CATALOGUE OF EQUIPMENT

USED

FOR PRODUCTION

of

PHYSICAL PHENOMENAS

In THEATRE

by

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PARIS ,

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In THEATRE

For some years now, theatrical staging has become an art form; the painted canvases have given way to truly artistic works. In their turn, the crude tricks must disappear, in the presence of the immense resources currently offered by the physical and mechanical sciences.

Since theatres are currently engaged in a struggle for richness and profusion in staging, we think we are doing the right thing by publishing, in the form of a catalogue, an account of the applications that theatrical staging can demand of science.

USE OF ELECTRIC LIGHT IN THE THEATRE.

One of the first applications of science in theatre was the use of electric light. In 1846, it made its debut at the Opera in the first performance of The Prophet.

Charged with the task of producing a rising sun effect, it was successful and received the most unanimous applause. Her cause was won: lanterns and lights of all calibres were put aside and an electricity service was installed on our first opera stage. Since that time, it is rare that a ballet or opera, requiring a large amount of staging, has been staged without the intervention of some kind of electric light effect.

Imperial theatres and first-rate theatres bounced back under the impetus of the Opera; and the voltaic arc became a permanent feature of stage customs. Few people today are completely unaware of the nature of such bright, dazzling light. Our intention, moreover, is by no means to repeat a description that everyone can find in the first Physics Treatise that comes along; we only want to indicate exactly to those interested in the question, the instruments and accessories indispensable to the production and use of this light.

Equipment required for electric light applications in theatre

Photoelectric apparatus, with its lantern equipped with a mirror

Reflector and coloured screens … . .. . … 600 fr[1].

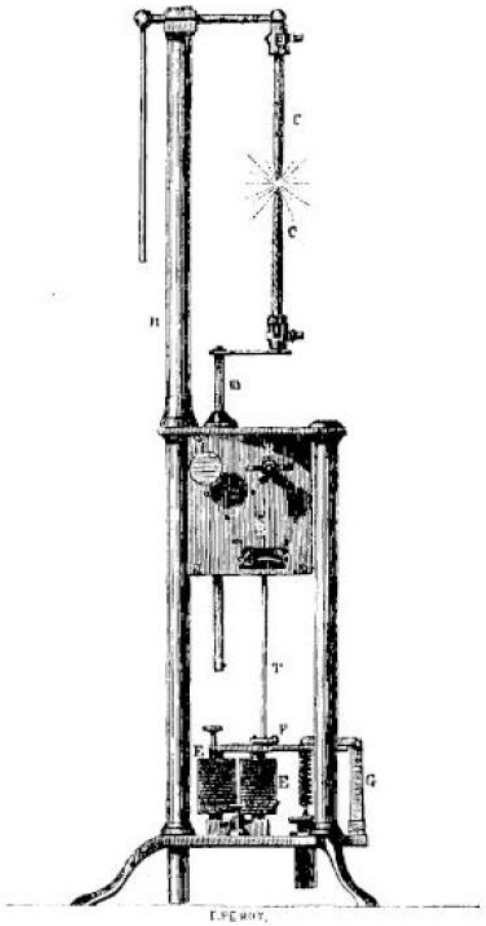


Fig. 1.

Large reflector designed to produce the effect of the sun in the

Prophet ... ... 90 fr.

The screen used to form the sun disk, ... 70 fr.

Bunsen battery (large model) consisting of 50 pairs 275 fr.

Charcoal pencils, one metre ... ... 3 fr.

Gutta-percha[2]-coated **conducting wires**, per metre ... . 1 fr

[1] Based on the gold price on 28/2/2021 a French Frank, 0.290322581 grams of gold, would be wort about 13.40€.

[2] A resilient, electrically nonconductive, thermoplastic latex

With this regulator, shown in figure 1, the position of the light point is strictly unchangeable and the constancy of the emitted light is absolute.

Among the various special effects that we have already produced with the help of electric light, we would like to highlight the Light Fountains. It was in 1853 that this brilliant optical phenomenon appeared in the Opera Theatre, in the ballet Elia and Mysis; its success was such that it was successively reproduced in several large scale plays, and it was even used in public and private parties.

Fountain with three parabolic jets ... ... 500 fr.

Vertical jet and spray fountain with two different illuminating

systems, with coloured glass (from bottom to top and from top

to bottom). . . . . 1000 fr.

Electric light has recently been used to imitate meteorological effects, lightning and rainbows.

Figure 2 shows the device used to produce the effects of instantaneous and momentary illumination of the scene, i.e. to imitate lightning.

