a deep

Y

Fast Blue 2BNS

Drab RHS

Brown PBS

Azurine GS

Green TS

Navy AN

"

22

" 6BNS

Dark Green M

L ,,

ESN

PR

BD

AW

Fast Black NN

**ESNC** 

5

insert Technique there

daylight sometimes accompanied by increased infra-red content, at other times there

no proportionality between the two.

Aerial photography presents a useful field for work and, though the photographic material at present available is somewhat slow, interesting results have been obtained under favourable conditions. The combined study of photographs taken on ordinary or panchromatic plates and those taken on infra-red plates promises to be serviceable since each photograph reveals details which are lacking on the other.

Foliage—It is well known that when foliage is photographed by the infra-red process it is always rendered darker in the negative and lighter in the print than is normal. Indeed, when the sun is shining it photographs so dark that the prints have somewhat the appearance of a snow scene in winter. This is because chlorophyll both reflects and transmits, but does not absorb, that portion of the infra-red light to which the plates used are sensitive, and it seems reasonable to suppose that it rejects this radiation because absorption of it would not be beneficial to the foliage; leaves, therefore, will have nothing to do with it and for this reason, it possibly is not quite so cool in the shade of a tree on a hot day as it ought to be!

Flowers and fruit exhibit the same phenomenon and probably for the same reasons. The absorption spectrum of an alcohol extract of chlorophyll shows complete

transmission from 6,800 A° onwards.

Fabrics, etc.—The treatment of fabrics with dyestuffs can produce big differences in their behaviour to infra-red light. Some coloured fabrics, though dyed with dark or black dyestuffs, reflect infra-red light strongly and might be cooler to wear in warm weather than those dyed fabrics which absorb it, but we have no proof of this. Little appears to be known about this and the effect of variations in the method of dyeing, in the mordants used, or in the after-treatment of the dyed material, has yet to be investigated. The after-treatment is certainly of importance. Two samples of cotton were dyed with chlorazol steel blue 6BS and one was after-treated with copper sulphate and potassium bichromate; in the same way, after-treatment with formaldehyde can produce marked changes. The former shows slight and the latter very strong infra-red absorption. In such cases the photographic method of differentiation might conceivably be an aid to analysis and classification. Messrs. Imperial Chemical Industries were kind enough to supply a large number of specimens of dyed fabrics; these have been examined and the following list of specimens of cotton, wool and silk dyed to a deep colour and showing relatively strong infra-red reflection, is of interest:—

