KINEMATOGRAPH

Specialities & Accessories

MANUFACTURED BY

L. KAMM & CO.

LONDON.

Reprinted from EDUCATION, *November 29th, 1912.*

Cinematograph and Education.

HOW TO INSTAL CHEAPLY.

At a time when the London County Council and other Education Authorities are carefully inquiring into the educational advantages of lessons illustrated by films, it behoves all educationists to consider this new aid to instruction. It is now possible to obtain films suitable for many lessons included in the curriculum of the school—elementary, secondary, and technical. Taking geography, for an instance, there is practically no corner of the earth to which the cinematographer has not penetrated; suitable films for this branch of study abound. In Russia the camera man has "taken" the great ice-breakers, cutting their way through fields of ice. Captain Scott was accompanied by a cinematographer on his dash to the South Pole.

To turn to the opposite extreme temperature, India, its inhabitants and their customs have provided a multitude of film publications. Niagara Falls, the Panama Canal zone and the mechanical operations there in progress have also been caught by the "eye" of the motion camera. English pictures also are often shown on the screen, giving opportunities for historical as well as geographical instruction.

Botanical subjects can be had in variety—many of them showing in a few minutes the development in plant and flower life occupying several days. The violet and other flowers can be seen in bud and breaking into full bloom.

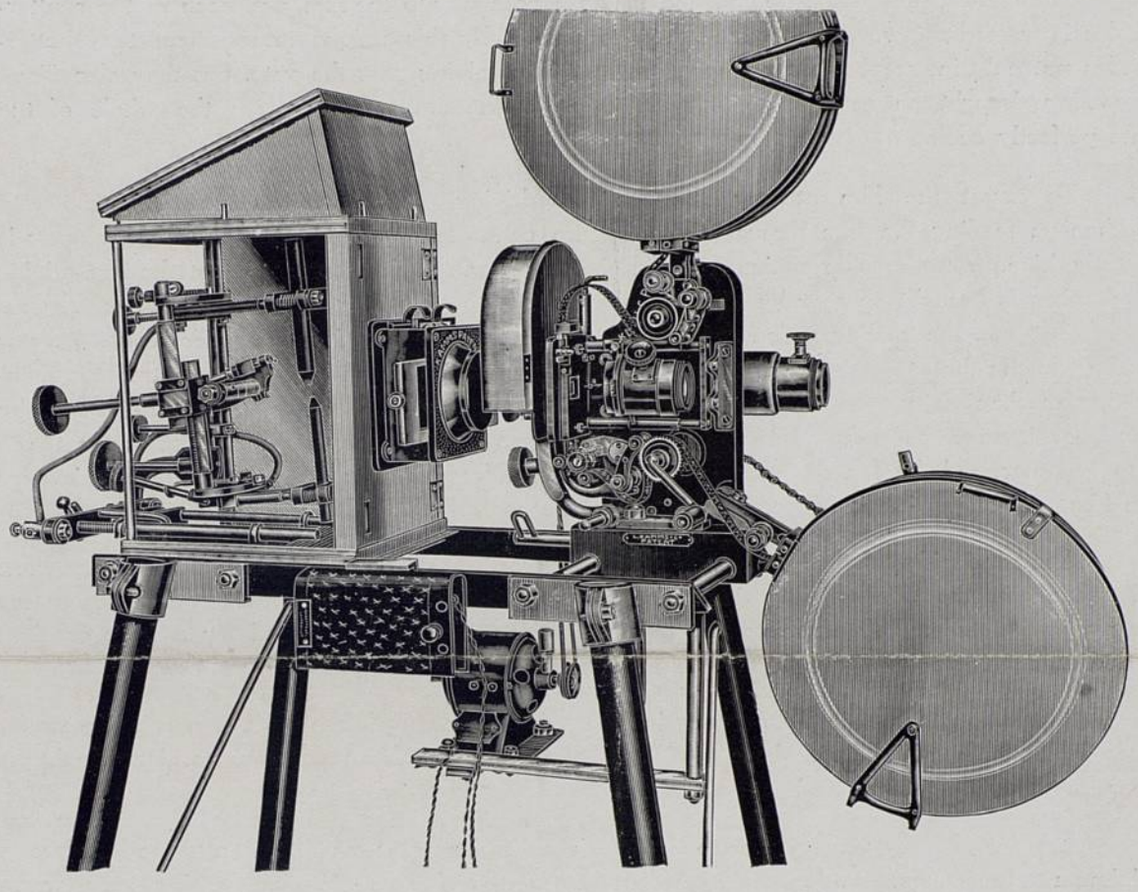
Fish and microscopical studies, tadpoles, frogs, water insects, etc., can literally be had by the hundred in film form; also the animals and birds of every quarter of the globe. Industrial and mechanical processes adopted in various countries and for various purposes are well represented in the film makers' list.

Probably some educational authorities have compared the cost of a film projector and its maintenance with the magic lantern and possibly the microscope. First of all it should be understood that a *projector* is equally good for showing *lantern slides as films*—every good machine is fitted for the *double purpose*. A good projector costs more to buy than a magic lantern, but there is no need whatever to go to such initial expense. One of the largest makers of projectors, and whose machines have been improved from time to time until they are now the standard of perfection in reliability and actual work, now offers to supply a full size machine, for film and slide projection, at the low inclusive figure of about 10s. per week. This hire cost includes not only the machine itself, but as any of the fittings show signs of wear they are exchanged without extra cost. All parts are interchangeable, are fitted together with ordinary nuts and screws, so that the projector can be taken to pieces practically with nothing more than a screw driver and screw wrench or spanner. The projector in question—the "Kamm"—is installed in hundreds of the leading picture theatres at home and abroad. Though Messrs. L. Kamm & Co., of Powell Street, Goswell Road, London, initiated this maintenance-hire system primarily for picture halls, they inform us that for the same charge of 10s. weekly they would supply a machine (and usual fittings) to any school or college. Probably if an authority installed the "Kamm" projectors in more than one school under their control, some special arrangement could be made. The connexion between projector and electric current would be made by the hirers, but this is not by any means a difficult matter, and involves but small outlay. This scheme for supplying a cinematograph at what is almost a nominal expenditure is worthy of attention by educationists generally and by schools, as well as those bodies with council schools under their control, for it places the cinematograph —so eminently suitable for educational work—within the reach of all.

W. 17989.

Kamm's Kinematograph Projector

1914 MODEL.



This projector is the latest development of the moving-film projector and is particularly designed for College, University, and Lecture purposes generally. It includes a unique feature not to be found on any other machine. The film can be arrested at any moment and in such a manner that the picture in the gate at the moment is projected as a lantern-slide. **Any particular picture of the film can thus be projected as a lantern-slide.** Furthermore, in thus arresting and projecting the film in the gate at the moment as a lantern-slide, there is not the slightest danger of the film catching fire, in the case of a celluloid film, nor of the gelatine coating on the film melting, in the case of a non-flam film. The film is, in fact, kept perfectly cool by special arrangements for this purpose. The value of the projector for Educational and Lecture purposes will thus at once be apparent. It has long been felt that, before the Cinematograph can be used for Educational purposes, it must be possible to use the film in this way without risk of fire or damage to the film.

It is a fact only too well known, that in the ordinary projector the heat from the arc or other light is sufficient to set fire to the film or to melt the gelatine coating unless the film is passed through the gate at a sufficient speed. It is not an uncommon thing for the gate itself to get so hot that even when used at a normal speed the gelatine coating on the film has a tendency to melt, with consequential damage. These difficulties in the way

of keeping the film stationary in the gate and using it as a lantern-slide at any moment are not entirely removed by the use of so-called non-flam films, in view of the liability of the gelatine to melt.

This result is attained by means of a special form and adaptation of the shutter, and by a special driving mechanism for the projector.

The shutter is situated behind and in close proximity to the film, and each of the shutter-blades is formed of two or more fan-shaped sectors. By this unique arrangement the shutter-blades not only intercept a large amount of heat in revolving past the gate, but they also direct a cooling draught on the film. This fan action of the shutter also keeps the whole of the gate perfectly cool.

To arrest the film at any moment the driving mechanism and the Maltese-cross mechanism feeding the film through the gate are connected through a clutch. The shutter is directly driven from the main motive drive for the projector. By this arrangement the film-driving mechanism is brought to rest by simply throwing out the clutch. The shutter, however, goes on rotating and the cooling action continues. To re-start the film it is only necessary to throw in the clutch ; but to save the strain on the clutch it is advantageous to re-start the film-driving mechanism by the handle provided for the purpose. The clutch may be operated by hand, or it may be adapted to be operated by an electromagnet. This electromagnet can also be energised from a distance—say, for example, from the lecture platform. In this way the film will be, as it should be, entirely under the control of the lecturer.

Another incidental, but extremely useful feature in the new projector, is that a very short title-section in the film, or any similar section of the film containing written or informatory matter, will suffice. By stopping the film such matter can be exhibited for a long or short period as desired.

In addition to the possible saving in film, the extreme usefulness of the new projector for films from which a portion of these sections of the film have been cut away will no doubt be appreciated by those who have suffered from this defect in films.

A point of very great importance also is that the wear on the film is reduced to a minimum. Injured perforations in films are principally due to the film getting very warm in the gate of the machine under heavy current, and arriving in this warm and soft condition at the intermittent sprocket, and consequently it is exceedingly liable to have the perforations torn. With the above improved gate the **film is quite cool** when it arrives on the intermittent sprocket and can therefore stand a greater strain.

L. KAMM & CO., *Scientific Engineers,*

also Manufacturers & Patentees of the above Machine.

Factory & Showrooms—

27 Powell Street, Goswell Road, LONDON, E.C.

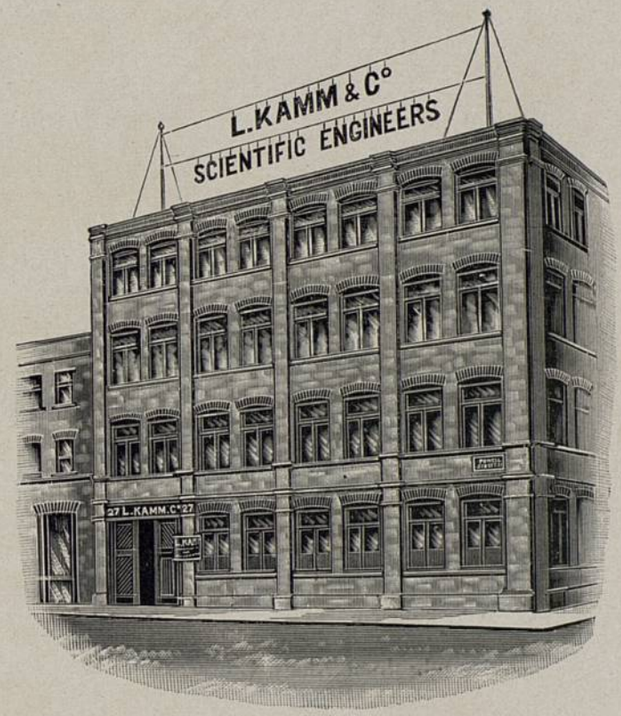
Telegraphic Address : Zerograph, Isling-London. **Telephone : Central 8281.**

CATALOGUE

— OF —

KINEMATOGRAPH AND LANTERN

SPECIALITIES AND ACCESSORIES



(From actual Photograph)

Manufactured by—

L. KAMM & CO.,

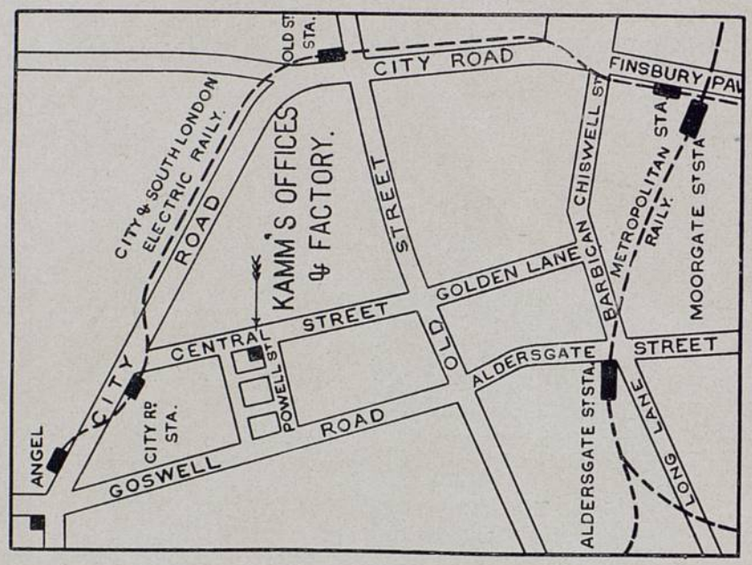
Electrical & Scientific Engineers & Manufacturers,

Showrooms, Offices & Works :

27 POWELL STREET, GOSWELL ROAD, LONDON, E.C.

Telegraphic Address : "Zerograph, London." Telephone : 8281 Central.

Telegraphic Code : A.B.C. 5th Edition.



Within 1½ minutes' walk of the City Road Station on the City and South London Electric Railway.

Through tickets can be taken to above station from all tube stations.

5	Minutes	by tube from	King's Cross or St. Pancras.
7	,,	,,	Euston.
9	,,	,,	London Bridge.
20	,,	,,	Charing Cross or Waterloo.

Clients arriving at Paddington take District train to King's Cross and Tube to City Road Station.

EXTRACT FROM

"THE KINEMATOGRAPH & LANTERN WEEKLY."

THE KINEMATOGRAPH INDUSTRY.

A representative of the WEEKLY recently went over to Powell Street and had an interesting chat with Mr. Kamm.

In a very short space of time the pressman came to the conclusion that inventions flow from the fertile brain of that gentleman as thick as leaves in Vallambrosa.

"You, Mr. Kamm, have given considerable inventive attention to kinematograph work, have you not?" queried the writer.

"Yes. I think I hold more patents in kinematograph work than any other man."

"Well now, Mr. Kamm, tell me briefly something about them."

"Well, as far back as 1895 I invented and patented quite a new form of kinematograph and which I called the "Kammatograph." It was a filmless machine enabling animated photographs to be taken to the number of 500 or 600 in succession in spiral form on a glass plate or disc, and was specially designed by me for the use of the amateur photographer. I abandoned altogether the celluloid film, and by the substitution of an ordinary circular glass plate coated with emulsion I obtained better results at a smaller outlay, at the same time reducing the difficulty in developing and printing a film of some length and I avoided the fire danger."

"I take it by this invention that you anticipated by a good many years animated pictures in the home?"

"Yes, that is so, but the people are not yet ready for animated pictures in their homes."

"Then, in 1898, I patented an improvement in kinematograph pictures, No. 6,515; the following year a new electric projecting lantern No. 15,967; the next year I brought out a new rheostat, No. 19,263; in 1902, oxygen generators (7,048), and a new carburettor (7,446), and a new acetylene lamp (2,509). In 1904 further improvements in projecting lanterns (23,685 & 25,708) and a lantern for projecting and enlarging (28,227). In the same year an improvement in the production of oxygen gas claimed my attention (6,903). In 1906 I was again at the Patent Office with a new limelight jet (14,873) and with 3 new kinematograph patents (Nos. 23,904, 24,952, and 24,953). The next year saw me there again with three new ideas, viz., kinematograph cameras (9,759), limelight jets (12,196), and kinematograph film gates (24,157). Last year I placed on the books a new carburettor (24,677), together with an apparatus for preventing the spread of fire in kinematographs (25,666)."

"That is a somewhat formidable record, Mr. Kamm. I suppose kinematograph work is an interesting subject with you in connection with your engineering work?"

"Just so. I have a large number of other patents, including printing, telegraphs, typewriting by air waves, and attaching tyres to rims. I have a telegraphic typewriter in connection with which I hold forty patents, out of which eight, including master patents, have been taken out in Germany. My cyclo-telegraph has been adopted by the British Government and used at the Aldershot manœuvres. I had the honour of demonstrating this invention in 1890 at the Military Tournament at the Agricultural Hall before King Edward, then Prince of Wales, of course."

"And what have you inflicted on a patient public this year, Mr. Kamm?"

"Well," laughed the inventor, "I have just put on the market a new lantern, the main idea of which is to obtain greater accessibility. It is made on a steel frame, and when the three sides are open nothing remains but a frame work of four pillars and a support to the lantern, stage, and condenser. I have also a new synchroniser specially adapted for the gramophone and the kinematograph, of which more is likely to be heard in the near future. My principle invention this year, so far, is a portable apparatus by which showmen and others may make their own oxygen. It does away with compressors and other cumbrous sections of the usual oxygen producer. In fact, the whole plant is contained in a flat case measuring 24×9×12 inches, and can be carried as easily as a portmanteau. It may seem like a story from fairyland when I say that I am able to charge an oxygen cylinder of any capacity with a limited pressure up to 120 atmospheres in a couple of minutes whilst I am sitting at the side watching the hand of the pressure gauge. Furthermore it does not require any manual labour or any exertion. You have only to watch the gauge, and by regulating the quantity of chemicals used the pressure can be checked to a nicety, even to half an atmosphere, when the generation of the oxygen will cease. All that has to be done is to turn off the gas tap of the cylinder and disconnect it from the apparatus. You will readily see," continued Mr. Kamm, "that the

value of such a generator can hardly be overestimated. In fact, it discards the former system of producing oxygen gas from parium oxide in obtaining the oxygen from liquid air. It will save thousands of pounds in plant and machinery and premises. Nothing of the kind has ever before been produced."

"It should be a great boon to the showman and the operator, I should say."

"Yes, it will, but I cannot give them the full benefit of it yet because the invention is under the consideration of several European governments."

"Is it as simple in its working as it is portable?"

"So simple, indeed, that a showman travelling in the desert could make his own oxygen and give a show to the Arabs in no time."

"I have heard, Mr. Kamm, that you have had some Royal recognition abroad as well as in England?"

"Yes, that is so. In 1895 I was honoured by the German Emperor, who invited me to demonstrate to him and the Empress, my telegraph typewriter on the occasion of the Imperial opening of the Post and Telegraph Museum at Berlin. The Kaiser, I may say, took the keenest interest in the working of the machine."

"I have also been told that you were once highly honoured by the Indian Government in connetion with one of your inventions?"

"Well, not exactly the Indian Government. I think I know to what you refer. It was in the Coronation year, 1902. Among the wealthy and powerful potentates in London attending the Coronation was Prince Scindia, the Governor of Gwalior. He it was who gave £10,000 to the London hospitals. He came to the works here in Powell Street to see the working of a new Punkah fan I had brought out. He was very much struck with it, and gave me orders to supply several of them. He was, I remember, a most affable and courtly gentleman, and took the deepest interest in my kinematograph machines. He bought one of my Kammatograph machines, and no end of plates. Some months after his return to India, His Highness wrote me some very nice appreciative letters, thanking me for what he was pleased to call my courtesy and painstaking ability to please him over the business transactions we had together.

A tour of the big building followed the conversation, where the WEEKLY representative saw, stage by stage, the conversion into concrete form of the inaugurative genius of the founder of the firm.

PREFACE.