Mirror set up for the production of lightning at the

theatre ..... 80 fr.

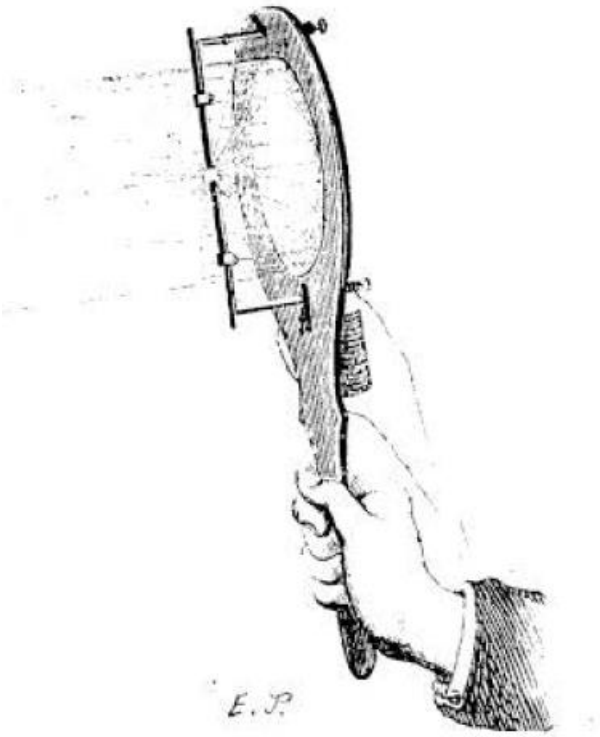


Fig. 2.

In principle, the rainbow was produced in the theatre by illuminating coloured paper strips with large oil-fed lanterns. Later came the electric light: but only the mode of lighting was changed, and, as it was necessary to divide the incident light to illuminate the rainbow over a suitable length, it always remained too dark to allow the stage to be left in full daylight; half-darkness was therefore produced, which made the meteorological phenomenon too magical, its appearance becoming a physical counter-sense. To avoid such a great loss of light, the spectral image had to be projected directly onto the front of the canvas, but the rainbow thus formed was too short. So this is the arrangement we had to settle for:

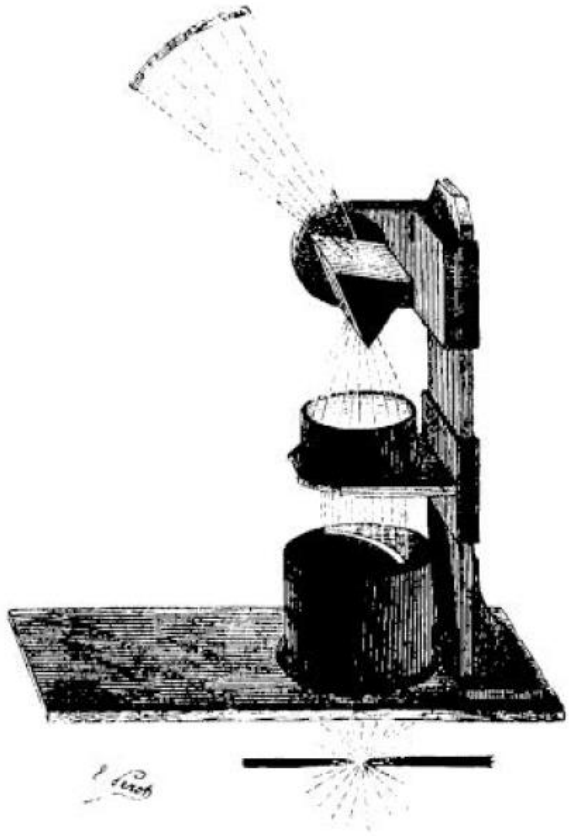


Fig. 3.

The photoelectric device (fig. 3), whose light arc is powered by a Bunsen battery consisting of 100 pairs, is placed on a scaffolding of suitable height, 5 metres from the curtain and perpendicular to the canvas showing the sky on which the rainbow is to appear.

The entire optical system is fitted and fixed inside a black box which does not diffuse any light outside. The first lenses form a parallel beam which then passes through a screen cut out in the shape of an arc; it is then received by another biconvex lens with a very short focus, whose role is to increase the curvature of the image and to give it a more considerable extension; it is at the exit of this lens that the light rays pass through the prism which must decompose them, and consequently generate the rainbow.

Device for rainbow creation, to be mounted on photogenic cameras .... 200 fr.