WOOL, COTTON AND SILK DYED TO A DEEP COLOUR AND SHOWING RELATIVELY

Chlorazol Black JHS  "BHS" "BHS" "Dark Black BS" "Steel Black 6BS" "Steel Black 6BS" "Black D"  "A2BN" "Burl Black RMW" "Black ES" "Black ES" "Black BKS" "Fast Black BKS" "Fast Black BKS" "Black PBS" "Black PBS" "Black Green PLS" "Black Green GS" "Black Green GS" "Black BKS" "BNS"			STRONG	3 INFRA-RED REFL	ECHON		
Dark Black BS Steel Black 6BS  Read Black D  CR Burl Black RMW Black ES Black ES Black BKS Black BKS Black PBS Black PBS Black Green PLS  CR Black Green GS Black BKS Blue 2RS Blue 2RS Blue 2RS Blue 2RS Blue 3BS Blue 3BS Blue 3BS Blue 3BS Brast Black N Acronol Indigo Blue AS	Chlo		Black JHS		Chlorazol	Blue BS Fast Blue	2BNS
CR Black D  CR , A2BN  Burl Black RMW  Black ES  SDS  Fast Black BKS  Black PBS  Dark Green PLS  CR , Fast Green  Green GS  Blue 2RS  Dark Blue BS  Blue 2RS  Dark Blue BS  Fast Blue FFRS  Blue 3BS  RWS  Acronol Indigo Blue AS			Dark Black BS		>>		
## Burl Black RMW ## Black ES ## Black ES ## SDS ## Fast Black BKS ## Black BKS ## Black PBS ## Dark Green PLS  ## CR ## Fast Green ## Green GS ## BNS ## Blue 2RS ## Blue 2RS ## Dark Blue BS ## Blue 3BS ## Fast Black N ## Acronol Indigo Blue AS  ## Green TS Lissamine Violet 10BS ## Navy AN ## Dark Green M  Solway Blue RS ** Naphthalene Black 12BS ** PESN ** BD ** PR  ## Blue 2RS ## BD  ## Tast Blue FFRS ## Fast Black N  ## Acronol Indigo Blue AS ** Acronol Indigo Blue AS	CR		Black D		**	Azurine C	SS
## Black ES  ## SDS  ## Fast Black BKS  ## Black PBS  ## Dark Green M  ## Solway Blue RS  ## Navy AN  ## Dark Green M  ## Solway Blue RS  ## Naphthalene Black 12BS  ## CR  ## Fast Green  ## Green GS  ## BNS  ## Blue 2RS  ## Dark Blue BS  ## Dark Blue BS  ## Fast Blue FFRS  ## Blue 3BS  ## RWS  ## Lissamine Violet 10BS  ## Navy AN  ## Solway Blue RS  Naphthalene Black 12BS  ## Naphthalene Black 12BS  ## Naphthalene Black 12BS  ## PR  ## Dark Blue BS  ## AW  ## ESNC  ## Fast Blue FFRS  ## ESNC  ## Fast Black N  ## Acronol Indigo Blue AS	CR		" A2BN Burl Black RMW		"	Green T	S
"Fast Black BKS"       "Navy AN"         Black PBS       "Dark Green M         "Solway Blue RS"         Naphthalene Black 12BS         CR       Fast Green         "Green GS"       "ESN"         "BNS"       "PR         "Blue 2RS"       "BD         "Fast Blue BS"       "AW"         "Fast Blue FFRS"       "ESNC         "Blue 3BS"       "Fast Black N         "Acronol Indigo Blue AS		,,	Black ES			,, 6B	NS
", LFS Solway Blue RS Naphthalene Black 12BS  CR ", Fast Green " " L  " Green GS " " ESN  " BNS " PR  " Blue 2RS " BD  " Dark Blue BS " AW  " Fast Blue FFRS " ESNC  " Blue 3BS " Fast Black N  " RWS Acronol Indigo Blue AS		"	Fast Black BKS			Navy AN Dark Gre	een M
CR , Fast Green		>>	" LFS		Solway B	lue RS ene Black	12BS
" Green GS " " PR " BNS " " BD " Blue 2RS " " AW " Tast Blue BS " " ESNC " Fast Blue FFRS " Fast Black N " Blue 3BS " Acronol Indigo Blue AS	CR		Fast Green		"	,,	L
", Dark Blue BS ", AW  ", Fast Blue FFRS ", ESNC  ", Blue 3BS ", Fast Black N  ", RWS Acronol Indigo Blue AS		,,	" BNS		,,	,,	PR
", Blue 3BS ", Fast Black N RWS Acronol Indigo Blue AS		and the same	Dark Blue BS			,,	AW
RWS Acronol Indigo Blue AS			Blue 3BS			Fast B	lack NN
	120 19 120	"	" RWS		Acronol l Caledon (	Indigo Blu Olive RS p	e AS

thus making ill now had a uses are sum-

APHY AND own that the light, scatters light less still. attempting to t only infra-red formed by the -red light only which would e formed by the ze-penetration" romatic plates. ith a telephoto t lens-becomes ph in The Times it of the Isle of of Wastwater, e method is also

RK. It is possinated by means d suitable filters,

Very little in the way of definite conclusion is at present possible, but it appears as though the sulphur colours, on the whole, reflect but little infra-red. No general relationship appears to exist between the infra-red reflection and the visual colour.

A number of oils, varnishes, gums and adhesives have been tested and all of them were found to be quite transparent. When these are applied to paper they render it more translucent to visible light, and the effect as regards infra-red radiation is similar. The materials which have been examined are: rape, sperm, castor and finseed oils, paraffin wax, vaseline, cellulose varnishes, indiarubber, seccotine, and among the gums, arabic, mastic, tragacanth and benzoin. Other substances transmitting infrared light are melted sulphur, selenium, orpiment and realgar in thin layers. Asphaltum is more opaque.