ALTHOUGH we are desirous of pointing out the superiority of our manufactures over other makes of apparatus, we do not hold with the practice to run down British-made goods by writing in catalogues and advertisements useless statements, which are only calculated to attract the less experienced purchaser. The fact that our machine is covered by ten English Patents, and also the adoption of the machine by His Majesty's Government is sufficient proof that

Our Goods are absolutely the Best

and that no manufacturer can duplicate our wares or offer their equivalent. Our increasing new multitude of customers must believe it. No man would abandon an article which secured the control of the market, in favour of a new article at a higher price, unless he were convinced of its intrinsic superiority. Our utmost endeavours have been insufficient to keep up with our orders, and yet every purchaser must believe before ordering our Kinematograph that it is absolutely unequalled. Any rival machine is less value, and the advanced price he pays is a proof that he has decided on our superior worth. Often he dispenses with a machine of some other make because he wants the clearly defined flickerless and steady picture which he can get from us, and which he cannot get from others.

These are facts from which any reasoning man may draw his own deductions. There is not a man in the business to-day who does not know that our goods stand alone, in a class by themselves and without any equal. All that we need is that the customer on the outside may ascertain the fact which is taken for granted by the salesman on the inside.

We have always adopted an attitude of justice and fair dealing towards our customers. If anything is not right we will make it right, and will do so willingly and cheerfully. We treat our patrons with courtesy, not with arrogance. We are not aware of a single customer who has ever had reasonable ground to find fault with us.

TERMS.

DELIVERY.—Free on Board or Rail. All goods are most carefully packed; we do not, however, hold ourselves responsible for breakages or loss in transit. Should goods be found damaged on arrival, claim should at once be made on the Carriers.

PACKING and cases charged for at cost price and not returnable.

CARRIAGE charged forward.

PAYMENT.—Cash with order, except with Firms desirous of opening an account, in which case they should furnish two Trade References **(preferably London).** Such accounts are payable **within one month following delivery of goods,** and are subject to a Cash Discount of **2½** per cent.

Accounts three months overdue will be debited with **5** per cent. interest.

Cheques and Postal Orders should be crossed "London, County and Westminster Bank, Limited."

REMITTANCES may be made by London Bank Drafts or Cheques or by P.O., Money or Telegraphic Orders, or Cable Transfer.

Remittances should also cover Freight and Packing, and in case of export, tinlined cases.

SHIPPING.—Apparatus are not sent on approval to Foreign Countries.

ALL GOODS we guarantee to be of the very best workmanship, and for the manufacture the finest material only is used.

All prices in this list are subject to change without notice.

KAMM'S PATENT
MALTESE CROSS PROJECTOR

The ONLY Flickerless Projector. As steady as a Lantern Slide.

(BRITISH MADE THROUGHOUT.)

As supplied to His Majesty's Government.

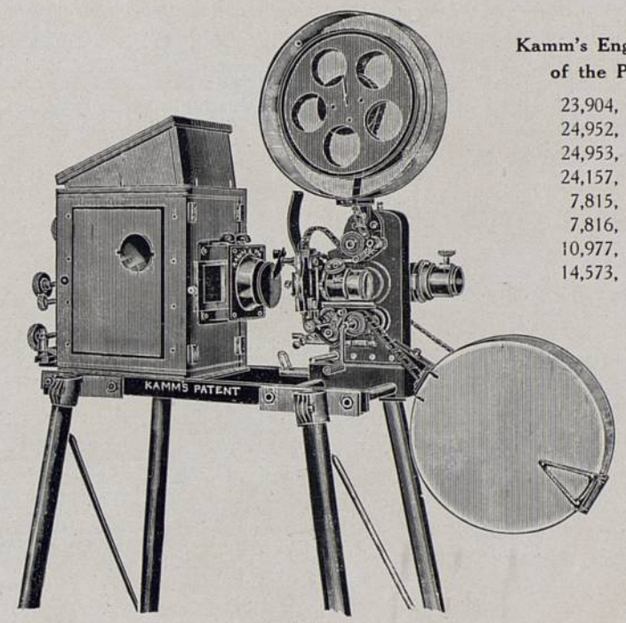


Fig. 1

Kamm's English Patents of the Projector.

23,904,	1906
24,952,	1906
24,953,	1906
24,157,	1907
7,815,	1910
7,816,	1910
10,977,	1910
14,573,	1911

PRICES of

Kamm's Patent Maltese Cross Projector with lamp house, fitted on steel frame, with one cine lens, one lantern slide lens, and two spools, complete as shown in the illustration	£35 0 0
Extra: **Steel Stand,** Telescopic	£3 0 0
Arc Lamp (100 amp.) continuous or alternating current ...	£4 0 0
Two Fireproof Spool Boxes, 14 inch diameter	£3 0 0
Complete Outfit, ready for projection	£45 0 0

CONSTRUCTION.

This machine is the outcome of years of experience and careful study of an apparatus which, in modern times, is put under the greatest strain for durability. It is designed to meet the long felt want for a perfectly steady and flickerless picture. The modern audience insist on having a good picture, and their criticism is only too often noticed in the halls where pictures are shown, by their appreciation or depreciation, not so much of the subject of the picture, as of the defects of projection. We have now succeeded in producing an apparatus which will meet with every required point to the utmost.

In the first place we have absolutely done away with flicker, and may say that flicker is a thing unknown in connection with the kinematograph which we manufacture, our success being due to a certain invention and improvement.

The wear and tear also is a great consideration. We have adopted a principle which is new in connection with the kinematograph. All rotary parts which are liable to wear, such as the gear wheels, are encased in an oil and air-tight reservoir. The train of gear wheels, as well as the pinion and maltese cross and fly wheel are all running in oil, and when the machine is operated all these parts are in a continuous spray of oil.

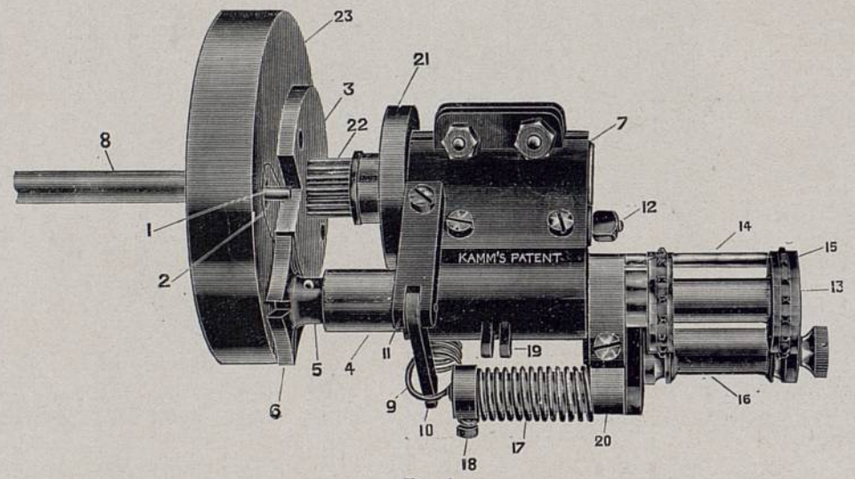


Fig. 2

OUR SYSTEM of maltese cross as shown in fig. 2 is original and patented in all the principal countries.

The object of these improvements is to prevent breakage of the engaging pin by eliminating sudden shocks against the cross when in action, and facilitating adjustment of the maltese cross action, and to obviate the cross wedging against the locking disc when any foreign body happens to get between the two surfaces, which causes wedging or breaking.

In the first instance the pin 1 is mounted on a pivoted lever 2, which is held by an antagonistic spring (at the reverse of the fly wheel, not shown) against the side, which is its normal position. This lever 2 is fixed against the locking disc 3. The bearing 4, which carries the spindle of the maltese cross 5,

is pivoted on the sleeve 7, which is engaged by the bearing 21 of the pinion spindle on which the locking disc is fixed. The said bearing 4 of the maltese cross spindle, is kept tight in its position by an antagonistic spring 9. Between the bearing 4 of the maltese cross spindle and the sleeve 7 which is engaged by the bearing 21 of the locking disc spindle 8, a wedge is inserted with an inclined surface, which is capable of being drawn in or out by means of a nut 12 on its outer end.

If, for instance, a piece of grit or metal should happen to get between the surface of the cross 6 and the locking disc 3 it will be clearly seen or understood that the maltese cross 6 will separate from the locking disc 3 owing to the insertion of this foreign body. As soon as the foreign body drops out, the bearing of the maltese cross spindle will take up its normal position under the pressure of the antagonistic spring.

The spindle 5 of the maltese cross is bored up on the intermittent sprocket side 13, and split longitudinally so as to enable a conical screw (which is not shown) to separate the split part, in order to wedge the intermittent sprocket 15 on the spindle 5. This method of fixing the intermittent sprocket facilitates the ready removal and replacing of the intermittent sprocket in order to adjust the maltese cross action.

SHUTTER.

As will be noticed in the illustrations, Figures 1 and 3, the shutter in front of the lens has disappeared altogether, and it will also be noticed at once that the apparatus will lend itself for very short focus lenses, as the new type shutter runs immediately in front of the film, thus obviating all disadvantages of shutting off the light a distance in front of the lens. With this system we can show an absolutely flickerless picture, 12 feet in diameter, at a distance of 16 feet, which cannot be done with any other machine in existence. When the light is thrown on the screen with this machine, without a film, and the handle turned, no flicker whatsoever appears on the screen. This holds good whether short or long focus lenses are used. The apparatus adapts itself for any focus lenses, without the use of lengthening tubes or any other arrangement which cannot be done at a moment's notice on the spot.

MASKING.

This machine has a further great advantage in masking the picture up or down, without interfering with the optical axis by racking the lens up and down and also the arc lamp. In fact it is every bit as simple as in our UNIVERSE machine, which has been so much appreciated in the past.

BEARINGS.

This machine is exceedingly neat and compact, and every part is made of steel wherever desirable. The bearings (which are $4\frac{1}{2}$ inches long), are made of special metal, harder than phosphor bronze and are removable. Their wearing surface is therefore very great, in fact much in excess of what is theoretically required. All pinions, as well as the maltese cross, are made of steel and hardened.

FRAME.

The whole machine is fixed upon a steel frame sliding upon two parallel rods, and comprising a locking device. The mechanism can be moved with the little finger from the position for showing film, to the position for showing lantern slides, and when locked forms a solid mass with the whole apparatus, which makes it as firm as a rock. *Patent No. 24952/1906.*

Wood is entirely discarded, as, through the intense heat which is created by powerful electric arc lamps, the wood is apt to warp, thus forming the baseboard into a curved surface, and rendering the whole apparatus very unsteady. The springy action of wood, is also very detrimental to steady working.

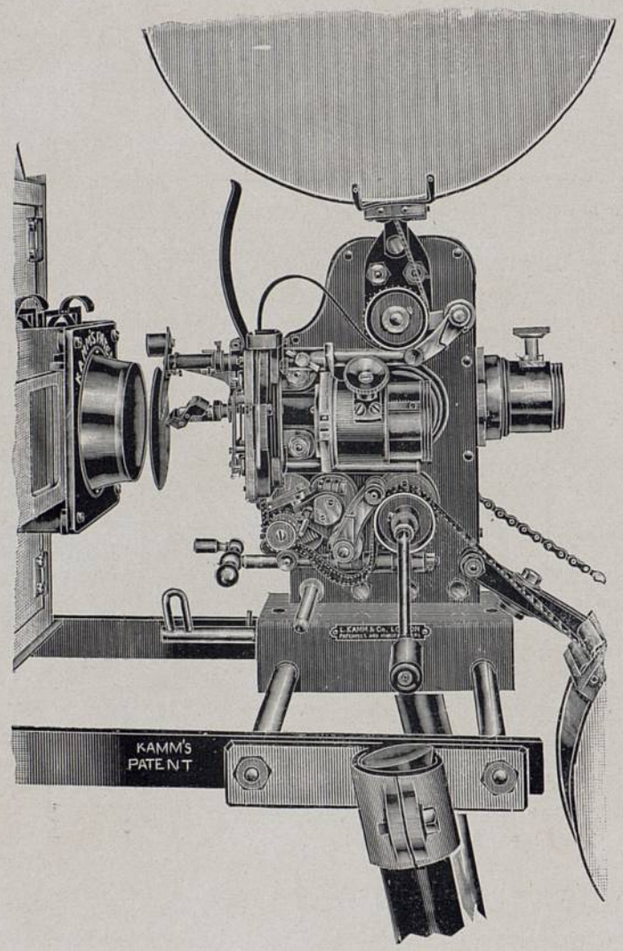


Fig. 3

TAKE-UP.

We have purposely not adopted the [illegible]

The new Take-up. The improvements in the take-up consist of a new arrangement to vary the pressure of the friction clutch by means of a handle which rides on the top of the spool box. This enables the operator to increase the pressure in the friction clutch at will while the machine is running, as the spool gets full. This new improvement entirely obviates the danger while operating of the film collecting inside the spool box without winding up, or running on the floor.

AUTOMATIC SHUTTER.

The machine is also provided with our patent automatic shutter, and every other safeguard to prevent the film firing, and as a practical test one may burn a hole in the film, and the flame will be confined to the space within the mask, and will not spread beyond the size of the mask. The patent governor for working the automatic shutter is of such simple nature that it is impossible for it to get out of order. There are no bevel wheels such as are usually used with an upright governor with two balls, as bevel wheels are very apt to wear at the very high rate of speed at which the machine has to travel.

FILM GATE.

The Gate is of solid construction, and the film runners are made of hardened cast steel, which ensures absolute durability. The picture mask and runners can be removed by the removal of one milled nut for cleaning and examination. The gate has been improved (Patent 24157, 1907), and in place of the bow springs formerly used, four steel runners are provided which press on the film evenly during its passage through the gate. The pressure of these runners can be adjusted while the machine is in operation if required, as is very often desirable when two films by different makers are joined together, or when a worn film is joined to a new film. With these runners also the wear and tear on the film is much less, as the pressure is evenly distributed throughout the entire length of the gate.

SPOOL ARMS.

The spool arms are made of steel on the girder principle, and are provided with an automatic locking device, holding the arms in the position required.

SPROCKETS.

The greatest care has been taken to have the sprocket wheels absolutely correct, and they will fit any standard film. They are made of ~~special forged metal, harder than phosphor bronze.~~ hardened steel

GENERAL FINISH.

The framework of the machine is stove enamelled black, and all steel parts are nickelled to prevent rust.

GUARANTEE.

All parts are made universal and interchangeable, and we guarantee the machine against wear and tear, and to show a good picture at the end of 3 years, after working 12 hours a day. (*See copy Guarantee, page 16.*)

LAMP HOUSE.

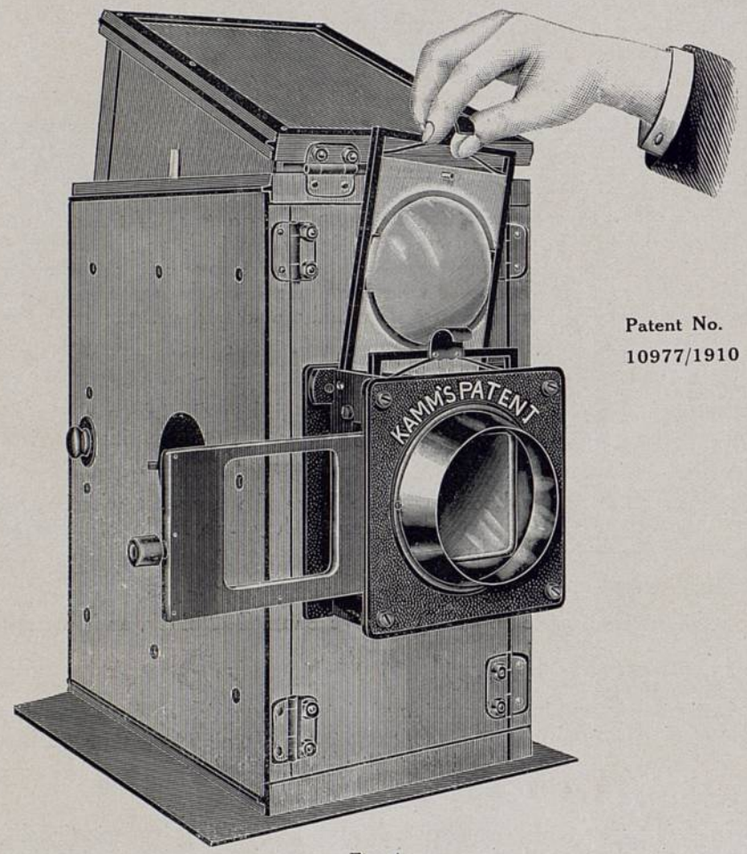
With this apparatus we supply a lamp house which is exceptionally large, namely, 12½ inches long, 10 inches wide, and 16½ inches high. The cowl, which is wedge shape, increases the height to another 4½ inches, enabling full size carbons to be used.

The lamp house is not made of "Russian iron", but is made of the best Sheffield Steel Plates, three times the thickness of Russian Iron. Although this house will stand the weight of three men standing on it, it is still very light and weighs only 16 lbs. by itself. It is asbestos lined throughout, and is provided with a very large spy hole, with two sets of glasses to dim the light. It also has large size doors and collapsible top, and in the event of the arc lamp requiring adjustment, access is obtainable from all sides.

The door on the side nearest the operator is double, with an air space between, which is ventilated at the top and bottom, in order to prevent it getting very hot. Carbons 12" long can be used with our lamp house and arc lamp.

CONDENSER LENS MOUNT.

We draw special attention to our patent condenser lens mounts, Patent No. 10977/1910. It will be noticed in the illustration, Fig. 4, that a single lens can be inserted or removed. This arrangement does not require any further comment, as every operator knows what it means to change a condenser lens which is mounted in an ordinary tubular mount, when it breaks. Our system is absolutely the height of simplicity and convenience.



Patent No.
10977/1910

Fig. 4

SLIDE CARRIER.

A metal slide carrier is also included with each lantern, which also acts as an additional light shut off.

STEEL STAND.

The steel stand which we supply for our machines, is made telescopic, and any desirable position may be obtained, whether in height or angle. The convenience of being able to put this stand together in the short time required, is a great advantage. Also the small bulk of this stand compared with the cast iron stand, is a point well worth consideration.

MOTOR DRIVE.

The apparatus may advantageously be driven by a motor. The exact position of the motor, as well as the resistance for regulating the speed, will be noticed in the illustration, Fig. 5. One very good point which we cannot show on the illustration in connection with the motor drive, is the possibility of shifting the kinematograph mechanism laterally, without having to shift any belt from the motor. The motor may be kept running, and yet the mechanism may be shifted either way.

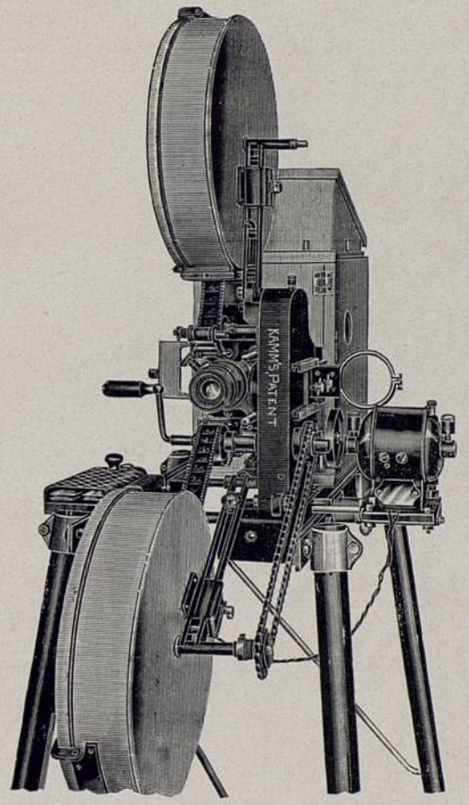


Fig. 5

BIOSCOPE MOTORS.