Various materials—It will be of interest and practical value to deal with the absorptive and transmissive properties of some common materials.

Wood—Woods vary greatly in this respect, but in thicknesses of  $\frac{1}{8}$  inch the majority of woods examined proved to be transparent, and a table of these, with exposure details is appended.

Name of Wood.	Exposure.	Photographic effect	Behaviour (qualitative) towards infra-red light.
Siberian Pine Balsa Wood	1 second at 6 feet from 500 watt lamp	Considerable "Some Slight Considerable	Transmit freely.
Tasmanian Oak Cedron (Nigerian) Gurjan Agba (Nigerian) Mahoborn Indian Teak Honduras Mahogany Jarrah (Australian) Silky Oak (Australian)	5 seconds at 6 feet from 500 watt lamp  400 seconds at 6 feet from 500 watt lamp	Some Slight Considerable Some	Some transmission.
English Oak Padouk (Andaman) Australian Walnut African Walnut Blackbean (Australian) American Walnut Indian Silver Grey Iroko Teak (Nigerian) Ebony	2,000 seconds at 2 feet from 500 watt lamp (=18,000 secs. at 6 feet)	Slight "" "None "" "" "" "" "" "" "" "" ""	Almost opaque.  Opaque.

All the above specimens were \{ \frac{1}{2} \text{ inch thick.} \}

It has long been known that ebonite in thin sheet is easily penetrable and vulcanised fibre resembles it. Paper and cardboard come under the same category and are unsafe, but black paper, such as that employed for packing photographic material, is far more opaque. Since carbon black is the substance generally employed in the pigmentation of this paper, it was tested by painting lamp black on to a white paper and, as expected, was found to absorb infra-red light strongly. Celluloid and bakelite are very transparent,

thicknesses of  $\frac{1}{8}$  inch of these materials, without any loading, transmitting infra-red light freely. Ebonite and vulcanised fibre, in thicknesses of not less than 1 mm. and 2 mm. respectively, are reasonably safe.

Leather, such as is used in camera bellows construction, is transparent, unless it contains, as dyestuff or loading material, some substance rendering it opaque. The metals are opaque. The practical points that emerge are the necessity for the use of metal dark slides and the use of leather backed up with a material opaque to infra-red for the camera bellows.

Analysis of documents—The usual method of procedure in dealing with erasures, blacking out, over-writing and supposed forgeries, is the photography of these in ultraviolet light. Recently, the infra-red method has been applied with success in certain cases. Bendikson, in 1932, photographed pages from a copy of Theodore de Bry's Voyages which is in the Huntington Library; these pages had been obliterated in black ink by the Inquisition Censor 300 years ago. The results show that the defacing ink is sufficiently transparent to infra-red radiation to permit of the successful photography of the underlying invisible printing. Many factors may affect the result. The character of the paper or parchment, the composition of the original ink used, the composition of the ink employed for erasure or over-writing, and the nature of the faded inks, which, in turn, depend upon their original composition. If the fluorescence of the paper or the ink in ultra-violet light are of the same order, and if their reflective and absorptive properties in infra-red light are also alike in degree, no useful results can be expected.

Portraiture—The taking of a photographic portrait in apparent darkness proved somewhat of a sensation and it was the examination of these pictures that directed attention to the notable differences in the variously dyed clothing. In general, infra-red portraits are far from flattering. In some cases they reveal hair beneath the skin of clean-shaven males, probably owing to pigmentation differences; in other cases the entire features of the sitter appear to be modified, never to advantage. In one instance of a photograph of a negro, changed racial characteristics were observed, and it is therefore

possible that the process might find occasional use in ethnological studies.

Scientific Applications.

- (a) Spectroscopy—The uses are obvious and need not be dealt with here at any length. If in any spectral region photographic material can be prepared which is sensitive to that region, it can be employed by any of the usual photographic methods.
- (b) Astronomy—Considerable use has been made of the infra-red method. Professor Wright of the Lick Observatory has taken photographs of Mars and the ordinary photograph shows the planet larger in size than the infra-red picture. It is thought that this increased image size is due to scatter of the shorter wavelengths of the Martian atmosphere in a manner similar to that which occurs in the terrestrial atmosphere. For the same reason (diminished scatter in the infra-red) the infra-red photograph reveals markings on the surface which are not visible on the ordinary plate. Trumpler, also of the Lick Observatory, has photographed the Orion nebula in this manner and has been able to obtain images of many faint stars invisible in the usual photograph. This is because the general light of the nebula, which is chiefly in the visible spectrum, blackens the photographic plate during the long exposures necessary, but with an infra-red filter such stars as radiate any infra-red are able to be recorded whilst the effect of the general scattered light is greatly reduced. Quite recently (1932) the infra-red spectrum of Venus has been photographed at the Lick Observatory. This shows the carbon dioxide bands in the atmosphere of Venus at 7,820 A° and 7,883 A°, which do not exist in the solar spectrum. The spectrum of Venus, apart from this, is that of sunlight reflected from the clouds in its atmosphere.
- (c) Microscopy—In working by transmitted light the spectral colour of the specimen, the method of preparation, and the stains used (if any), all affect the results obtainable. In those cases where the specimen is opaque, or nearly so, to visible light, but more or less transparent to infra-red, useful results may be expected and some of the work

which has been done is not without promise. The photomicrographs show exterior detail as well as interior structure. Focusing and exposure present no special difficulties.

(d) Medical—As a consequence of the peculiar results obtained in portraiture, it was considered that the photography of cases of skin complaint and of those suffering from such infectious and other diseases as produced markings on or beneath the skin, should prove of considerable interest. Insufficient work has been done to make any considered statement about this, but the results so far have not been very promising. Some recent pathological work, however, has provided interesting results. Experiments upon flesh penetration have also been made, but scatter of the light has hitherto prevented any considerable degree of success.

A letter received from Copenhagen states that in the Rigs Hospital cases of lupus have been photographed in infra-red light. It was found that the photographs distinguished between dead skin and tissue and living skin with lupus nodules in it. A further interesting outcome of the work was that varicose veins not perceptible by the eye were clearly indicated in the infra-red photographs.

Conclusion it is apparent
We have seen from this discussion that a highly specialised process such as this can have unsuspected applications, and that a knowledge of its powers and possibilities may not be without value in the course of technical work or scientific investigation.

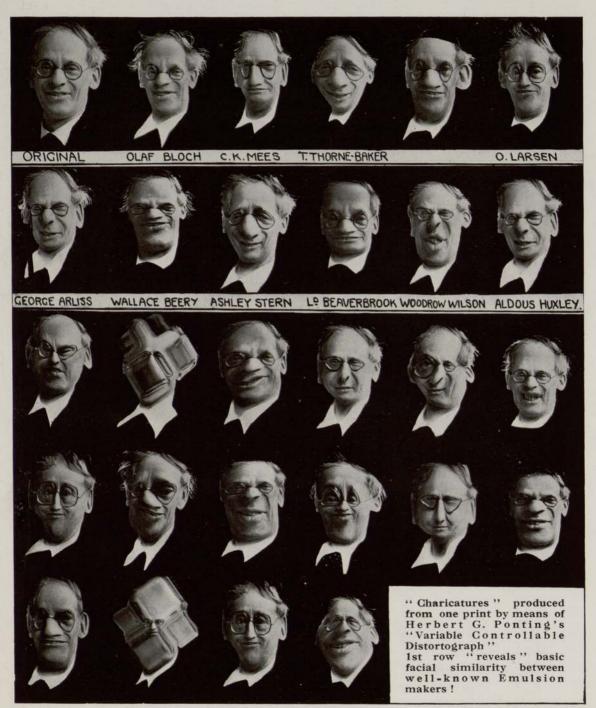


Fig. 26

THE CAMERA CANNOT LIE (?)