The ideal method of running a bioscope is by means of a motor, as there is no unsteadiness due to uneven turning. These motors do not use any more current than an ordinary electric lamp. They leave the operator perfectly free to adjust the arc lamp, focus of picture, &c. The motors are supplied with speed regulator. When ordering state voltage required, and if alternating current, state also the periodicity. They are supplied for any voltage between 60 and 120, and between 200 and 250.

PRICES of

Continuous Current	£3 10 0
Alternating Current	£3 15 0
Speed Regulating Resistance, 60-120 and 200-250 volts	£1 5 0
Attachment for fitting motor to bioscope	£1 5 0

KAMM'S
PATENT CAM or DOG MACHINE.

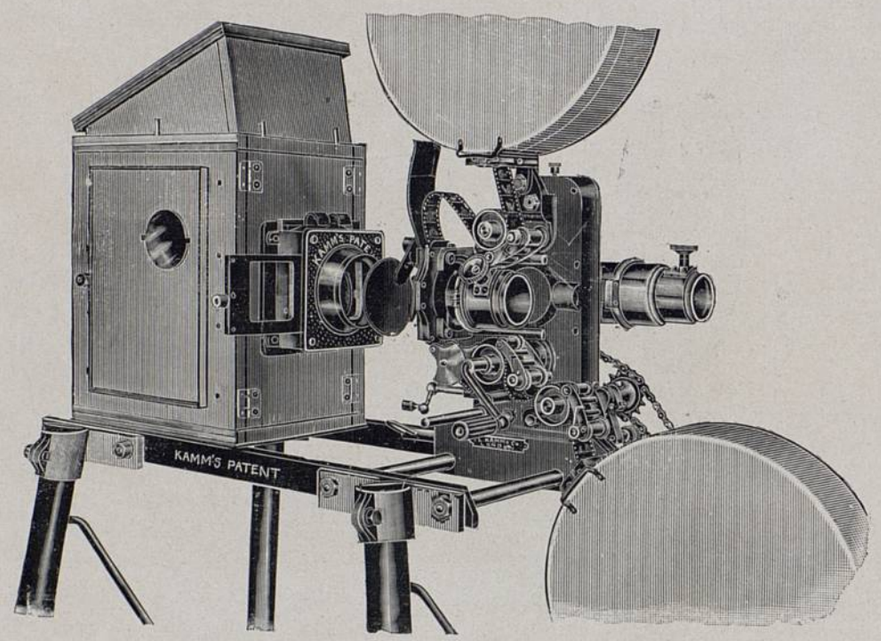


Fig. 6

As shown in the illustrations, Figs. 6 and 7, is of a similar construction to our maltese cross machine. All the moving parts of the apparatus are cased in, and are running in an oil bath. All parts are made interchangeable and are of the same calibre as our maltese cross machine.

This new kind of "Dog" machine can advantageously be used on film with broken perforations and cuts, which could not be expected from a maltese cross machine. **A picture shown with our dog machine cannot be equalled by any other make dog machine.**

A third sprocket, which is supplied with this machine, adds greatly to the steadiness of the picture when an old film is to be shown.

The workmanship is of the highest standard, and we guarantee this dog machine against wear and tear, the same as our maltese cross machine, for three years.

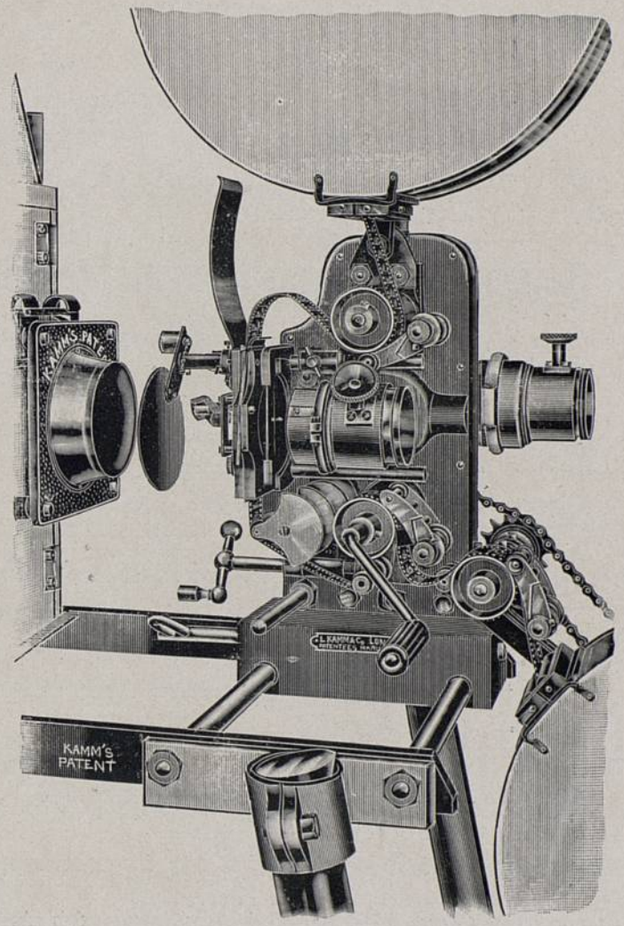


Fig. 7

PRICE of

Kamm's Patent Cam or Dog Machine with third sprocket, fitted on steel frame, with lamp house, one cine lens, one lantern slide lens, and two spools, complete as shown in the illustration	£30	0	0
Extra: **Steel Stand,** Telescopic	£3	0	0
Arc Lamp (100 amp), continuous or alternative current ...	£4	0	0
Two Fireproof Spool Boxes, 14 ins. diameter	£3	0	0
Complete Outfit, ready for projection	£40	0	0

COPY OF GUARANTEE LETTER.

Telephone No
8281, P.O. CENTRAL.

Telegraphic Address,
"ZEROGRAPH, LONDON"

Works:- 27. Powell Street,
Goswell Road.
London.
E.C.

1½ minutes from City Road Station on the City and South London Electric Railway

L. Kamm & Co

SCIENTIFIC ENGINEERS & MANUFACTURERS.

OF EVERYTHING IN CONNECTION WITH KINEMATOGRAPHS.

CONTRACTORS TO THE BRITISH AND FOREIGN GOVERNMENTS

Machine No.....

Date delivered.....

Sold to .....

Through our agents, Messrs.... .....

We guarantee the above machine for three years from the date on which it was delivered against defect in material + workmanship wear and tear, and will replace any parts which unduly wear, provided that if it is necessary to return any part of the machine to us it is sent carriage paid, but will not hold ourselves responsible for any consequential losses or accidental damage to the machine. This guarantee only applies when the machine is in the possession of the original purchaser and when used by himself or his assistant.

STEEL STAND.

This stand is made with weldless steel tubing, and is very strong and light. It is especially suitable for Kamm's machines, and is guaranteed absolutely rock-rigid. All the legs are telescopic, so that the machine can be tilted to any angle. *(See illustration No. 1).*

Price £3 0 0

Measurements.

Height of centre of lens from floor	47 inches
Distance apart of stand legs on floor	26 × 37 ,,
Distance apart of stand legs on floor, when legs telescoped out 12 inches longer	29 × 40 ,,
Maximum angle at which machine can be tilted, with legs usual length	22½°
Overall length of apparatus, with Arc Lamp in position, and with Spool Boxes on	46 ,,
Ditto but with legs telescoped out 12 inches longer	48 ,,
Height of apparatus with Spool Box on	68 ,,
Minimum size of projecting opening in operating room	9 × 7½ ,,

Instructions for Fixing Steel Stand.

(See fig. No. 1 in catalogue.)

First place the legs in the corner brackets and tighten the clamping nuts up. Do not do them up to tightly, or the casting may break, as a great leverage can be obtained with a spanner and screw. Then place the feet between the two legs at one end, and force them apart by pressing against them with the feet and knees, and place the straining bar first in the upper hole of one leg, and the other end in the lower hole of the other leg. Do the same with the other pair of legs.

Be careful that the straining bars are parallel with one another, that is to say, the strainers should be placed in the lower holes of the two legs on the one side of the machine, and the upper holes of the two legs on the other side of the machine, otherwise the machine will not stand so steady. If these instructions are properly carried out the stand will be absolutely rock steady. Any uneveness on the floor can be put right by means of the telescopic parts of the legs.

FIREPROOF SPOOL BOXES.

(PATENT 25666/1908).

These are preferably made round, which is a convenient shape for packing. The film is drawn between rollers through a slot in the box. When the fireproof box is shut a film may be set alight from the outside, but it is impossible for the fire to penetrate the box, thus ensuring absolute safety. These boxes are made universal and fit either the top or the bottom spool arm, and they can be fixed in a few seconds without the aid of any tools whatsoever, when used in connection with Kamm's Machine. They can also be attached to any ordinary standard machine of other makers. These boxes are made in one size only, 14 ins. diameter, which is the size allowed by the Board of Trade Regulations. *(See illustration No. 1.)*

PRICE of

Fireproof Spool Box, 14 inch diameter ... . each **£1 10 0**

Iron Boxes for Storing or Carrying Spools

up to 14 ins. Diameter.

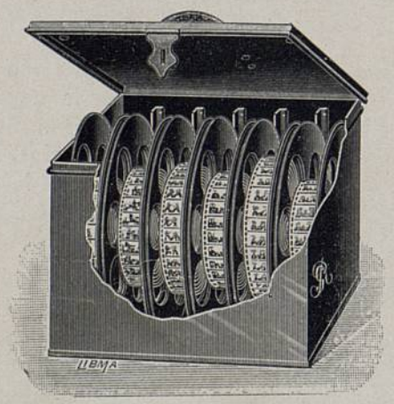


Fig. 8
6 Spool Storage Box.

To take 3 Spools ... **10**/– each

Do. 6 „ ... **12/6** „

STEEL SPOOLS.

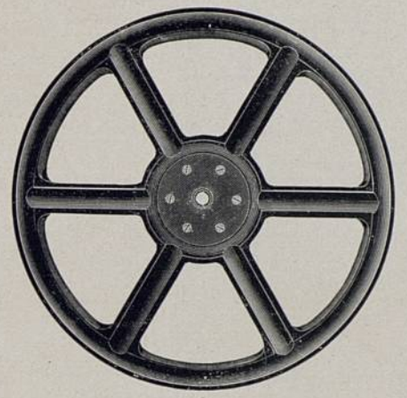


Fig. 9—12 inches

Absolutely rigid, edges bevelled
and beaded
with angular fenestration.

12-ins. diameter, **2/6** each

13½ „ „ **3**/– „

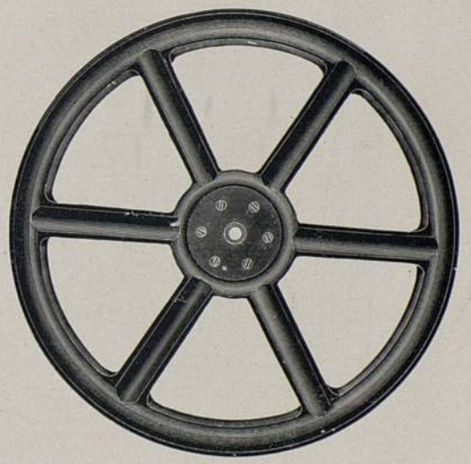


Fig. 10—13½ inches.

FILM & SPOOL WINDERS.

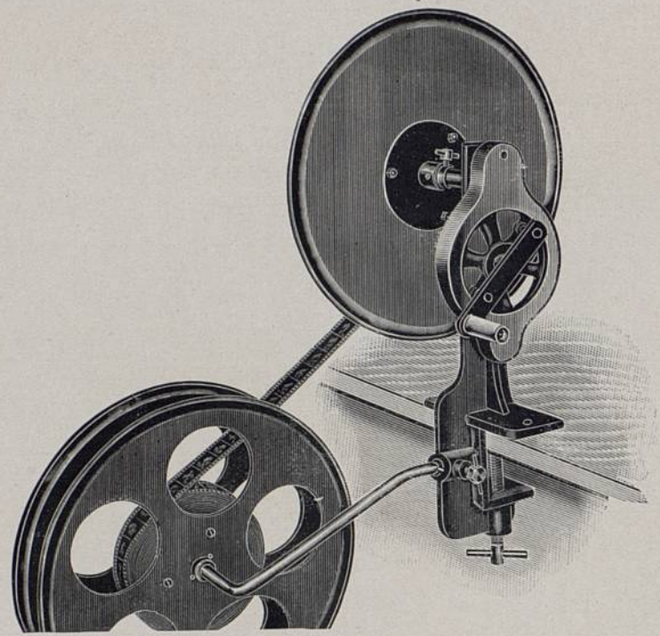


Fig. 11.

Winds Films & Spools up to 14-ins. diameter ... ... **Price £1 5 0**

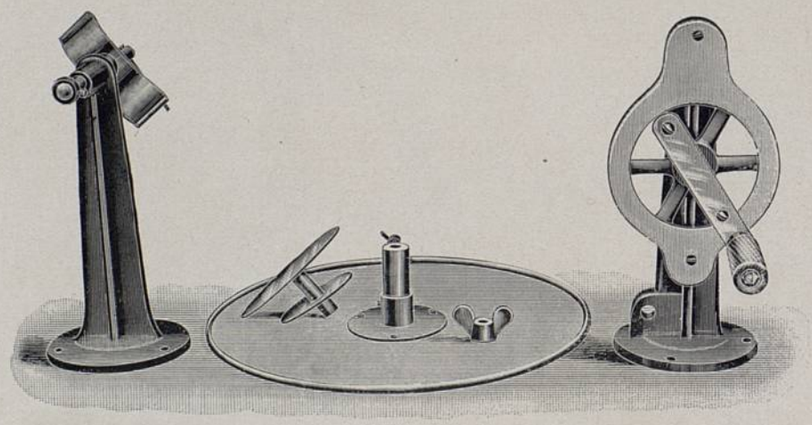


Fig. 12

Table Rewinder ... ... **Price £1 15 0**

Can be fitted in any position on bench or table, complete for winding films or rewinding spools.

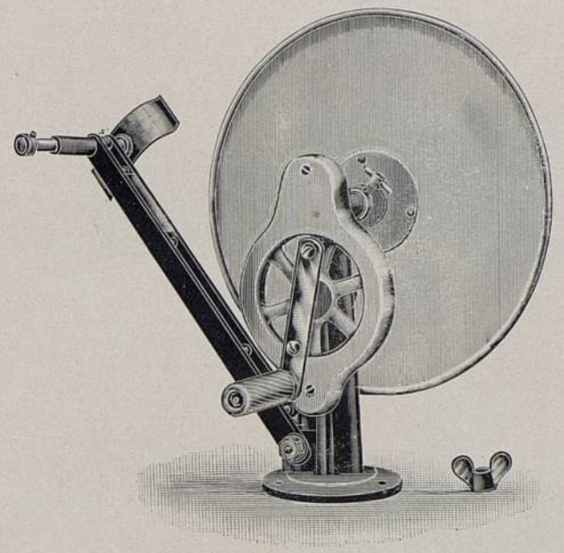


Fig. 13

Collapsible Rewinder
with girder spool arm and
live spindle,
complete for winding films
or rewinding spools
(Fig. 13 & 14)
£1 15 0

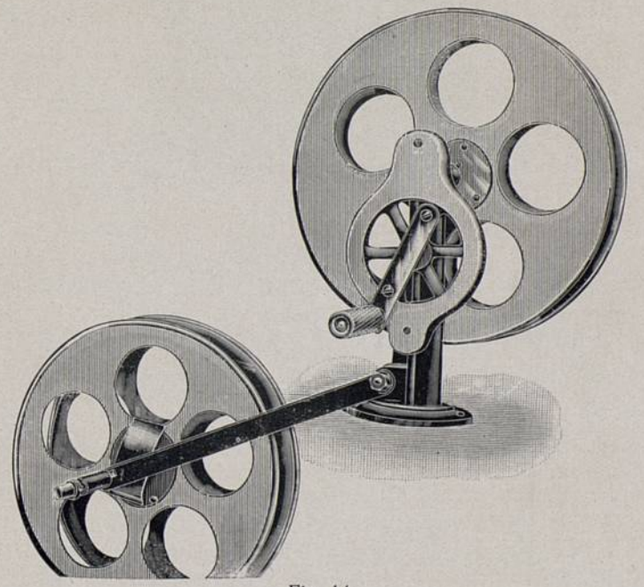


Fig. 14

FILM MEASURER

for use with any of the above rewinders, **Price £2**

FILM MENDER.

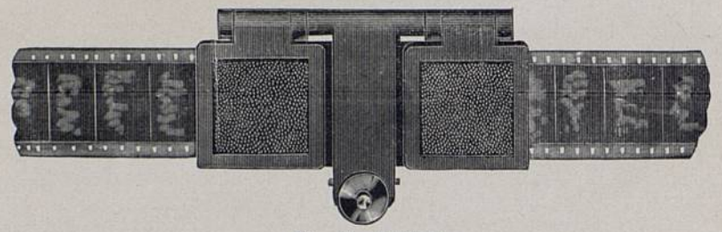


Fig. 15. SHUT.

FILM CEMENT.

4 ounce bottle, **1/6**

8 „ „ **2/6**

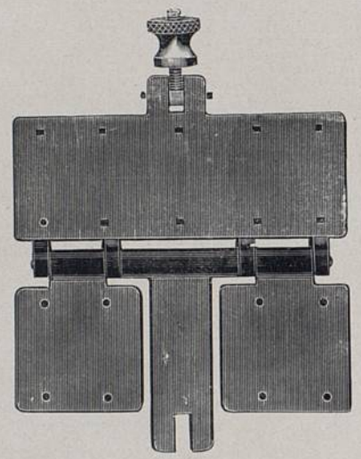


Fig. 16. OPEN.

PRICE

7/6

KAMM'S NON-FLAM FILM CEMENT.

Price, 1/– per stick.

The great difficulty hitherto found in obtaining a cement which will stick non-flam films firmly, has now been overcome by the use of the above cement. A little of the cement is rubbed on the surface of a piece of flat metal, which has been previously warmed. The ends of the film having been trimmed, are pressed on the metal so that they take up a thin layer, and are then pressed together between the fingers for a few seconds. This join will be found to be quite strong when it is set, and impossible to pull apart.

Special Lubricating Oil, ... 1 pint bottle **1/–**

Safety Cut-off & Dissolver, arranged to be clamped against the cone of the lantern ... ... Price, **10/–**

LENSES.

CINE LENS TUBES. Large Diameter.

1 inch Focus	**£6**	**10**	**0**
$1\frac{1}{8}$ „ „	**£6**	**0**	**0**
$1\frac{1}{2}$ & $1\frac{3}{4}$ inch Focus	**£1**	**7**	**0**
2, $2\frac{1}{4}$, $2\frac{1}{2}$, $2\frac{3}{4}$ inch Focus	**£1**	**1**	**0**
3 inch to $5\frac{3}{4}$ inch Focus, every $\frac{1}{4}$ inch	**£0**	**18**	**0**
6, 7 & 8 inch Focus	**£0**	**10**	**6**

CINE LENS TUBES. Double Illumination.

3 inch to 6 inch Focus ... ... each **£2 0 0**

CASKET OF CINE LENSES.

Consisting of one complete lens tube and five extra lenses which screw on the front of the tube to alter the focus.

Complete for 2, $2\frac{1}{2}$, 3, $3\frac{1}{2}$, 4, $4\frac{1}{2}$ inch foci **£2 0 0**

LANTERN SLIDE LENS TUBES.