This paper was delivered by the author as the opening lantern lecture at The Royal Photographic Society's Annual Exhibition in September, 1933, at 35, Russell Square, W.C.1, when the chair was occupied by Mr. Olaf Bloch, F.I.C., Hon. F.R.P.S.

At the conclusion of the lecture a short length of experimental kinematograph film, lent by Mr. Herbert Ponting, was projected. The film, which greatly amused the audience, was at one moment reminiscent of Alice in Wonderland and at another of the most fantastic dreams of De Quincey. Pigmies turned slowly into giants cows into prehistoric lizards, whilst close-ups of faces went through every deformation from the grotesquely funny to the horrible.

Mr. Olaf Bloch said that he need scarcely say to that appreciative audience what an altogether delightful evening they had had. His own difficulty was to reconcile himself with the number of individuals with whom he had been confused in the series of portraits just shown. Dr. Spencer had covered a great deal of ground. He wondered whether it had ever struck landscape workers, for example, that in very few cases did a land-scape photograph reproduce the real tonal values of the

original. He imagined that very few prints showed the correct tonal relationships of Nature from end to end. In that way photography might be charged with uttering a minor white lie. A very hearty vote of thanks was due to Dr. Spencer, who had delivered his lecture with his usual wit and clarity. They would all go home happier and wiser people, and quite determined that the photographic sins they had committed in the past would be nothing to those they intended freely to commit in the future. (Laughter.)

Dr. Spencer, in reply to the vote of thanks, which was heartily accorded, said that he had been only the mouthpiece, and all the material had been supplied to him by other people, to whom he wished to make careful acknowledgments for their loan to him of lantern slides and films. Those to whom he was specially indebted were Mr. David Charles, Flight-Lieut. Boas, Mr. J. R. Reynolds, Mr. Olaf Bloch and Ilford Ltd., Mr. Robins of Kodak Ltd., Dr. Oliver Ellis, Dr. C. Ainsworth Mitchell, Mr. W. M. Webb, Mr. Charles Wormald, and Mr. Herbert Ponting. He also wished to record his grateful thanks to his friends at Colour Photographs, Ltd., who had made the lantern slides, and had helped to make the lecture possible.





# THE CAMERA CANNOT LIE (?)

THE TWO UPPER PICTURES REPRESENT THE FAMOUS FILM ACTRESSES, JOAN CRAWFORD (left) AND CONSTANCE BENNETT (right), AS SEEN ON THE SCREEN, AND, BELOW, THEY ARE SHOWN AS THEY LOOK IN REAL LIFE.

Reproduced by courtesy of Vogue and Photography

Photography

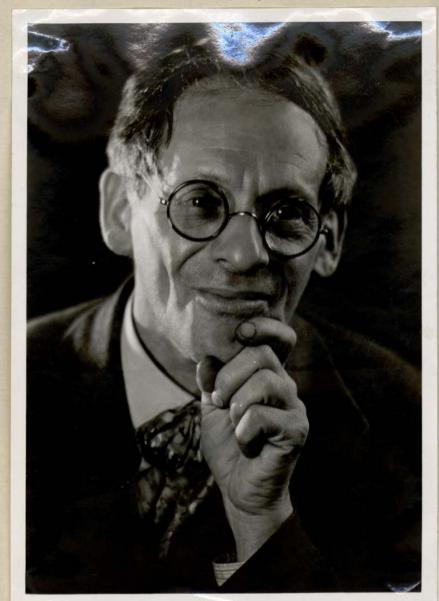


## A PANORAMA OF THE FRENCH COAST TAKEN FROM DOVER: A NOTABLE ADVANCE IN LONG-DISTANCE PHOTOGRAPHY



THE FRENCH COAST FROM DOVER.—This panoramic photograph, in which a stretch of the French Coast is clearly shown, was taken from Old Park, behind the town of Dover, at a time when the French Coast was barely visible to the eye. It was taken by a long focus lens, and although photographs of the French Coast from Dover have been taken before, this is the first that has been taken under normal conditions of visibility. This has been accomplished by the use of an Ilford infra-red plate and filter, allowing an image to be photographed through the suspended moisture in the air which prevents the eye from seeing the object. The long-focus lens has had the effect of foreshortening the picture, consequently the French Coast appears to be much nearer, and the Channel much narrower at this point than is actually the case. The stretch of French Coast shown is that approximately from Sangatte to Boulogne. Cape Gris Nez (over 20 miles away) is in the centre of the picture, and it will be noticed that the outlines of hills and fields can be distinguished behind the coastline. Buildings were visible on the print, but were too small to appear in the reproduction.