6 to 18 inch focus, every 2 inches **10/6** | 20 inch and above **15/–**

SPECIALLY ANNEALED CONDENSER LENSES.

Ordinary Focus, 4 inch dia. Biconvex or Meniscus ... ... each **2/6**

*Long Focus, 8 inch or 10 inch Meniscus ... ... „ **3/–**

* For use with cine lenses of 4 inch focus and above.

LENS JACKET or RACK MOUNT.

To take large diameter lenses ... ... each **12/–**

ADAPTOR.

For fitting in large Jacket to enable small diameter lenses to be used „ **3/–**

Announcement and Lantern Slides.

Price 1/6 each *(coloured).*

The following is a list of those usually required, but similar announcements to order can be supplied at the same price.

His Majesty the King
Her Majesty the Queen
Their Majesties the King & Queen
Good night
A pause of one minute for change
Five Minutes Interval
Interval
No smoking, please
Will Ladies kindly remove their [hats
Special Matinee on Saturday next
A Merry Christmas
A Happy New Year, &c.

Specially prepared black slides, suitable for writing special announcements with a sharp pointed instrument. **Price, 9d per dozen.**

KAMM'S UNIVERSAL ARC LAMP.

(PATENT APPLIED FOR.)

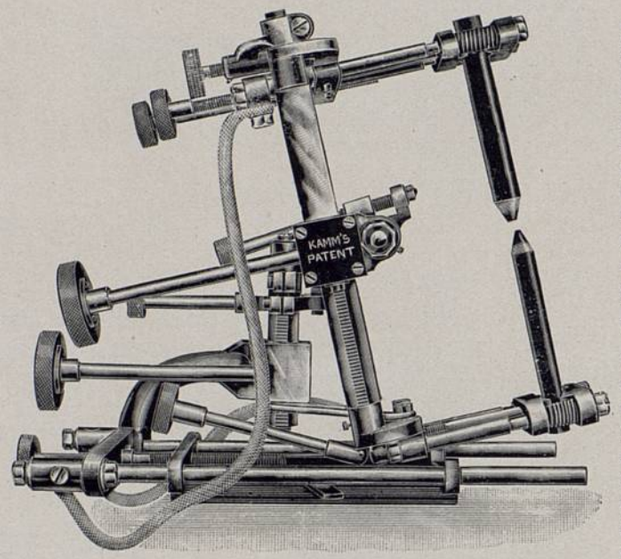


Fig. 17

The illustration shows actually the "last word" in hand-feed arc lamps. Every operator knows the difficulty of changing carbons when the lamp is hot. With our new universal arc lamp which has nine adjustments, all these difficulties are overcome. A fresh carbon can be inserted as easily as the feeding of the arc lamp when in operation. The arc lamp is very solidly made and all worm adjustments are entirely obviated. The racks are made of triangular brass of 1 inch section, which is exceptionally large. The lamp is built up of gunmetal and steel, and will carry 150 amperes with the greatest safety.

1—Clamping screw for upper carbon.
2—Clamping screw for lower carbon.
3—Carbon Feed.
4—Vertical adjustment of arc lamp.
5—Lateral adjustment of arc lamp.
6—Angular adjustment of arc lamp. (For tilting lamp.)
7—Longitudinal adjustment of upper carbon
8—Lateral adjustment of upper carbon.
9—Screw for advancing entire arc lamp.
10—Parallel rods sliding in sleeves on tray.
11—Fixing lever for tray.
12—Adjustable tray.

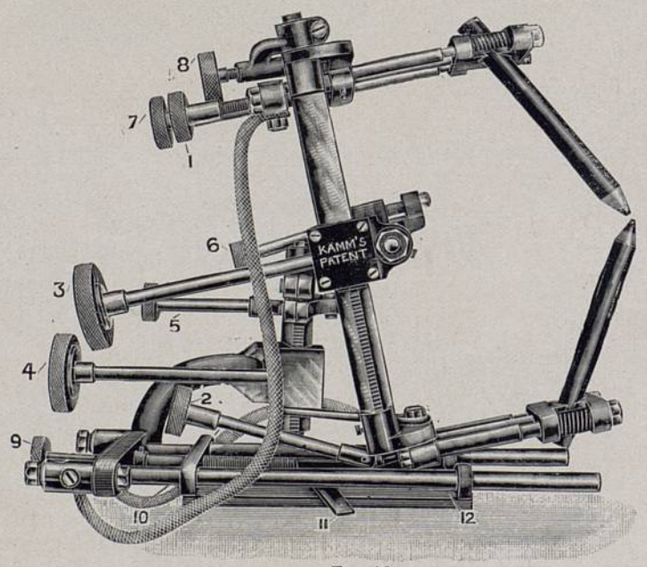


Fig. 18

Price ... ... £6 10 0.

KAMM'S UNIVERSAL ARC LAMP.

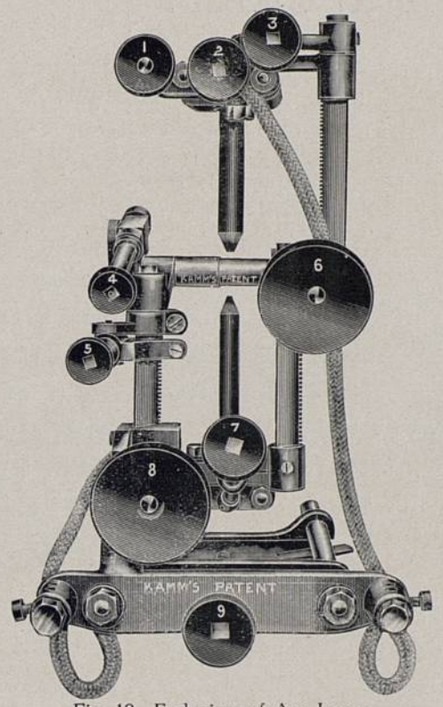


Fig. 19—End view of Arc Lamp.

1—Longitudinal adjustment for upper carbon.
2—Clamping screw for upper carbon.
3—Lateral adjustment of upper carbon.
4—Angular adjustment of arc lamp. (For tilting lamp.)
5—Lateral adjustment of arc lamp.
6—Carbon Feed.
7—Clamping screw for lower carbon.
8—Vertical adjustment of arc lamp.
9—Screw for advancing entire arc lamp.

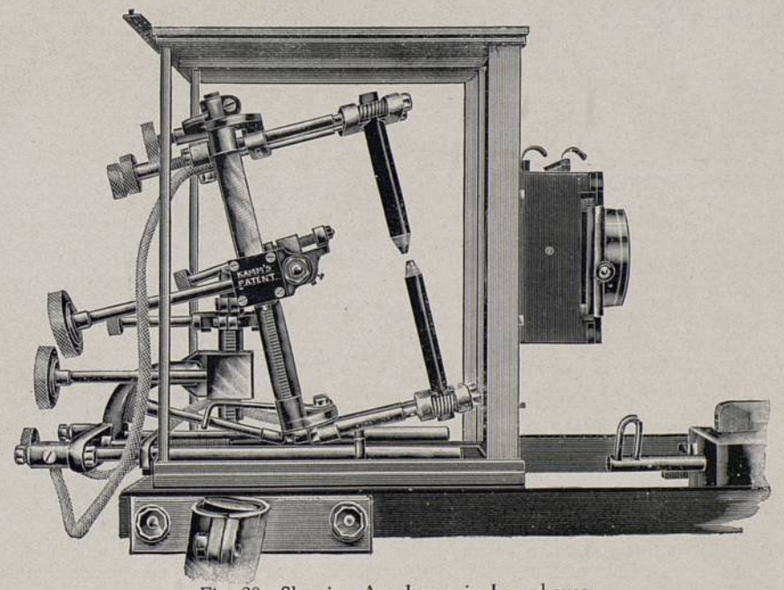


Fig. 20—Shewing Arc Lamp in Lamphouse.

POPULAR ARC LAMP.

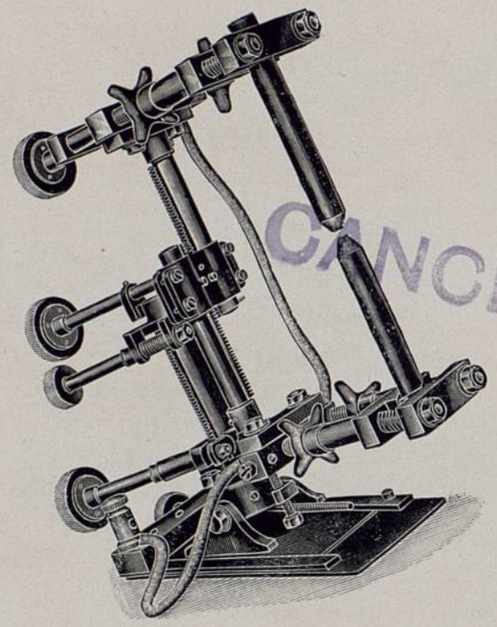


Fig. 21—For continuous current.

Heavily made in brass with steel screws, and will carry any current up to 120 amperes. Has every adjustment usually supplied, and in addition an extra adjustment for advancing the whole lamp in the lantern for focussing the light. Can be supplied for alternating or continuous current. Extra carbon holder blocks can be supplied so that the lamp may be used for either current as desired. (See illustrations 4 & 5.)

Price, £4 0 0.

Carbon Holder Blocks

the set of four, to enable lamp to be used for alternating or continuous current.

Price 10/– the set.

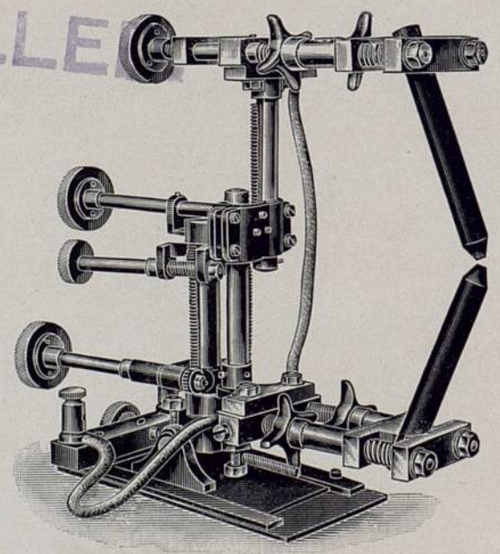


Fig. 22—For alternating current.

CARBONS.

FOR DIRECT CURRENT.

Suitable for Amperes						Per 100 pairs 6 ins. long	8 ins. long	12 ins. long
5–10	7 m/m Solid	and	10 m/m Cored			**3/–**	**4/–**	**6/–**
10–15	10 ,,	,,	13 ,,			**4/–**	**5/4**	**8/–**
15–25	12 ,,	,,	16 ,,			**5/6**	**7/4**	**11/–**
25–40	13 ,,	,,	18 ,,			**7/–**	**9/4**	**14/–**
30–60	14 ,,	,,	20 ,,			**9/–**	**12/–**	**18/–**
40–80	16 ,,	,,	22 ,,			**10/–**	**13/4**	**20/–**
50–100	18 ,,	,,	25 ,,			**13/6**	**18/–**	**27/–**

FOR ALTERNATING CURRENT.

10–20	...	...	...	10 m/m Cored	**3/6**	**4/8**	**7/–**
20–30	...	...	...	13 ,,	**5/–**	**6/8**	**10/–**
30–50	...	...	...	18 ,,	**9/–**	**12/–**	**18/–**

D-section carbons can be supplied at an extra cost of 25 %

SPECIAL CARBONS

for Alternating Current. Silent Arc. Fixed Crater.

One of these Carbons is used in the upper carbon holder, and an ordinary cored carbon, the same size, is used in the lower carbon holder, or two of these carbons may be used.

Snitable for Amperes						Per 100 carbons 6 inch	8 inch	12 inch
10–20	...	...	13 m/m	...	...	**9/6**	**12/8**	**19/–**
20–30	...	...	16 ,,	...	...	**14/–**	**18/8**	**28/–**
30–40	...	...	18 ,,	...	...	**18/–**	**24/–**	**36/–**
40–60	...	...	20 ,,	...	...	**22/–**	**29/4**	**44/–**
60–80	...	...	22 ,,	...	...	**22/6**	**30/–**	**45/–**

THE POPULAR RESISTANCE.

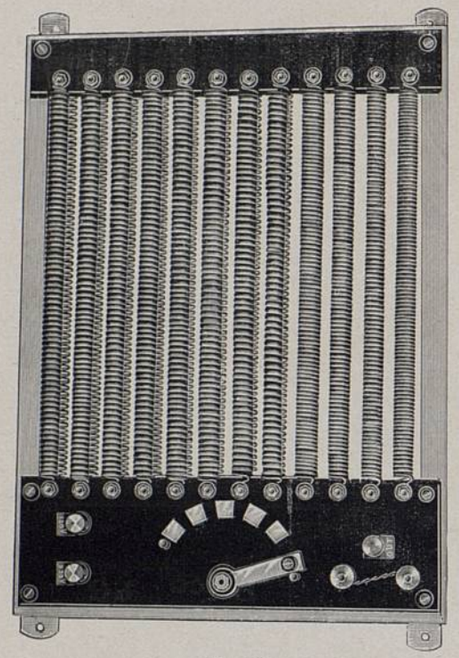


Fig. 23

Suitable for use on 100 to 240 volts, 60 amperes. Made with special high resistance wire of heavy gauge to prevent overheating, and guaranteed not to sag or become brittle with use. Has multiple contact switch and fuse terminals. Aluminium and Steel frame. (See Illustration No. 23.)

Price £4 10 0

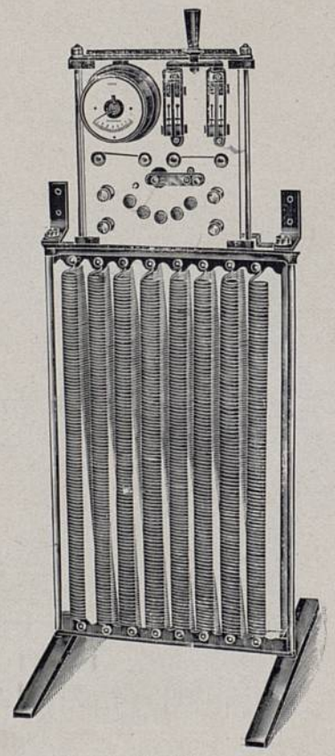


Fig. 24

Resistance.

With double pole switch and fuses and ammeter, mounted on marble. Very compact,

£8 0 0

SWITCHBOARDS.

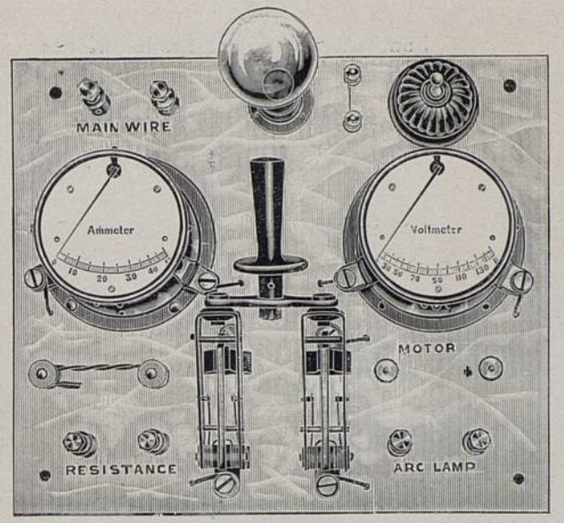


Fig. 25

Ammeter ... £1 15 0
Voltmeter ... £1 15 0
Double Pole Switch ... £1 0 0

The above instruments can be supplied mounted on marble, with terminals and double pole fuses.

Price £6.

Switchboard

as per illustration No. 26, with ammeter, voltmeter, double pole switch, and double pole change-over switch, fuses & terminals for two machines for working alternately.

Price £7.

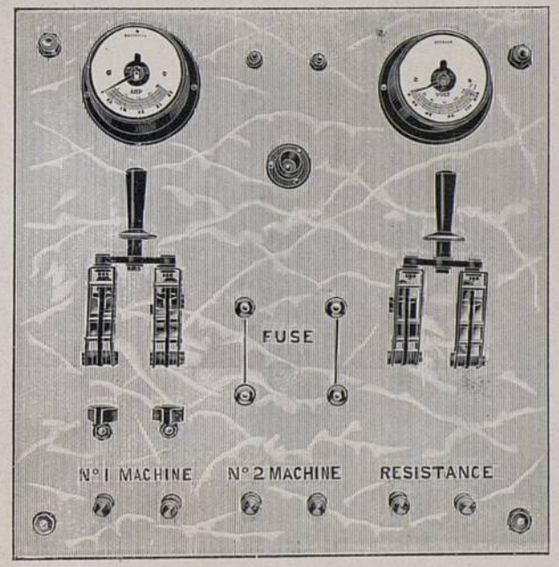


Fig. 26

IRONCLAD SWITCHES.

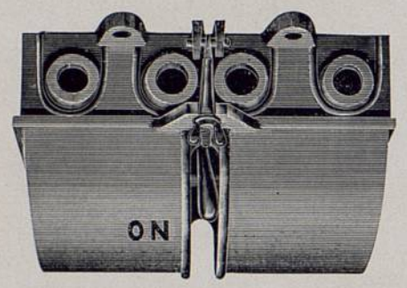


Fig. 27

Laminated Phosphor Bronze Blades
Positive Quick Break Action.
Solid Brass Contacts.
For any Voltage up to 500.

To carry		Price
30 amperes	... ...	**12/–**
50 ,,	... ...	**20/–**
100 ,,	... ...	**35/–**

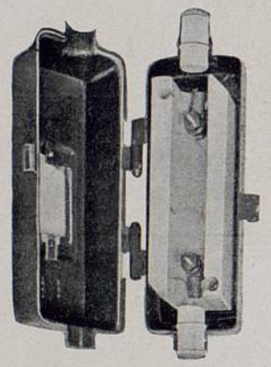


Fig. 28

Ironclad Cut-Outs or Fuses.

With Clamp Terminals.

		Prices
30 amperes	... ...	**3/8**
50 ,,	... ...	**4/4**
100 ,,	... ...	**9/–**

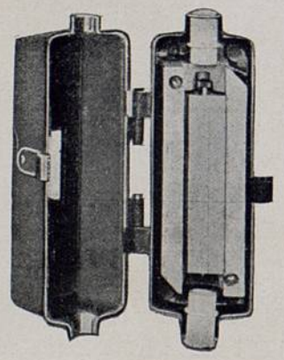


Fig. 29

Ironclad Cut-Outs or Fuses.

With removable Porcelain Bridge.

	Price	Spare Fuseholders
30 amperes	**4/–**	**1/1**
50 ,,	**5/6**	**1/8**
100 ,,	**12/–**	**2/8**

TRANSFORMERS.

Specially designed for cinematograph work. For use on alternating current. Transform the voltage down to 60 volts. If paying 4d per unit and using 60 amperes on 100 volts they will save 8d per hour, and on 240 volts they will save 3/4 per hour. The higher the voltage the more money saved.

Fig. 30

PRICES.

Voltage of Mains		Output at 60 Volts. 50 amps.	66 amps.	85 amps.	110 amps.
100 Volts	...	**£4 0 0**	**£4 8 0**	**£5 12 0**	**£6 10 0**
240 ,,	...	**4 8 0**	**5 12 0**	**6 10 0**	**7 17 0**
440 ,,	...	**5 12 0**	**6 10 0**	**9 4 0**	—

Any periodicity from 40 to 100.

When ordering state the voltage of mains and also the periodicity, and the maximum number of amperes required.