This photograph and particulars are reproduced by the courtesy of The Times



M Olaf Block F.I.C. FRPS.

-----

THE INVENTION OF CELLULOID AND HOW IT WAS APPLIED TO KINEMATOGRAPHY.

#### CHAPTER 8. .

Much has been written, and many statements made, regarding the actual invention of Celluloid. As in many other instances, several statements that have been made are entirely erroneous, as in many Encyclopedias the invention of Celluloid has been accredited to America. The one man to whom the world owes a deep dept of gratitude for the invention of this extremely useful substance, was Mr. Alexander Parkes, a native of Birmingham, England. He was a clever inventor and in 1841, when he was 27 years of age, he secured his first Patent for "Improvements in the production of works of Art in metal by Electro deposition."

In 1843 he devised a valuable improvement in connection with the preparation and application of solutions of indiarubber for waterproofing which was sold for a large sum of money to the firm of Mackintosh of Manchester. In 1849 Mr. Parker obtained several patents for dealing with metallic alloys. Amongst the many processes evolved by this clever inventor was a wonderful system for hatural flowers with a phospheric metallic solution, and upon the occasion of the visit of Prince Consort he succeeded in Electro Plating a spider's web. A further series of Patents followed all of a substantial and useful nature, for use in conjunction with various metals.

In 1885 he carried out a series of important experiements and improvements for the use of collodion in Photography, this led to the discovery of the all important substance called Celluloid. Collodian is a mixture of Gun-Cotton or Pyroxylin dissolved in alcohol or ether, and Mr. Parker after trying out various solvents, discovered that if he used a certain proportion of Caster or Cotton seed oil, a plastic substance was obtained, which, under certain conditions could be brought to varying degress of hardness, and could readily be mixed with other substances and pigments, to give it a resemblance to amber, Tortoiseshell, coral, ivory, etc. A number of beautiful examples made up into combs, knife handles, buttons, card cases, brush backs, etc. were exhibited by Mr. Parker at the International Exhibition of 1862, which attracted a large amount of interest.

The first patent secured, was No. 2359, October 22nd 1855, and he did not call the substance Celluloid, but gave it a name coined from his own "Parkesine," He did not reap the rich monetary reward that should have been his, as his patent

# Celluloid



Mr. Alexander Parkes, of Birmingham, England. The inventor and patentee of Celluloid, in 1854.





was only taken out for Great Britain and it was not long before he found Paresine being manufactured freely in America under the name of Celfuloid, at a large works established by Mr. Hyatt at New Jersey in 1867. Mr. Parkes received several awards for his invention, amongst which may be mentioned a prize medal at the Great Exhibition of 1862 and at the Paris exhibition of 1867. A company was formed in 1866 under the title of Parkesine Ltd. to work the first six British Patents for this substance which were as follows:-

No.2359 Oct. 1855 No. 2675 Oct. 1864. No.1313 May 1865. No. 2733 Oct. 1865. No.3163 Dec. 1865. No. 1564 June 1866.

Many years later John Carbutt of Philadelphia with the aid of his brother produced Celluloid in 1884 and clarified it to be used for photographic negative plates instead of glass. It is interesting to note that it was from Mr. Carbutt trading as the Keystone Dry Plate and Film Co., that William Kennedy Laurie Dickson purchased his first supplies of sensitized emulsion coated celluloid, with which he carried out his first experiments for Mr. Thomas Alva Edison, on his first little cylinder machine.

The Reverend Hannibal Goodwin an American clergyman was the first to disclose particulars of a process for making sensitised and clarified film in ribbon form for which he applied for a patent in 1887. This patent was disputed for many years by the American Patent Office, being finally granted to him on September 13th 1898, the number being 610,861. It was this patent that rendered celluloid film in ribbon form a commercial possibility, thus giving to the world the necessary medium for the production of Kinematography.