—— *Other sizes quoted for on application.* ——

MOTOR GENERATORS.

ALTERNATING TO CONTINUOUS CURRENT TRANSFORMERS.

FOR LIGHTING CINEMATOGRAPH ARC LAMPS.

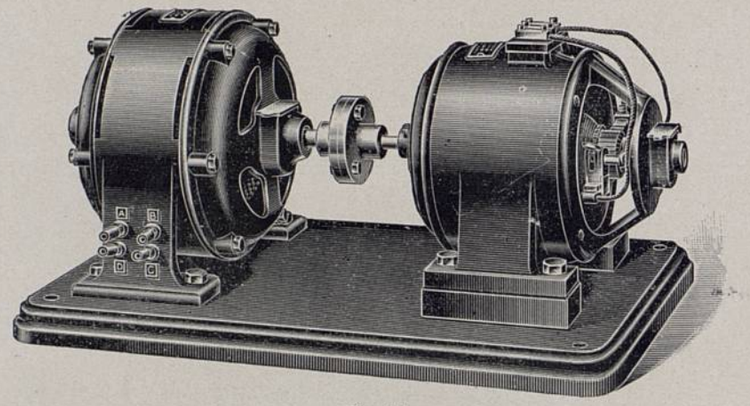


Fig. 31

The above block illustrates our standard pattern Alternating to Continuous Current Transformer. The set consists of an Alternating Current Motor of squirrel cage rotor type, mounted on a cast iron base and coupled to a shunt wound continuous current dynamo.

Both machines are fitted with self-oiling ring lubricators, and are fully guaranteed.

Both, the dynamo and motor, are made throughout in our factory in London, and are of the very best workmanship and material.

The following prices for the single phase motors include a starter, but for the two or three phase this is extra.

These machines are particularly suitable for lighting Cinematograph Arc Lamps and for this purpose we recommend the 2000 watt size for a medium size hall and the 3000 watt size for a large hall. As is well known alternating current arc lamps do not give the best results and if first class pictures are required an alternating to continuous current transformer is essential.

The Primary can be wound for any voltage or periodicity, but 10 per cent. must be added if the voltage exceeds 250 volts.

PRICES.

	Single Phase	Two or three Phase
Output on the secondary at 65 Volts, 46 Amps.	£57 0 0	£54 0 0
Do. do. 65 ,, 60 ,,	89 0 0	80 0 0

Other sizes quoted for on application.

DYNAMO.

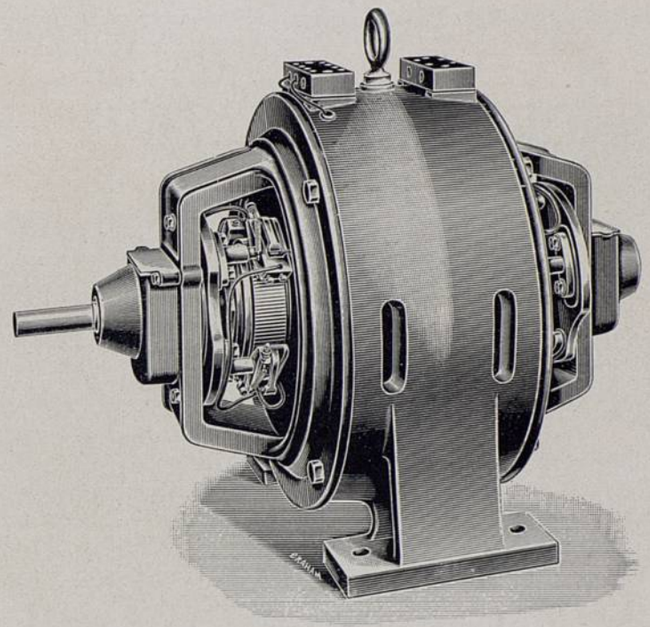


Fig. 32

Dynamo, compound or shunt wound, specially adapted for Kinematograph work.

COMPLETE with SHUNT REGULATOR.

Output 65 volts 54 amperes . . . **Price £25**

,, 65 ,, 80 ,, . . . **,, £35**

PARAFFIN PLANT.

Will work on Alcohol, Benzine, Petrol, Paraffin or Gas.

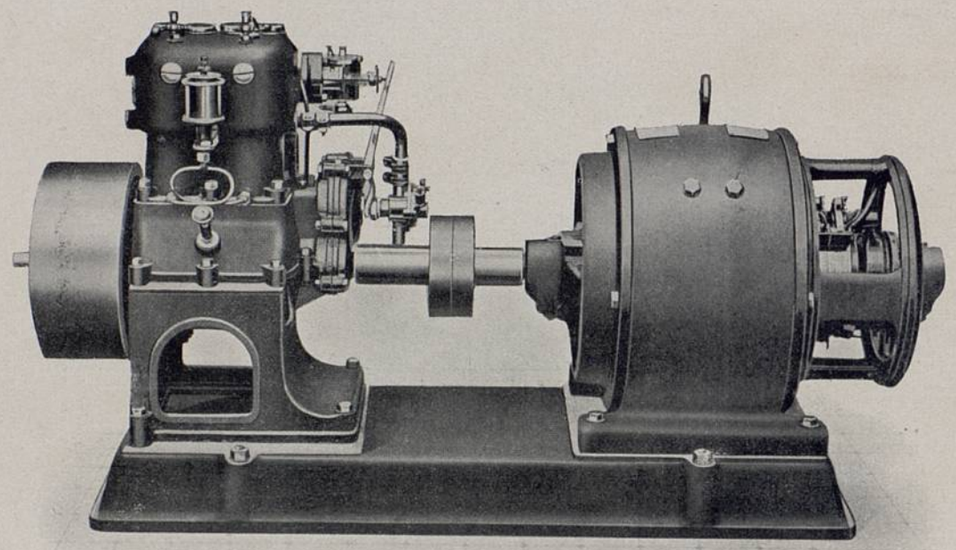


Fig. 33

Direct-coupled Twin Cylinder Engine and 5 Kilowatt Dynamo (60 v. 83 a.)

Direct Coupled	60 volts	83 amperes	(5 Kilowatts)	... ...	£128 0 0
Belt Driven	60 ,,	83 ,,	,,	... .	£120 0 0
Direct Coupled	65 ,,	54 ,,	(3½ Kilowatts)	... ...	£120 0 0
Belt Driven	65 ,,	54 ,,	,,	... ...	£111 0 0

These prices include shunt regulator, but not water tanks for cooling.

The engine is fitted with High Tension Magneto.

PARAFFIN ENGINE.

Will work on Alcohol, Benzine, Petrol, Paraffin or Gas.

Twin Cylinder Engine for Belt Drive.

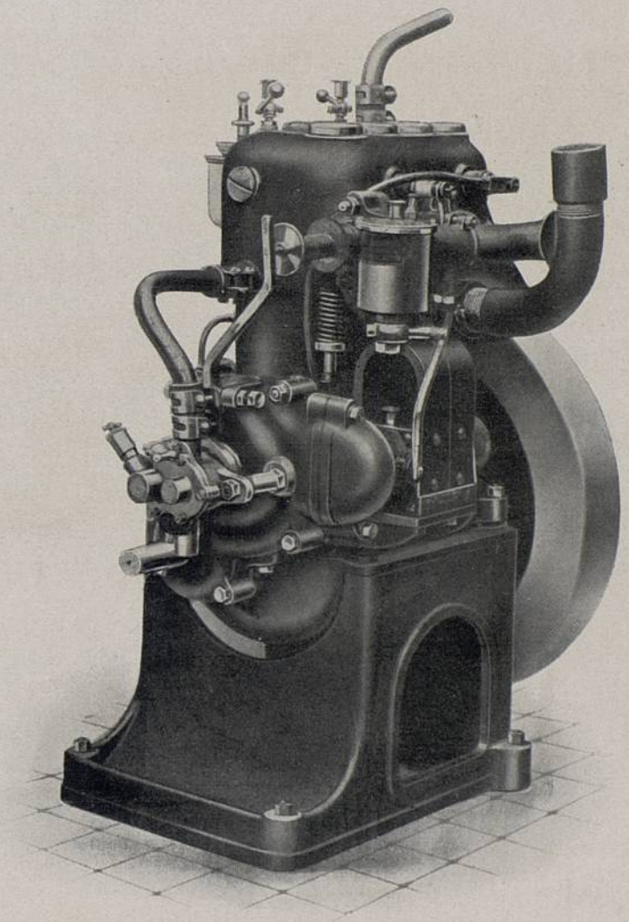


Fig. 34

Bore	95 m/m (3⅝ ins.)	Height	2 ft.
Stroke	110 m/m (4¼ ins.)	Floor Space	2 ft. 2 ins. × 1 ft. 5 ins.
Speed	800–1300 r.p.m.	Weight	342 lbs.
Power	7–10 H.P.	Gross Weight	472 lbs.
Size Packed for Shipment		3 ft. × 2 ft. 8 ins. × 1 ft. 8 ins.	

PRICE £86.

CABLES FOR CINEMATOGRAPH INSTALLATIONS.

SPECIFICATION.

H.C. Copper wire tinned, insulated with pure and vulcanizing India rubber and tape, the whole vulcanized together, braided and compounded.

The current these cables will carry, is in accordance with the standands fixed by the Institution of Electrical Engineers.

To carry Amperes.	Gauge Wire required.	600 Megohm per 55 yards.
20	7/18	**30**/–
25	7/17	**36**/–
30	7/16	**44**/–
35	19/19	**45**/–
40	7/15	**53**/–
60	19/17	**76**/–
80	19/15	**120**/–
100	19/14	**146**/–
150	37/15	**225**/–

Lengths of less than 55 yards charged 10% extra.

Special Asbestos covered "flexible cable," the same as used in our arc lamps, suitable for use in operating box	per yard	**2/6**
Black adhesive insulating tape	per ½ lb. roll	**1/3**
*Lead Fuse Strip	per ¼ lb.	**9**d

** When ordering state the number of amperes it should fuse at.*

KAMM'S TRANSPARENT DAYLIGHT SCREEN.

In 1902 our Mr. Kamm demonstrated this principle with his filmless kinematograph the "Kammatograph," under the glare of the arc lamps, at the Portman Rooms Photographic Exhibition, organised by Messrs. Marshall & Brooks. The original model can be seen at our works in operation, and it has already been demonstrated to some of the leading dealers in this country. Our Mr. Kamm omitted to take out a patent on the idea, and hence the idea is common property to everybody. What we claim is our Daylight Screen, for which we have the Sole Agency in this country, to show a transparent picture in conjunction with this original idea of the Kamm's Cone.

We supply you with everything, from the Screen and Apparatus down to the Portable Engine and Dynamo.

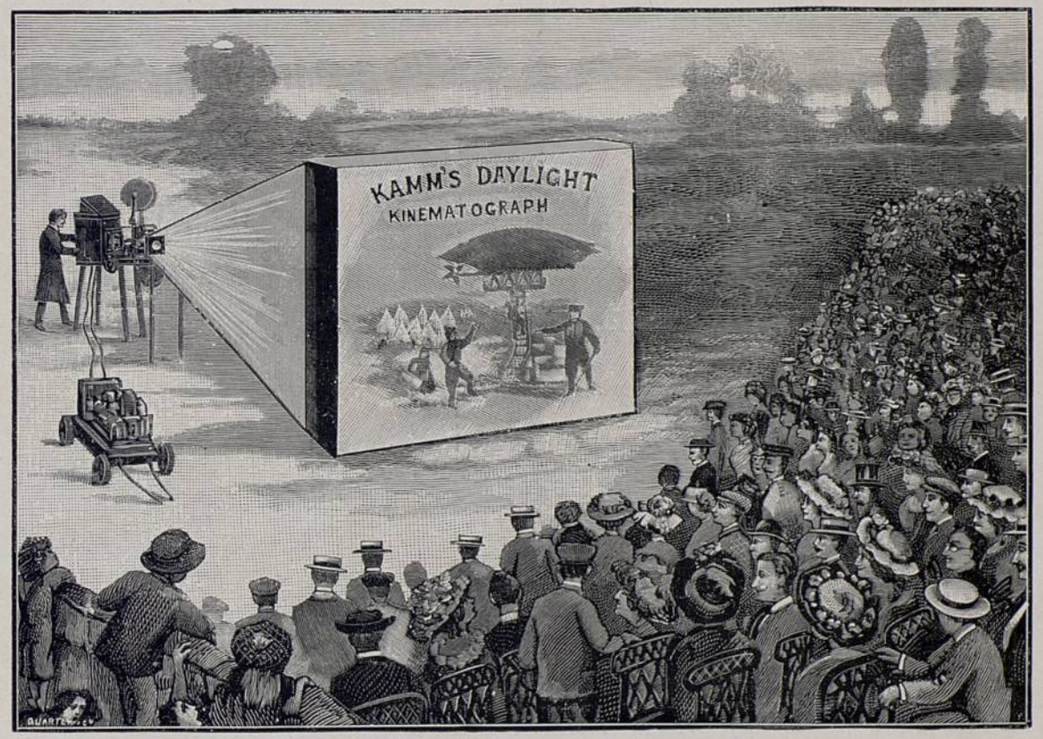


Fig. 35—**The above illustration explains everything.**

This Screen is chiefly used for showing pictures from behind the screen with our machine, using short focus lenses from 1 in. upwards.

Prices of Transparent Screens (eyeletted).

9 ft., **£4.** 12 ft., **£6.** 14 ft. **£9.**

Larger sizes are not recommended, but can be supplied.

LANTERN SCREENS & SUPPORTS.

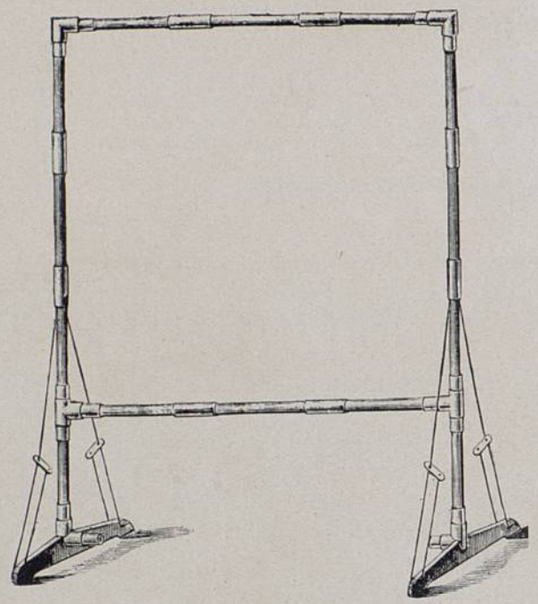


Fig. 35a—LIGHT, STRONG, EFFICIENT.
Well made throughout, Interchangeable Parts. This illustration shows the "S.B." Support with Elevator. Comlpete in Strong Iron Box, with Handle and Lock and Key.

THE "S.B." SCREEN SUPPORT.

Solid Wood Rods.

No.	Size of Stand	Will also make	Complete in Box
1	8 ft.	4 & 6 ft.	35/-
2	9 „	4, 6 & 7 ft	35/9
3	10 „	4, 6 & 8 ft.	39/-
4	12 „	4, 6, 8 & 10 ft.	42/-
5	14 „	4, 6, 8, 10 & 12 ft.	45/-
6	16 „	4, 6, 8, 10, 12 & 14 ft. ...	49/6
7	18 „	4, 6, 8, 10, 12, 14 & 16 ft. ...	60/-
8	20 „	4, 6, 8, 10, 12, 14, 16 & 18 ft.	67/6

The above prices do not include Elevator.

Extra Rods, &c. for Elevators.

Wooden Rods, 2 feet	each	4½d
„ „ 3 „	„	6d
„ „ 4 „	„	6½d
Brass Connecting Sockets		5d
T Pieces for connecting the Elevator	each	5/3
Wing Nuts for ditto	pair	9d
Extra Guy Ropes (long) ...	„	1/1½

The Elevator is not included unless specially ordered. Kindly state when ordering whether T pieces for elevating are required at the extra cost.

OPAQUE SCREENS.

Fitted with **Cords and Pulleys,** upon stout Varnished Roller and Bevelled Batten, the bottom roller having four collars attached.

5 feet square,	22/-	13 feet square,	80/-
6 „ „	25/-	14 „ „	90/-
7 „ „	30/-	15 „ „	105/-
8 „ „	35/-	16 „ „	120/-
9 „ „	45/-	17 „ „	130/-
10 „ „	52/-	18 „ „	140/-
11 „ „	60/-	19 „ „	155/-
12 „ „	70/-	20 „ „	190/-

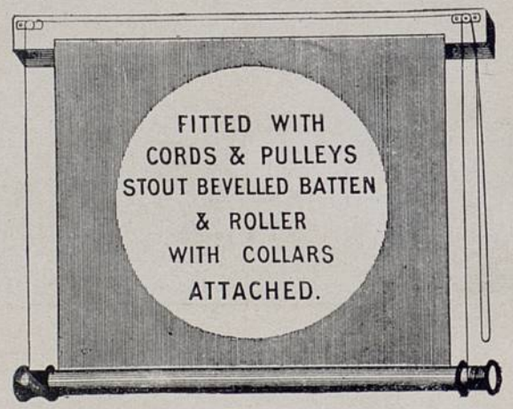


Fig. 35b.

CALICO SCREENS.

A new specially woven strong warp material as good as an opaque.

4 feet square, best quality ...	3/6 each	12 feet square, best quality ...	22/- each
5 „ „ „ ...	4/- „	14 „ „ „ ...	30/- „
6 „ „ „ ...	5/6 „	15 „ „ „ ...	32/6 „
7 „ „ „ ...	7/6 „	16 „ „ „ ...	40/- „
8 „ „ „ ...	10/- „	18 „ „ „ ...	50/- „
9 „ „ „ ...	14/- „	20 „ „ „ ...	63/- „
10 „ „ „ ...	16/- „	24 „ „ „ ...	80/- „

PORTABLE IRON OPERATING HOUSE.

Absolutely Fireproof and Smokeproof.

Doors drop immediately they are released.

Admirably adapted for use with our Daylight Screen for open air shows, as described on previous page.

The whole iron box is collapsible and folds in the smallest possible space in sections, for transport by either rail or road.

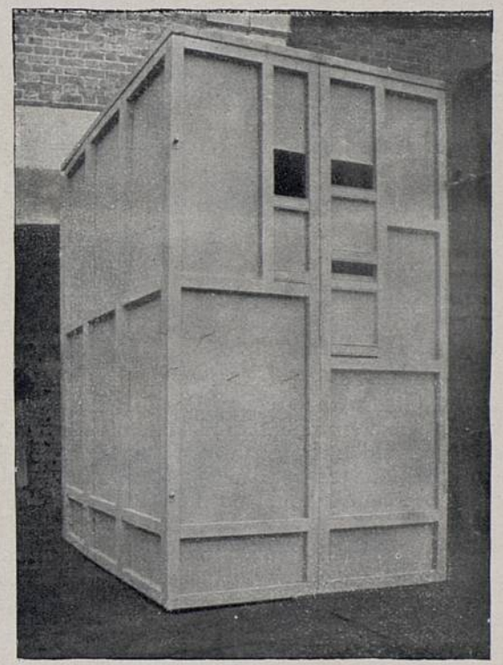


Fig. 36

PRICES:

4 ft. × 4 ft. × 7 ft.	£6 10 0
6 ft. × 4 ft. × 7 ft.	7 10 0

KAMM'S OXYGEN GENERATOR.

(PATENT)

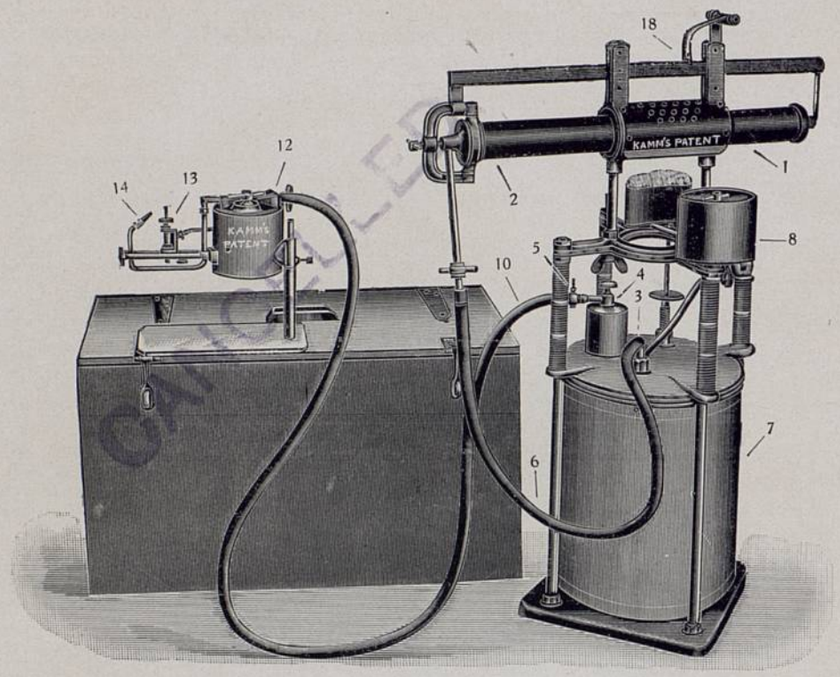


Fig. 37

Kamm's Oxygen Generator & Carburetter Jet have been invented with the object of providing cinematographers and lanternists generally with the means of producing their oxygen and hydrogen as they require it. It is well known that the light required for this kind of work must be more powerful than for ordinary lantern projecting purposes, and should be from 1000 to 2000 candle power.

This power of light is more generally produced by weights placed upon the reservoir containing the generated oxygen gas. In many cases some gallons of water are used to procure the necessary pressure which is a messy and inconvenient proceeding.

It will be clearly seen that this method has many disadvantages, especially when entertainments are given in friends' houses, or at a place of entertainment, where it is difficult to procure the necessary weights.

Kamm's Generator has none of these disadvantages, as no weight is depended upon. By means of specially constructed springs a continual pressure, which can be varied from 100 to 200 lbs., is kept upon the gas. The weight is thus reduced to a minimum, and the apparatus, which does not weigh more than

25 lbs., may be stored in a comparatively small size box. The usual water tank also, which is generally loaded with weights upon the container, is entirely discarded.

Kamm's Generator is a perfect machine, entirely reliable and automatic. The oxygen is made by heating cakes made of Chlorate of Potash and Oxide of Manganese, which is the most convenient method, as any number of these cakes may be made and stored away for future use. For cinematograph work, two pounds of these cakes are sufficient to produce a most powerful light lasting for one hour.

The following are some advantages of this generator :—

It is much cheaper than gas bought in cylinders.

There is no carriage to pay on full and empty cylinders, and the gas can be used to the very last inch.

Then again, if an operator living any distance from the oxygen works should run out of gas, he has to order it and wait for its arrrival, whereas with his own generator he has the means of preparing the gas in five minutes.

The advantages to colonists are self-evident, as this is very often the only means they have of procuring oxygen gas.

No water whatever is required for this apparatus, either for producing pressure or for purifying the gas. The gas is purified by means of a special purifier attached to the top of the container, containing soda lime powder, which delivers the gas absolutely pure, and it may be used for medical purposes if required.

The whole apparatus for producing oxygen and hydrogen is very simple, as a glance at the illustration will show. It consists of :

1) A retort containing some cakes, which is heated by being suspended over a methylated spirit lamp ; and

2) a container to hold the gas as it is made, in which the pressure is produced by springs, and which is provided with a safety valve.

The action of the generator may be explained as follows :—The retort is filled with cakes, and the methylated spirit lamp is lit. The heat causes the cakes to give off oxygen, which passes into the container, making it rise, and tilting the steel lever back. As this gas is used, and the container begins to descend, the steel lever before mentioned is pulled forward by a spring, bringing the retort forward with it and thus exposing more cakes to the heat of the spirit flame. In this way more gas is generated before the whole of the first is consumed. The consumption of gas by the jet, and the production of new gas, are beautifully balanced, and continue until the whole of the cakes in the retort have been exhausted. Another retort may then be placed in position, and the lecture or performance need not be interrupted.

The spirit lamp can be filled without removing it from the generator.

In place of spirit lamp we can supply a blow lamp, which works with paraffin, and will generate the gas faster than a spirit lamp.

Extra for Blowlamp in place of Spirit Lamp, **10/–**.

KAMM'S CARBURETTER-JET.

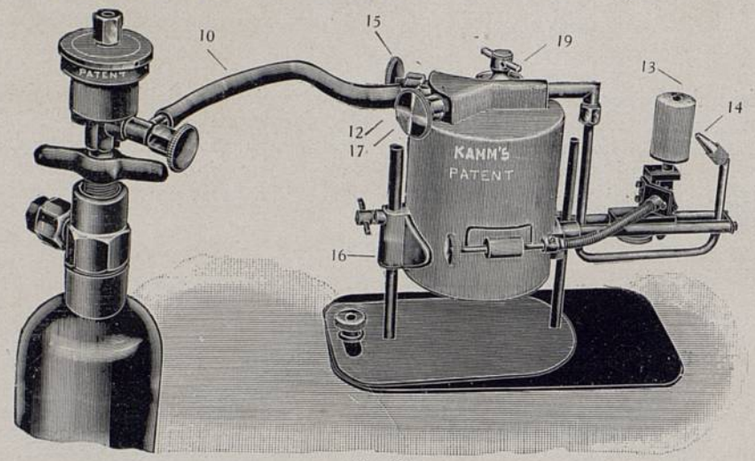


Fig. 38

This Carburetter-Jet is for use in the lantern, and produces the hydro-carbon gas required for limelight from gasolene, ether, or petrol. It gives a high power light, and can be used with either an oxygen generator or a cylinder of compressed oxygen (as shewn in illustration No. 38), or with oxygen under pressure from any source. When used with the oxygen generator it is connected up as shewn in Fig. 37. It is very economical in use, one gallon of gasoline being sufficient for about 40 hours light. It is exceedingly simple to manipulate and cannot get out of order. Its great advantage lays however in the fact that it is *absolutely safe*, as it is impossible to get a back-fire with it, owing to a patent device which renders it absolutely impossible for the flame to travel back down the nozzle of the jet. It is safer than using compressed coal gas, or gas from a house installation, as, where these are used, if the rubber tube is pulled off the gas escapes into the air, and there is risk of a gas explosion. With this Carburetter-Jet, however, only one tube is required, namely, that which conveys the oxygen gas to the Carburetter-Jet, and if this is pulled off by accident, although the oxygen will escape, there is absolutely no danger, as oxygen will not burn by itself. Another advantage is that if the tube is pulled off by accident there is sufficient oxygen gas stored up in the Carburetter-Jet to last for a short time, enabling the tube to be replaced without stopping the light at all.

TESTIMONIAL.

"*LANCET*," *11/10/02.*—"We have recently had an opportunity of watching the working of this Generator and of examining the oxygen gas which it produces in regard to purity..... We carefully examined the oxygen gas for impurities, and especially Chlorine compounds and other irritating bodies, but without a positive result; further, the gas was completely absorbed by alkaline pyrogallate. The details of its construction are based on sound engineering principles. It is safe and easy to work, is made of good material and is compact and portable."

PRICES.

Oxygen Generator		£12 0 0
Carburetter-Jet		3 10 0
Oxygen Cakes	per lb.	0 1 0
Soda Lime Powder	,,	0 2 0

Full Instructions & Appliance for making Oxygen Cakes given with each apparatus.

Instructions for Using Kamm's Oxygen Generator and Carburetter-Jet.

1. Open the retort (1) and fill it with cakes to within 1½ inch of the end (2). The cakes should be placed in the loose tins provided with the retort, so that they may be easily removed after use.

2. Replace the retort lid, giving it one or two turns to ensure a good engagement of the two surfaces, screw it up tightly, and suspend the retort over the generator by the hook and pin.

3. Remove and examine the inlet valve (3), and then replace and screw firmly so that no leakage can take place.

4. Take the purifier (4) off, place a small piece of wadding at the bottom, then half fill it with soda lime powder and fill the remainder with wadding to prevent any of the powder passing through with the gas. Make sure it is screwed up tightly, and the tap (5) turned off before use. One charge of the purifier will last a number of times.

5. Connect the rubber pipe (6) from the inlet of the container (7) to the the retort, and then pull the retort to the end, so that the first cake nearest the outlet of the retort is over the spirit flame.

6. Light the lamp (8), having the flame about 3 inches high, and place on the upright pin of the generator, taking care to loosen the filling screw of the spirit lamp first.

7. Connect the rubber pipe (10) from the purifier to the tube (12) on the top of the carburetter-jet.

8. Place a lime (13) upon the pin of the jet about 4 millimeters from the nozzle (14).

9. When the container begins to rise, turn the purifier tap on. Then turn on the hydrogen tap (15) at the jet, allow the air to escape first from the tube, and then light. Turn the lime round by means of the screw (16) at the side of the carburetter-jet, so as to warm it throughly and prevent it cracking. Then turn on the oxygen (17) very gradually.

10. To put the light out, give the lime half a turn, and turn off *first the Oxygen* and then the hydrogen,

11. After use take the used cakes out of the retort. Should they stick tap the retort all round with a piece of soft wood and they will come out easily. Clean the retort out with mop and black lead to prevent rust. Remove the inlet valve and clean with a stiff brush.

12. To ensure the lid of the retort being pefectly gas tight, one drop of oil may be used for grinding it in, but it must be carefully removed afterwards.

13. Oil or anything oily or greasy should not be used for the interior of the retort under any circumstances, nor should it be allowed to get on the container, as it will perish rubber. Be very careful that no wood, paper, grease, or anything combustible is in the retort with the cakes.

These generators are made to work automatically at the usual rate of consumption of gas, but if it is desired to use the gas faster than is given off automatically, the retort should be moved forward by hand between each cake, in which case the pawl (18) may be thrown backwards, so that it cannot move the rack.

Instructions for Making Oxygen Cakes.

Take four pounds of powdered Chlorate of Potash, and one pound of Black Oxcide of Manganese. *Thoroughly well* mix, and then just damp the mixture enough to make it hold together. Take great care that nothing combustible gets in the mixture. Press it in the mould provided, forcing it down by means of a suitable implement, such as a ruler, and then push it out at the end. Lay the cakes on their sides in a warm place until quite dry.

Instructions for Using Kamm's Patent Carburetter-Jet.

To fill the Carburetter-Jet, unscrew the cap (19) on top, and pour gasoline in. Five ounces of gasoline will last over an hour, but it may be poured in until the packing will absord no more, any unabsorbed liquid must then be poured out, and the cap screwed into position tightly.

Gasoline is the best to use with this Carburetter-Jet, but either methylated ether (·725) or the best motor spirit may also be used.

Owing to the inflammable nature of these liquids, the Carburetter-Jet should always be filled away from light or flame of any sort which might ignite it, and if possible in the open air, as the vapour will catch fire at a distance of several feet.

In connecting up for use, the tube from the oxygen generator or oxygen cylinder should be connected to the inlet tube (12) on the Carburetter-Jet. When lighting up, turn on the hydrogen (15) and light it first, then give the lime two or three turns to warm it through throughly and prevent it cracking, then turn on the oxygen (17) very slowly. When turning off the light at the jet, turn off the *oxygen first*, and then the hydrogen, and turn off the oxygen generator or oxygen cylinder last. Then remove the Carburetter-Jet from the lantern and enscrew the cap (19) slightly in order to release the pressure, and screw up again tightly before putting away.

After the Carburetter has been used a number of times, a quantity of non-volatile liquid collects, which should be pumped or dried out. To do this remove the cap (19), connect a cycle pump by means of a rubber tube to the inlet (12), put the Carburetter-Jet upside down on the ground, and pump it out. It can be dried out by removing the cap (19), and placing on an oven or over a spirit flame or gas flame, placing a sheet of metal between the Carburetter-Jet and the flame, so that the flame cannot get anywhere near the Carburetter-Jet.

KAMM'S MIXING JET.

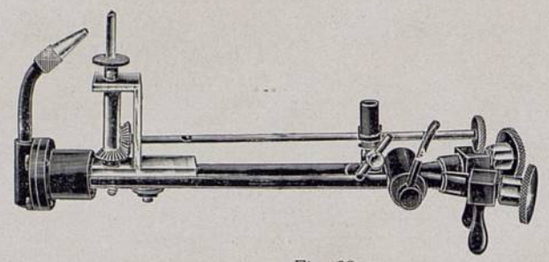
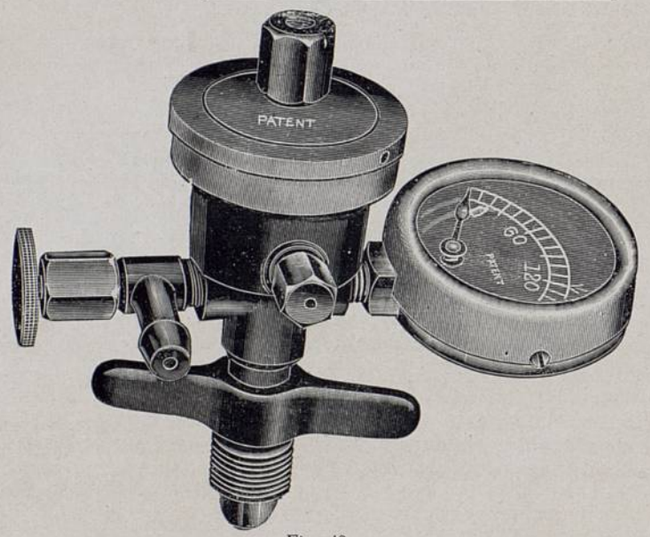


Fig. 39

This Jet is made of the very best material and the greatest care is taken in its manufacture. It is provided with a by-pass and a novel adjustment for the lime by the aid of one milled nut only. The fast travelling screw which supports the lime is constructed on a new principle, and it cannot wedge or work stiff as the heat from the lime increases. There is no packing to get lost or corrode, all parts being fitted with ground metal surfaces. It is hard soldered throughout, and will wear a lifetime with ordinary wear and tear. The nozzle is made of a special metal which stands a high degree of heat, and will not cinder or char. **Price,** complete ... ... **£2 0 0.**



Kamm's Patent Oxygen Gas Regulator.

The simplest and most reliable Regulator.

This Regulator has been adopted by several Governments.

Fig. 40

Regulator as illustrated, with Screw Tap and Over-Pressure Valve	**£1 10 0**
Do. without Screw Tap or Over-Pressure Valve	**1 1 0**
High Pressure Gauge	**1 0 0**

The above Regulators are made also for hydrogen gas, with left-hand thread, and painted red, at same price.

SPECIAL HARD LIMES.

$1\frac{1}{2} \times 1$ ins. (12 limes in a tin)	**1/6** per tin
$1\frac{1}{4} \times 1\frac{1}{4}$ „ (6 „ „)	**1/6** „
Special Imperishable Limes, give much more light than ordinary limes, and last as long as a dozen ordinary limes	**2/-** **3/-** each
Special holder for same	**3/-** each

small large

KAMM'S OXYGEN GENERATOR.

(FOR OXYLITH).

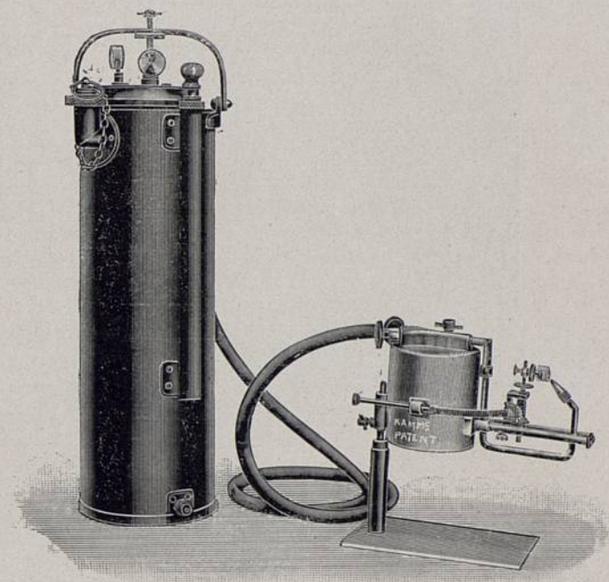


Fig. 41

The above illustration shows a most compact installation for cinematograph work. Its chief features are extreme portability and readiness for use. Gas is generated the same as in acetylene apparatus, namely, by means of water coming in contact with oxylith, which causes it to give off oxygen, which is set under pressure by means of a pump fixed to the apparatus. A pressure indicator as well as automatic pressure valve is provided. The apparatus is perfectly safe, and is an ideal outfit for Colonial Cinematographers when used in conjunction with our Carburetter-Jet.

PRICE of "Kamm's" Oxylith Generator only, £5.

Oxylith (in tins containing about 2 lbs. 3 oz.), **3/10** per tin.

INSTRUCTIONS FOR USE.

When the internal cylinder is removed from the generator, the small tubular container is filled up with oxylith blocks and then replaced in the internal cylinder. The outer container is half-filled with water and the internal cylinder containing the charge of oxylith is replaced in same, and then firmly closed by means of the central screw. Care should be taken that the stop-cock is closed before use. One indiarubber pipe connects the carburetter-jet with the generator. When more light is required the side pump is used to increase the pressure.

With one charge of one kilo (about 2 lbs. 3 oz.) of oxylith about eight feet of oxygen gas are produced.

Oxylith is sold in hermetically sealed tins and keeps in any climate for any time.

The "UNIVERSE" Cinematograph Cameras.

MODEL 1.

Capacity :
200 feet of film
(60 meters).

Dimensions :
12 × 13 × 5½ ins.
(30·5 × 33 × 14 ctm.)

Weight, unloaded :
12½ lbs. (5·7 kilos.)

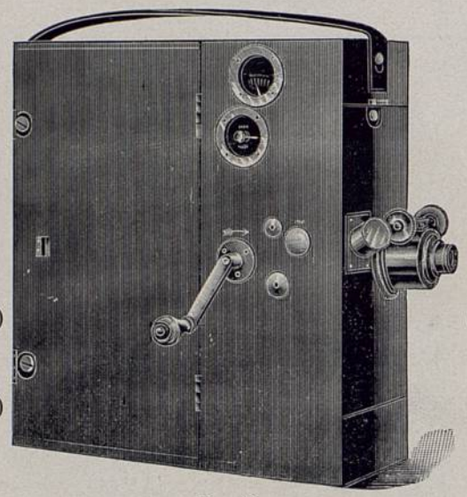


Fig. 42

MODEL 2.

Capacity :
400 feet of film
(120 meters).

Dimensions :
14 × 15½ × 5½ ins.
(35·5 × 39 × 14 ctm.)

Weight, unloaded :
13½ lbs. (6·1 kilos.)

Model 1. The mechanism is constructed on the clutch intermittent principle, allowing the film to be fed between two loops in order to prevent any undue strain upon the film, which saves the perforations from injury. Registration is absolutely perfect even with the highest speed of turning, and the greatest care has been taken to balance all parts to obviate vibration when in use.