It was Mr. George Eastman, who, with the aid of his clever chemist Dr. Reichenbach, towards the latter part of 1888 discovered that a solution of Gun Cotton in Wood Alcohol could be rendered as transparent as glass, and produced as thin as desired. A machine was quickly constructed for the production of this base, which, when covered with a sensitized emulsion could be produced on a commercial basis.

It was after a meeting of the New York Camera Club in December 1888, that Mr. Dickson interviewed Mr. Eastman and asked him for a few sample strips of his new film. Mr. Eastman readily acceded to his request much to the delight of Dickson, who at once hastened back to his laboratory and carried out numerous experiments for his chief. After having secured a series of short pictures, he showed Mr. Edison the very satisfactory





## PARKESINE.

PARKESINE is so called after its Inventor, Mr. Alexander Parkes of this town, the well-known discoverer of the Cold Process of Vulcanization of India Rubber, described by the late Mr. Thomas Hancock as "one of the most valuable and extraordinary discoveries of the age." Mr. Parkes is also the author of numerous other Improvements in Manufactures which have added greatly to the power and wealth of this and other countries.

The material was exhibited in the Exhibition of 1862 in its rough state, and manufactured into all kinds of articles in general use, and there excited the greatest attention and admiration, and received a Prize Medal, Class IV, Catalogue 1112.

Since that time Mr. Parkes, impressed with its great value, has secured several patents both in England and abroad, which add greatly to its value, both commercially and economically.

The different stages of manufacture are fully illustrated by the various materials exhibited, from the unprepared cotton waste to that of its ultimate conversion into solid blocks.

		# 25年の1 7 3 14 10 0 J 以上明日 、
No.	1.	Bankesine solvent (A).
	2.	Native and waste cotton.
	3	Parkesine solvent (c).
	4.	Native cotton made soluble.
10121	5.	Waste cotton rags made soluble.
		Native cotton partially dissolved.
2	7.	Waste cotton , ,
- 51	8.	Parkesine solvent (B).
	9.	Parkesine vegetable oil solidified.
	10.	" " " partially solidified.
	11.	Pure vegetable oil.
	12.	Parkesine, colour red.
	13,	, transparent.
22.	14.	" colour yellow.
	15.	" · " green.
	16.	" white.

No.	17.	Parkesine,	colour blue.
	18.		vegetable oil, red (for mixing).
	19.		" " blue "
	20.		" " green "
	21.		manufactured "paste."
	22.		various pieces.
175	23.	***	manufactured thin sheet (white).
	24.		thin sheet (red.)
	25.		shavings various.
	26.		insulated wires for instruments.
	27.		wires for instruments,
31	28.		Specimens of manufactured
		wires, inst	nsisting of insulated telegraphic clators, carvings, tubes, bosses, abs, buttons, inlaid book covers, &c.

Parkesine is inexpensively produced in a fluid plastic or perfectly hard state—of any colour—as thin as the finest gold beaters' skin, and as perfectly transparent as the finest plate-glass, or of any thickness as black as ebony or as white as marble, and indestructible by oxidation as iron. It is not acted upon by strong acids nor by heat much exceeding that of boiling water. It is applicable for every purpose for

results, he had obtained, the outcome of which being that all his future experiments and work were carried out on Eastman stock, and this led to the adoption of the Edison standard gauge as being the world standard for Kinematograph films, being 35 millimetres in width and having four perforation holes at the margin on each side of the picture.