These cameras are of the very best workmanship, the case being of polished mahogany with sliding doors. Every part is tested, and they are made light so as to save weight wherever possible without sacrificing strength and durability.

This camera is guaranteed for correctness of registration, and a film taken by the camera is given with each camera sold. The camera has also Automatic Feet Register, giving the number of feet of film which has been taken, direct focussing sight hole, spirit level, automatic winding device, view finder, film punch, for punching a hole in the film, which prevents cutting the film in the wrong place when preparing same for developement in the dark room.

Four Daylight Loading Film Boxes are given with each camera.

PRICE of

Camera, complete as above, without lens	**£23**	**0 0**
Extra Spool Boxes ... ... each	**0 12**	**0**

Model 2. This camera is made exactly the same as Model No. 1, with the exception that it has in addition to the automatic feet rigister also a Speed Indicator, which shows accurately the number of pictures taken per second from 10 to 24.

PRICE

Camera, without lens	**£25**	**0 0**
Extra Spool Boxes ... ... each	**0 15**	**0**

These cameras can be supplied in steel and aluminium case specially constructed for the tropics and colonial work for £5 extra.

Leather Travelling Case for above to take camera, four spools, and rooms for spare lenses, &c.	**£2 10**	**0**
Wood Case, to take ditto	**1**	**0 0**

Voigtländer Collinear Lenses.

Equivalent focus. C/m	Inches	£	s.	d.
6	2⅜	4	0	0
7	2¾	4	4	0
9	3½	4	16	0
12	4¾	5	12	0
13½	5⅜	6	0	0

"Tessar" Lenses.

Manufactured by ROSS Ltd.

Equivalent focus C/m	Inches	£	s.	d.
About 5·1	2	4	0	0
„ 7·6	3	5	0	0

All these lenses are fitted with Iris Diaphragm.

"KAMM'S" TRIPOD.

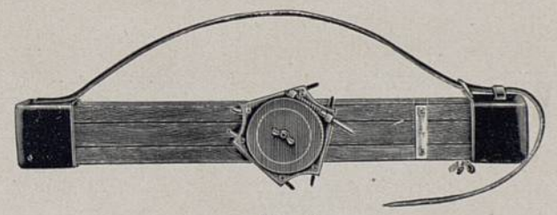


Fig. 43

Height, 4 feet (122 ctm.)

Weight, 6 lbs. (2·7 kilos.)

This tripod is two-fold, and is made of ash and is very strong and rigid, It folds up and is carried by a leather strap as shown in the illustration. The top is made of aluminium and is provided with a rotary movement, by means of a worm and wheel which can be easily handled while taking the photograph, for use in taking panoramic subjects and following the centre of interest to be photographed, such as processions, football matches, railways, &c. It can also be supplied with tilting movement in addition to the rotary movement.

PRICE

With rotary movement	**£4**	**0 0**
With rotary and tilting movements	**6**	**0 0**
Do. do. made of telescopic steel tubing and very light and rigid	**8**	**0 0**

Camera Attachment
FOR
Printing Cinematograph Positives.

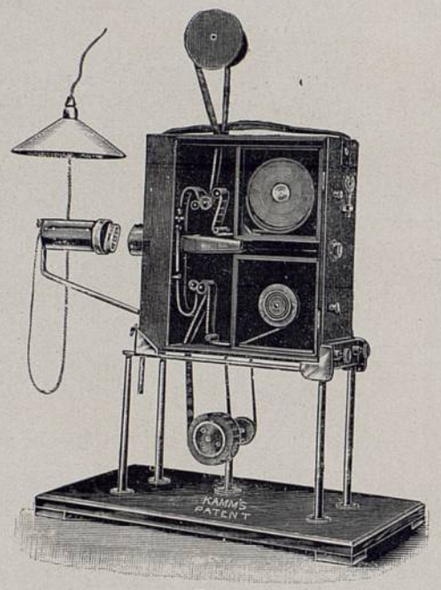


Fig. 44

We have found by experience, that positives printed with the same camera in which the negatives were taken, give the best and most accurate results. We therefore supply all our cameras with a device, if required, for printing the positives. It can be used with electric, acetylene or oil lamps.

Price, without Lamp **£5 0 0**

KAMM'S PERFORATOR.

We need hardly point out how essential it is to have a film accurately perforated, as the whole steadiness of the subject depends upon this. Our perforator is constructed on an entirely new principle, by means of which absolute accuracy of perforations is obtained. There are 64 perforations to the foot, and we guarantee this perforator to perforate a film 60 meters in length, without being one-eighth of an inch out. The perforations are quite clean, and there are no stampings left in the holes of the film, which is so very ojectionable when put in the camera, and often brings about failure.

It can be operated by hand, or by electricity taken from the ordinary house wiring by removing a lamp and inserting a plug from the apparatus in its place. If electricity from the main is not available, it can be operated by a battery of eight volts.

Price of Perforator complete **£30 0 0**

THE "KAMA" LANTERN.

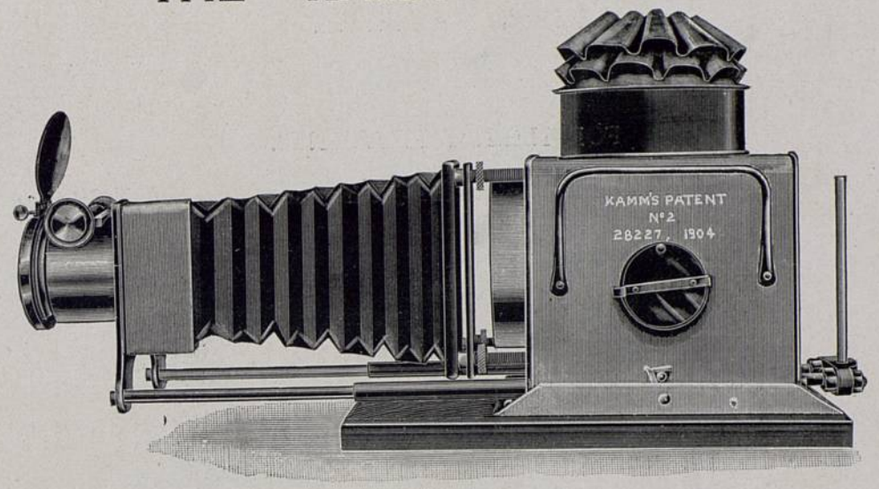
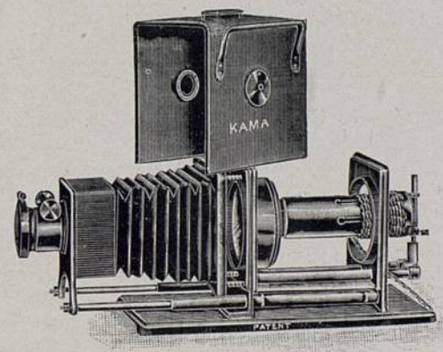


Fig. 45

This Lantern is specially constructed for use with the "Kama" Nernst Electric Lamps or lime light jet or acetylene. It is very light and compact and measures $17 \times 6\frac{1}{2} \times 8$ inches. It is constructed nearly entirely of aluminium, and is a very handsome piece of apparatus.

The bellows can be lifted right off in order to see whether the light covers the lens, and the body also can be lifted off in order to heat the filaments of the "Kama" Electric Lamp, or to adjust the lime light or acetylene burners.

It is supplied complete with a $4\frac{1}{2}$-inch meniscus condenser, and best $2\frac{3}{8}$-inch diameter objective lens of any focus, in jacket.



Price, complete ... ... **£5.**

Special Mahogany Box, with extra receptacle to take Lamp, Jet, Slide Carrier, &c.		**£1 0 0**
Spare Lens Tubes of any focus, $2\frac{3}{8}$ ins. diameter (60 m/m)	each	**0 15 0**
Do. Condensers, complete, $4\frac{1}{2}$ ins. diameter (114 m/m)	,,	**0 13 6**
Do. Lenses for Condenser, $4\frac{1}{2}$ ins. ,, ,,	,,	**0 4 0**

THE "KAMA" PATENT ELECTRIC PROJECTING LAMP

FOR NERNST FILAMENTS.

Arc Lamp superseded for Lantern Projecting purposes and Enlarging.

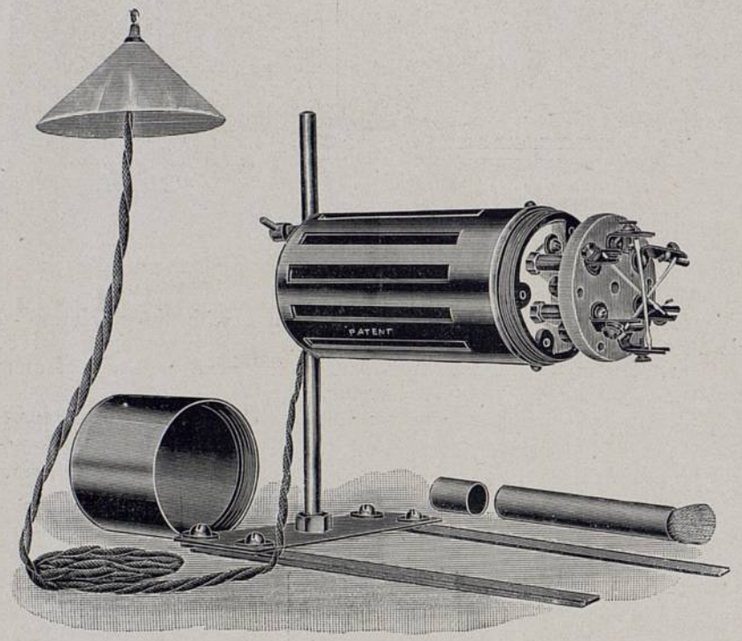
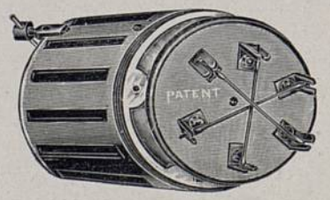


Fig. 47—**No. 3 KAMA LAMP.**

THE "KAMA" STAR BURNER

FOR NERNST FILAMENTS.

A PERFECT RADIANT.



Supplied with No. 3 "Kama" Lamps.

Fig. 48

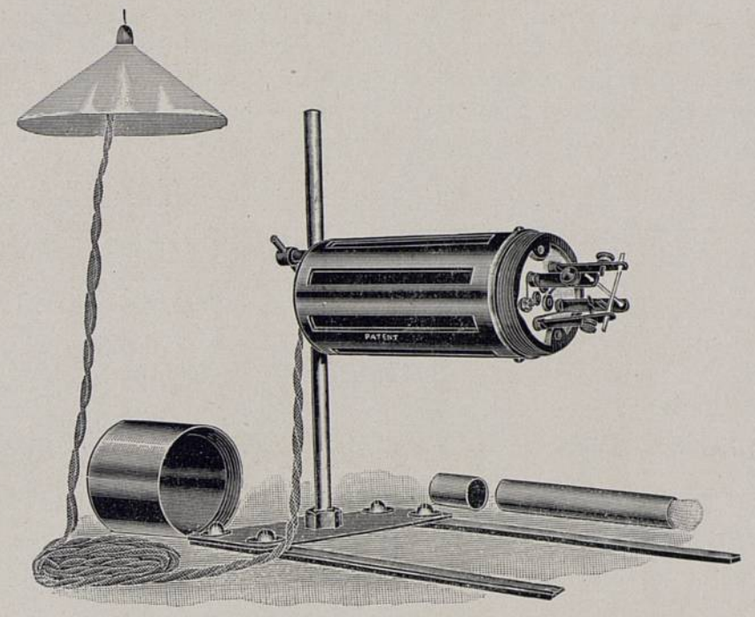


Fig. 49—**No. 2 KAMA LAMP.**

Fig. 50

Spirit Torch, given with each lamp.

(For heating filaments previous to use.)

These electric lamps, which are used in conjunction with Nernst filaments, are specially constructed for enlarging and projecting lantern work. They are very compact and can easily be carried in the pocket. They are tubular in shape, strongly made, and highly nickel-plated. Each lamp has a metal screw cap to guard the filaments from injury.

The Nernst light, as is well known, is a radiant of high candle power, but using much less current than the ordinary incandescent electric lamps. It is one of the most economical electric lights known. These lamps are complete in themselves, no special wire resistance or auxiliary appliances being necessary to use with them. They can be used on any electric light installation from 80 to 160 volts (low voltage) or from 195 to 260 volts (high voltage). In the event of a filament being broken or destroyed, it requires only a few seconds to take the old one out and put a spare one in its place.

These lamps are ready for immediate use, all that is necessary being to remove an ordinary incandescent lamp from its holder, and insert the plug from the projecting lamp in its place, as shown by the illustration No. 47. This arrangement is exceedingly handy for those who lecture in different places, and who require an illuminant which will give them the least trouble.

Each lamp is supplied with nine feet of connecting cord and plug to fit any bayonet holder.

PRICES.

No. 2 Lamp, complete **£1 10 0**

300-500 c.p. (according to voltage). Low voltage (2 filaments), takes 2 amperes; high voltage (2 filaments), takes 1 ampere.

Spare Filament 4/- **£0 3 6**

Spare Resistance **£0 3 0**

No. 3 Lamp, complete **£2 5 0**

500-1000 c.p. (according to voltage), about 1000 c.p. on 200 volt circuit. Has 3 filaments, and takes 3 amperes for all voltages.

Spare Star Burner 16/6 **£0 15 0**

,, Filaments ... ... 4/- ... **£0 3 6**

,, Resistances **£0 2 0**

Extra Cord, per foot 4d

Adjustable Tray, to fit any lantern 2/-

Wall Plugs, extra 2/6

Screw Plugs, extra 1/-

WHEN ORDERING PLEASE STATE VOLTAGE OF CIRCUIT.

INSTRUCTIONS

for using "Kama" Electric Projecting Lamps.

(FOR NERNST FILAMENTS.)

Having unscrewed and removed the cap, place the lamp upon the lantern pin, then remove an incandescent lamp from its holder, and put the plug from the projecting lamp in its place. Switch on the electric current, light the spirit torch, and hold the flame under the filament or filaments until they become redhot, when they will light up.

In all cases, the cap must be removed from the lamp before it is connected to the circuit, and it must not be replaced until the current is switched off, otherwise it is probable that an accidental short circuit be made.

To obviate the difficulties in lighting, it is essential to have a large flame on the spirit torch, and to see that it heats the filament throughout its entire length.

For high voltage filaments which are very long, the wick of the torch may be spread out and flattened, so that it gives a flame long enough to heat the whole filament. The filaments should not be held in the middle of the flame, but at the top, which is the hottest part. Should filament become curved after some use, use the lamp the other side up until the filament straightens itself again.

These lamps and filaments should only be used on circuits of the same voltage as they are marked, otherwise their life is very uncertain, even if they are not rendered useless at once. The No. 3 lamp is suitable for use on any voltage, all that is necessary, being to change the burner for the correct voltage. The No. 2 lamps are made in two types, the one for "Low Voltage" (80 to 160 volts), and the other for high voltage (200 to 260 volts). As the connections in these lamps are different, a high voltage lamp cannot be used on a low voltage circuit, or vice versa.

Great care should be taken in handling these filaments, as they are very fragile, and should only be lifted up lightly and placed in position on the supports. If necessary, the supports may be bent slightly apart in order to place the filaments in the holes, afterwards bending them together again. If the ends of the filaments are too long, the ends should be cut off with a pair of wire nippers, very carefully, so that the filament is not broken where the wires are joined to it. This is best done by laying them in the hand loosely and cutting the end off, without having the other part of the filament held in any way.

Care must be taken from time to time, that the filaments do not touch each other, or they will fuse. They may easily be turned round and kept in any position by means of the fine wire at the ends.

If the lamp will not light up, the cause is either that the flame on the spirit torch is not large enough, or that it does not heat the filament throughout its entire length. It may also be caused by the slotted tube at the back of the box burner, which fits on the pin of the lamp, being too large, in which case it should be made smaller by pinching slightly with a pair of pliers until it fits tightly.

When ordering new filaments or resistances, always state the voltage of the circuit on which they are to be used, and whether for a No. 2 or No. 3 lamp.

We do not fit the filaments to the lamps when sending them by post or carrier, owing to their liability to breakage in transit, unless it is specially stipulated, in which case they are only sent at consignees risk. Owing to the careful method employed of packing each filament separately in a small box, in fine sawdust, breakages in transit are a thing unknown. Full instructions are given with each lamp for fitting the filaments, which is an easy matter, and does not require any tools or implements.

THE "KAMA" SAFETY ACETYLENE GENERATOR.

(KAMM'S PATENT.)

Complete with Reflector and Tray to fit any lantern, strongly made, highly polished and nickel-plated.

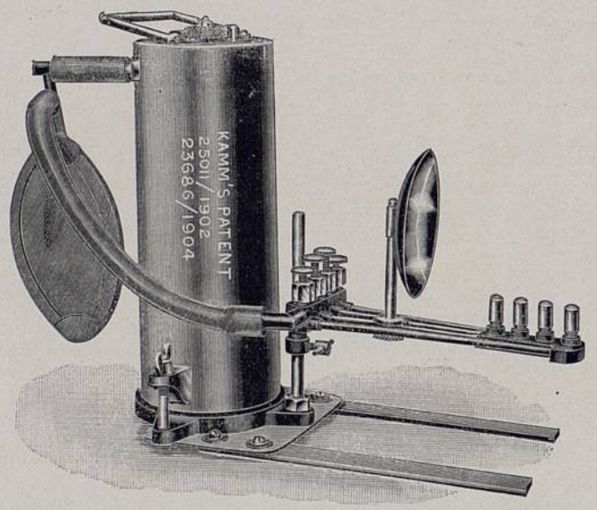


Fig. 51—**No. 2 GENERATOR.**

No. 1 Generator (capacity ½ lb. Carbide) with 3-Burner Jet, **£1 10 0**

No. 2 Generator (,, 1 ,, ,,) ,, 4-Burner ,, **2 0 0**

These Acetylene Generators are very neat and compact in form and are specially constructed for lantern work. They work by an adjustable feed supply, which when once adjusted, will give a steady flame without attention. They are absolutely safe and can be turned on their side without any danger. Each Generator has an adjustable reflector and a tray to fit any standard size lantern.

The No. 1 Generator is fitted with a jet having three burners to it. It takes about 7 ounces of carbide and will give a light lasting about an hour and a half with one charge, covering a nine feet disc upon the screen.

The No. 2 Generator is fitted with a jet having four large burners. It takes nearly one pound of carbide, and will give a light lasting about three hours with one charge, and covering a disc upon the screen of about 15 feet. It is, therefore, specially suitable for lantern work before large audiences. This Generator may be placed on the ground, if preferred, and connected with the jet by means of a long rubber tube.

The supply of gas to the burners can be regulated separately by means of screw taps, according to the pressure and light desired.

The Generator comprises also an appliance for equalizing the pressure of the gas.

The small charge required, compared with the length of time one charge will last, shows the great economy of these Generators, owing to the perfect generation of the gas from the carbide.

Directions for Use.