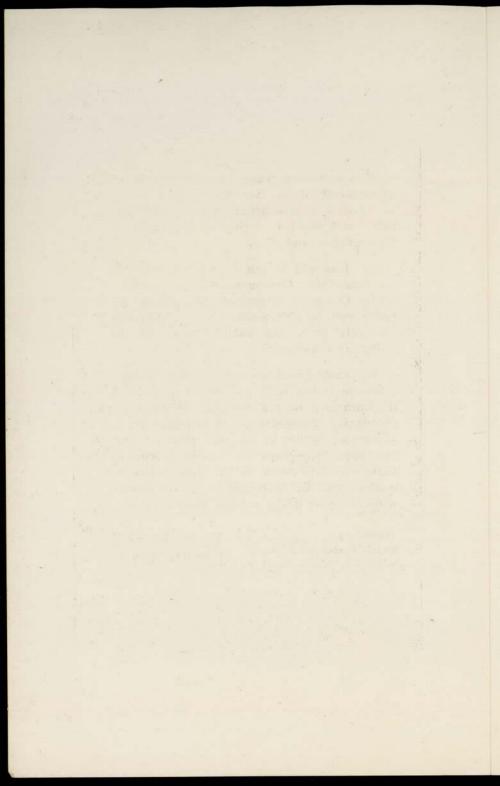
Although this outlines the principle inventions relating to the production and commercialising of celluloid films as a photographic base it must not be overlooked that other inventors also achieved the same results, Dr. Marey in Paris succeeded in purchasing celluloid coated with a sensitized emulsion from Blair for his experiments in early 1889.

The first man to make clarified celluloid film for Kinematography in England was Mr. Blair at his works at Foots Cray in Kent, which was supplied in large quantities to the various firms that came into being during the early years of the MorioN Perune industry. Mr. Blair eventually disposed of his interests to George Eastman. It must also not be overlooked that the brothers Lumiere in France in 1895 commenced to make films for Kinematography and supplied large quantities of their stock all over the world, whilst the AGFA company in GERMANY, GAEVERT IN FRANCE + DU- PONT AT DELAWARE. U.S.A ARE ALL VERY LARGE Through the foregoing chapters it will be seen that the MANUFACTURE principle branches of the science of physics, which have a bearing upon the ultimate invention of Kinematography, have been traced from their earliest sources. The study of the been traced from their earliest sources. The study of the human eye by which means we see the pictures, the study of light and illuminants by which we take and show pictures, the invention of glass and the formation and grinding of lenses. The invention of electricity, the invention of the Camera Obscura and the Camera. The invention of Photography, the invention of the optical lantern, the earliest known Peep Shows, Shadow Shows, Marionettes, Galanty Shows, Pamoramas, Dioramas, Cosmoramas, Myrioramas and the invention of Celluloid, all of which played their several parts, and were waiting to be almalgamated into one composite whole, to eventually form the complete science of Kinematography.

In the following chapters, the author will endeavour to give an unbiased explanation of the various inventions with a short description of the inventors themselves, which have led up to the ultimate invention of motion pictures, photography, popularly known first as the Movies, and then as the Talkies, all over the world.



Jeorgelaelman Merchi 1932



It is with deep regret that we have heard of the death of Mr. Eastman, creator of the world-wide Kodak organisation, and originator and builder of the modern amateur photographic industry.

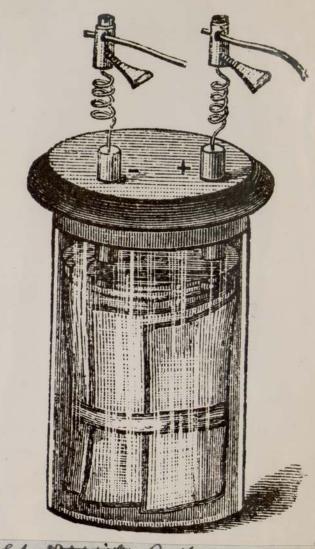
His loss will be felt by all employees of the Associated Companies of the Eastman Kodak Company throughout the world. He had cared for the welfare of his staff unceasingly since the earliest days of the Company's existence.

For some years he had not been intimately connected with the direct control of the Company, having delegated all authority throughout the Kodak world organisation to successors, whom he himself appointed, but the inspiration imparted to his executives survives. The work of the Kodak organisations will be continued in all its phases without interruption exactly as hitherto.

Kodak Ltd., Kodak House, Kingsway, London, W.C. 2 E. E. BLAKE Managing Director Electricity



101 Farraday. F.R.S



Groves Battery

Siemenis Armsture