Unscrew and remove the base. Hold the generator upside down, and see that the central tube is in position, that is, with the flat disc away from you. Place the finger over the tube of prevent any carbide getting into it, and then fill the container about two-thirds full with carbide. Screw the base on by means of the nuts, und turn the apparatus the right way up. Connect the bag to the generator by the small angle piece and to the jet by the long rubber tube. Put in the rubber bag just sufficient cold water to cover the bottom of the long tube, which serves the purpose of purifying the gas and also prevents any water vapour condensing in the jet. See that the indicator on the top of the generator points to "off," and then pour water into the top of the generator until full. Have some water handy to replenish. Turn the indicator on the top round to about section four, which will allow the water to feed fast enough to make sufficient gas. If too much or too little gas is made, vary the indicator accordingly.

Ordinary small carbide (half inch mesh) is the best to use with this generator, but deodorised may also be used. Some kinds of specially prepared carbide take a considerable time to generate gas, owing to their having been impregnated with chemicals, which makes it difficult for the water to decompose the carbide, and should not be used.

When fitting a new burner, note that the two small holes on the top of the burner should be in a line with the jet. Any burners may be used, but the larger the burner the less time a charge of carbide will last. Do not allow the light to get too low or the burners will carbonise.

To empty the container after use, take hold of the central tube and pull the sludge out. The container should be rinsed out and dried after use. Should it occur that no gas is generated when the water is put on, the needle valve hole is probable stuffed up, in which case the carbide should be taken out and the container well rinsed out with water.

If it is desired to use the generator away from the lantern, the jet pin should be unscrewed from the generator base, and clamped in the small hole in the middle of the tray by means of the nut provided, and the generator connected with the jet by a long tube.

In order to preserve the rubber gas bag when not in use for a length of time, it may be kept under water in a vessel, which prevents the rubber from perishing.

ACETYLENE JETS.

MULTIPLE TUBE.

These Jets are of solid make and the best workmanship. They are made in three sizes, for two, three and four burners, as shown in the illustrations. Each burner can be adjusted separately by means of screw valves. The Reflectors are highly plated and adjustable in both directions.

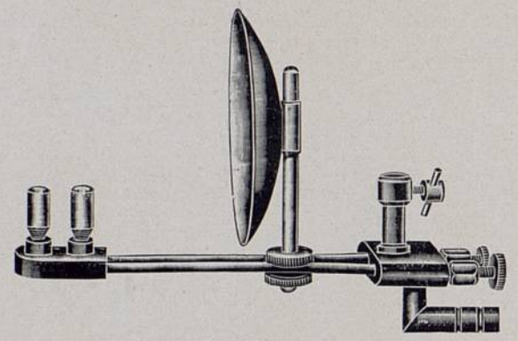


Fig. 52

2 BURNER

Price 8/6

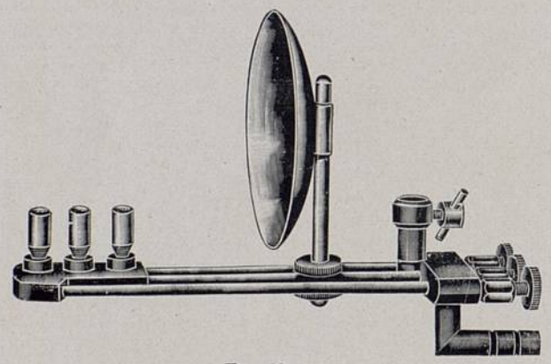


Fig. 53

3 BURNER

Price 10/6

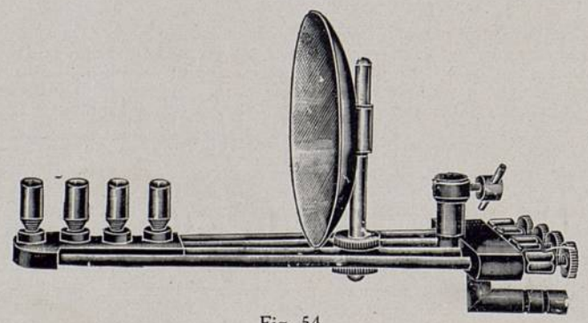


Fig. 54

4 BURNER

Price 12/–

INSTRUCTIONS FOR KINEMATOGRAPH PROJECTORS.

Lubrication.

Every piece of mechanism has to be treated according to its construction, that is to say, whether delicately made or robust. A watch would require a different brand of lubricant to a clock, and a kinematograph requires a different lubricant again to a bicycle, although there are many people who think that all oil is equally as good for lubricating a piece of mechanism. This may be so to a certain extent, but when explained and observed more closely, it would be found that thick oil is absolutely useless for a piece of mechanism where the bearings have to be ground to the 10,000th part of an inch. In the case of a kinematograph, it is most essential that the bearings are an absolute fit, and that there is hardly any space between the two surfaces of bearing and spindle to be taken up by the oil. Hence the lubrication should be with oil of medium thickness. *We have a special kind of oil prepared for this class of machine which is sold in pint bottles for 1/–*

Further it is essential to be lenient with the lubrication, as too much oil will penetrate eventually through the bearings to the outside and find its way to the film, which is not only detrimental, but it also very annoying to see blurs on the screen, caused by the oil-splashes.

The KAMM enclosed machine should be oiled every day by squirting with a suitable oil can a few drops into the lubricator or oil hole. If this method is observed every day the machine will not run dry, neither will the machine have too much oil to waste. Outside moving parts such as the pressure rollers should also be oiled every day, all superfluous oil on the outside being wiped off with a clean rag. It should also be observed to oil the shutter every day with one or two drops of oil, the quantity depending entirely upon the number of hours the machine is working.

Maltese Cross Adjustment.

With regard to the maltese cross and its adjustment, the owner of a maltese cross machine of the KAMM type should refer to the description of its construction on page 8. In the illustration on that page the nut 12 plays a most important part. This nut is engaged with a wedge shaped key, and has the function when tightened up of drawing out the wedge in order to separate the two surfaces, which makes the cross looser on the 2″ locking disc. In the opposite direction, by unscrewing the small nut slightly, and pushing the wedge back to its original place (because there is no spring to pull it back), the maltese cross is made to go tight on the locking disc. In order to get the right adjustment of the friction or pressure upon the locking disc, it is necessary to test the friction by catching hold of the small steel sprocket and adjusting the nut until one observes a minute shake. Too much shake would cause the picture to be unsteady. No shake would cause the machine to work stiff. It is experience and trials which find the golden middle way.

Taking Machine to Pieces.

Any time an operator wants to see the internal part of the case it would be wise for him to be careful when replacing the outer cover to do the screws up loosely at first. Then the handle should be turned a few times to enable the half of the cover case replaced, to find its level and to be free of any undue tension. After this the screws should be screwed up tightly.

Chain Adjustment.

Lengthening and shortening of the pin can be effected by means of the eccentric pin, which carries the lower spool arm. The box spanner which is supplied with each machine, enables one to loosen the nut of this eccentric spindle or pin. A pointed pin or key can then be pushed in the small hole in the said spindle, and by gradually turning the spindle round, the proper tension is obtained on the chain. The nut must afterwards be screwed up securely so that the spindle does not turn.

Take-up Friction Clutch.

Our friction clutch on the take-up arm is provided with means to get the desired friction or tension to carry round the spool. When great lengths of films are used up to 2,000 feet the tension has to be considerable, as a great pull is required when the spool fills. This can be tested without a film by placing the hand on the periphery of the spool and turning the handle. The experienced operator will have no difficulty in ascertaining the right tension. All our spools are provided with two small holes near the centre hole which engage with a pin on the spindle. Also the tilting lever on the spool arm spindle has a carrying pin, which should invariable be

engaged in a hole in the spool. If other make spools are used, this hole can easily be made with a small templet in the right position. If this pin and hole are not used, the spool will not only be worn out itself, but the pressure spring will eventually attack the spindle, and cut a deep groove in it. Also it would be simply useless to have a friction clutch.

Shutter Adjustment (for Ghost).

Should the shutter at any time get out of register, which is only possible by loose screws in the pinion mounted on the governor spindle which drives the shutter, or to the shutter having been removed and not placed back in its original position, the re-adjustment is easily effected by slightly loosening the two screws of the said pinion which is mounted on the governor shaft, so as to have them still friction tight. A piece of film should be put in the machine and the handle turned until the film is on the point of being moved, when the shutter should just cover the picture mask. Should it not do so, this can be effected by holding the governor weight with one hand and turning the pinion with the two screws with the other hand, or if is fairly friction tight, with a pair of pliers. Then observe whether you have got it properly adjusted. If not try again until you do succeed.

Removing and Replacing Steel Sprocket.

A new sprocket can easily be fixed by loosening the end screw No. 13 (fig. 2) and drawing the old sprocket off. When the new sprocket has been slipped on the spindle, the screw 13 should be gripped with a pair of pliers and pulled towards you so as to make sure that the maltese cross with the spindle is kept against the shoulder, and with the other hand the steel sprocket should be pushed on the spindle against the bearing, leaving a very minute end shake. The steel screw should afterwards be screwed up very tight in order to ensure the sprocket not turning on the spindle. A film should then be put in the machine and a few feet projected on the screen to see if the picture is steady. If it is not steady, the screw 13 should be again loosened, and the sprocket turned round slightly on the spindle, and a few more feet be projected on the screen. This should be repeated until the picture obtained is perfectly steady.

Ghost on Dog Machine.

This is easily rectified by loosening the end screw on the dog spindle (corresponding with the screw 13 in the maltese cross machine) and turning the dog in the desired direction for the shutter to cover the aperture, and then tightening the screw again. The shutter also can be adjusted if preferred, the same as in the maltese cross machine.

How to find the Focus Lens required.

The usual rule given is to divide the distance of machine from screen in feet by the width of picture required. This rule is not correct, as it goes on the assumption that the size of the picture on the film which is projected is 1 inch wide, overlooking the fact that the mask in the gate cuts off a little all round. To allow for this, we find that the best plan is to divide seven-eighths of the distance between the screen and machine by the width of picture required, which will give the focus of the kine lens. Thus if you wish to show a picture 12 feet wide at a distance of 40 feet, $\frac{7}{8}$ of 40 = 35 and this divided by 12 = 3″ focus lens nearest.

To find the focus of Lantern Lens.

Having found the focus of the kine lens, multiply this by 4, and this will give a lantern picture, the same size as the kine picture is in height. Thus, in the above instance, a 12 ins. lantern lens will be required.

Where lenses of more than 4 ins. focus are used it is advisable to have the condenser lenses of longer focus, in order to avoid having to bring the arc lamp too close to the condenser. The usual focus of the condenser is 6 ins., but this can be increased by using a long focus meniscus lens to 8 ins. or 10 ins. focus.

Twelve ins. Carbons may be used with advantage in our lamphouse by simply removing the small tray from the bottom of the lamphouse and raising the lid.

It is not generally known that the sound of the machine working may be kept from the audience entirely, by covering the openings in the operating room with best English plate glass about $\frac{1}{4}$ in. thick We can supply this from stock 12 ins. square, $\frac{1}{4}$ in. thick, at 2/- per piece. It also prevents smoke, dust and draught passing through the opening.

ON LIGHT.

To those about to become Kinematographers.

A powerful light is the prime condition in producing the best effect of animated pictures upon the screen. Owing to the scattered radiant (or rays) of light derived from oil, acetylene, or spirit burners, their use is very unsuitable for lantern work, and absolutely useless for the cinematograph. The stronger the radiant of light the brighter and sharper the definition of animated pictures.

The various powers obtained from the different sources of light according to photometric tests are :—

4-wick Oil Lamp	80 to 100 c.p.
Acetylene Generators	100 to 250 c.p.
Oxygen with ordinary house gas used with blow-through jet	300 to 500 c.p.
Oxygen gas compressed in cylinders and used for mixing jet.	1,000 to 1,500 c.p.
Oxygen in Cylinder with a Kamm's Carburetter-Jet	1,000 to 2,000 c.p.
The Electric Arc light from	1,000 upwards to 100,000 c.p. (in use with search lights).

The best and most concentrated radiant of light is derived from the electric arc, and most favourably from the arc on a direct current circuit, as it keeps the crater of the carbons in a more fixed position than if it were produced through an alternating current, which has a tendency to make the crater move round and so cause the luminous point of light to travel, necessitating frequent adjustment. This defect can, however, be overcome by the use of special carbons (see page 27).

At various places of public entertainment it is not uncommon for some operators to use a most powerful current through hand-feed arc lamps, taking as much as 50 to 100 amperes for throwing a light at a great distance, and from 20 to 40 feet in diameter upon the screen.

DEFINITIONS OF ELECTRICAL TERMS.

Lanternists who adopt electricity should possess some knowledge of the peculiarities of the electric current. Arduous study of the subject is unnecessary, but a thorough understanding of the terms ampere, volt, and ohm, and their relation to one another should be arrived at.

The *volt* is the unit of electromotive force, commonly written E.M.F., and stands in the same relation to electricity as pressure does when applied to water for hydraulic force. The *ampere* is the unit used for measurement of current. One ampere of current would result from one volt E.M.F. passing through a resistance of one ohm.

The *ohm* is the unit of resistance, and it regulates the pressure of the voltage. All conductors and apparatus offer resistance to the passage of a current of electricity, although some allow it to flow much more readily than others, and, when necessary, resistance coils or rheostats are used to further reduce the E.M.F. or voltage.

Early in the nineteenth century Ohm discoverd that "the strength of a current through any circuit varies directly as the electromotive force, and inversely as the risistance." This has since been known as Ohm's, law, and put as an equation would read

$$(1)\ C = \frac{E}{R}, \quad (2)\ R = \frac{E}{C}, \quad (3)\ E = C \times R.$$

where C, R, and E, mean respectively current, resistance and electromotive force. Less technically put, it may be explained as follows :—(1) To find the amount of a current in circuit, you divide

the voltage by the total amount of resistance. (2) To find the resistance in a circuit the voltage must be divided by the current. (3) The voltage or E.M.F. is found by multiplying the current by the risistance. All these factors should be stated in volts, ohms, or amperes, or decimal parts thereof.

Owing to the differing voltages supplied by electric companies, it will readily be seen that, to obtain uniform results, the lanternist must often have to calculate, the amount of resistance which should be put in circuit to enable him to reduce the current to a pressure which will not damage his apparatus, and yet give perfect illumination. These calculations are most simple, and when, as is almost invariably the case, the E.M.F. is known, the resistance needed is at once arrived at. The arc lamp itself when working has the effect of reducing the E.M.F. by from 30 to 40 volts, termed back E.M.F. which must be deducted from the main voltage when calculating. Thus, if it is proposed to work with 30 amperes of current on a 220 volt circuit, deduct 40 from 220 which leaves 180, and divide by 30, which gives 6 ohms resistance required. Resistance coils or rheostats, the resistance of which is easily varied by cutting off or joining up different sets of coils of wire, are both handy and portable,

The wires are principally made of alloys of hard metals The commercial made rheostats pay best in the end, as the danger of fusing through short circuiting is scientifically reduced to a minimum.

It is necessary to be quite sure that the wires from the mains are thick enough to carry the current needed, and one or two spare fuses should be placed in the circuit to prevent damage through accidental increase of current.

An electrician is generally to be found in any decent hall where the electric light is installed; but an exhibitor should always satisfy himself that everything is order before commencing, and should always have some fuse wire handy in case it is required to replenish a blown one.

How to Ascertain the Cost of Electric Light Consumed.—Multiply the voltage of the supply by the amperes taken by the lamp. This will give the watts. 1000 watts, flowing for one hour, equal one Board of Trade unit, by which the corporations or companies supplying, charge for the current.

Electric Light and its Management for Projecting Purposes.

In halls where the electric light is laid on, it is a simple matter to obtain the electric current for the arc light. In most cases, it is best to call in the local electrician to examine the wiring and see whether the same is heavy enough to carry the amount of current required. If it is not, two wires should be connected somewhere near the main and brought in separate to the locality where the electric light would be used.

With "Direct" current *a rheostat or resistance* is necessary in order to reduce the current to the desired amperage. When the current is 100, 200 or 230 volts, our special wire resistance, as illustrated in this catalogue, is most convenient, giving from 20 to 60 amperes by means of the adjustable sliding switch. When the voltage of the current is 400 volts or over, the resistance should be doubly as large in wire coils, and when purchasing a resistance, the voltage and the maximum number of amperes required should be distinctly mentioned.

With "Alternating" current we recommend the use of our *Transformers*—particulars of which will be found in another place, as a great saving in cost of current is brought about by the use of Transformers *instead of Rheostats* in the old-fashioned way—necessitating the use of several resistances, great waste in current, and a poor light on the screen.

A wall switch or plug should be fixed up, and also safety fuses as well as two terminals as shown by illustration. It is recommended that from this switch board flexible wire of best insulation should be used, of dimensions to carry the maximum current required with ease.

Before joining up to the switch, (1) make your connections at the arc lamp setting both the carbons apart, (2) insert the necessary resistance in accordance with the instructions given on the resistance, (3) join up the two wires to the switch board near the wall, (4) switch on the current, (5) to create an arc light, turn the milled head of the carbon feed screw round and back again sharply: by this means the carbons are brought into contact and separated again, thus creating the arc. Do not allow the carbons to remain touching one another or your fuse may go.

The most convenient *arc lamp* is the hand-feed one, as it obviates any complication or or liability to get out of order. The construction is so simple that it suggests itself, and the regulating is performed by a mere turn of the screw at intervals, according to the distance of carbons from one another. Another advantage arising from the use of the hand-feed lamp is that at the time of projecting a more powerful current can be used to get the best effect, and when not in use the current can be reduced. This cannot be done with an automatically fed arc lamp. Our lamp meets every requirement of the operator, and is simplicity itself. Through its universal adjustment, the light can be centred in a few seconds.

After using the arc lamp the greatest care must be taken to switch off at the wall before disconnecting or removing any part of the apparatus.

Electric light is, however still unobtainable in some places. The only substitute for electric light, has up to the present been found in the *oxy-hydrogen light*. Oxygen mixed with hydrogen will yield the most powerful light next to the electric.

DIAGRAM OF CONNECTIONS.

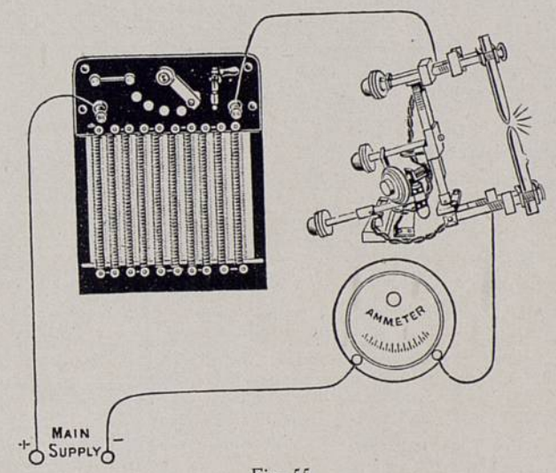


Fig. 55,

The above cut represents the way to connect the arc lamp, resistance, &c., to the main supply of electricity in the hall. The positive wire or lead is connected to the upper carbon of the lamp, and the negative to the lower. A resistance must be inserted in the circuit to check the flow of the current, which would otherwise be too great. The positive lead to the lamp is therefore broken, and the two loose ends inserted in the two terminals of the resistance. An ammeter should be similarly inserted to measure the quantity of current passing through the lamp. Less resistance gives more current and brighter light. High voltages of the supply main require more resistance. The positive (plus, upper) carbon burns away at twice the rate of the negative (minus), and should therefore be considerably thicker, and it should be cored to keep the light steady. In the case of *alternating* current both leads are alike and may be connected up indiscriminately, and the carbons should be of equal size and both cored.

INDEX.

INDEX—*continued.*

ERRATUM.—Page 26.

(See illustrations 4 & 5) should read *(see illustrations 21 & 22).*