Other Applications of electricity in the theatre

In another form, electricity has found a very important application in the theatre: the installation of a telegraphic connection, either by means of electric bells or special signals, between the stage and auditorium departments. For example, in cases where an orchestra is detached on the stage, the principal conductor can conduct it with the help of an electric metronome.

Electric metronome, with battery and accessories ... . 125 en .

Electric bell ..... . 30 en .

(The installation costs are to be agreed upon according to the size of the project)

Electrical switchboards for the administrative department.

(The price depends on their complication).

Electricity has also been used to produce remote ignition of gas or fulminating materials. As an example of this application we will mention the magic candelabra of the “pied de mouton”[3].

Device for remote control of combustion

. . . . . 180 fr.

Double-branch chandelier . . . . . 80 fr.

Conductor wire for the experience (1 meter) ..... 0 .50 c.

[3] The “pied du mouton” (sheep's foot) is a French play from 1807

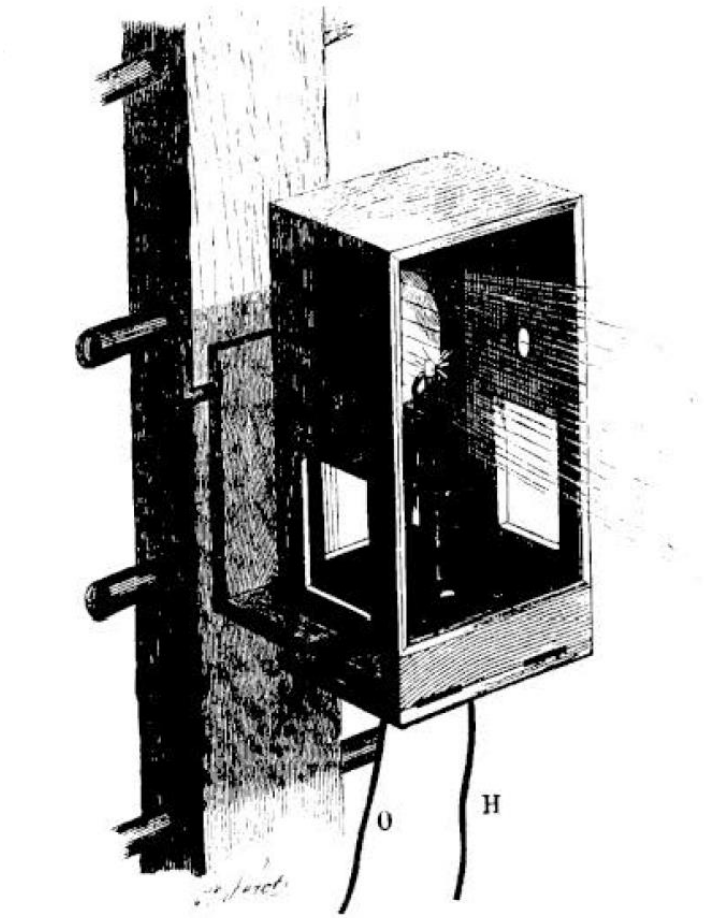
Application of Drummond light

Drummond light, on the other hand, which is very old in science, is on the contrary almost unknown to the public. The first use of this light source in the theatre dates back to 1806[4]; at that time, since there was no lighting gas on the stage, oxygen and hydrogen had to be prepared on site: the lighting equipment was very imperfect, and the only way to light the gas mixture, which had been pre-processed in the gasometers, was to light it directly at the opening of an abductor tube.

It is true that a Volta pistol was placed in the circuit, the explosion of which was supposed to prevent total ignition. Unfortunately, the too frequent accidents that occurred showed the inadequacy of this precaution.

Today, this is the light source that used to appear again in the theatre where it is most eagerly received; however, it has not changed in its nature or in its illuminating power: the improvements made to its production method and to the construction of photogenic devices alone explain this reversal of thinking.

The Drummond light, as we know, is none other than that emitted by a stick of lime at the moment when it enters in irradiation under the calorific influence of the gaseous mixture, ignited in the proportions (2 vol. hydrogen. 1 vol. oxygen) This light would have important industrial applications once its production will be no more so expensive. Nowadays, pure hydrogen can be replaced by lighting gas; but, despite the remarkable work of M. Boussingault and Messrs. H. Saint-Claire Deville and Debray, oxygen is far from being a manufactured product. This gas must therefore still be prepared, as at the birth of modern chemistry, that is to say by decomposing potassium chlorate by heat; the only practical improvement we will indicate is the following : The salt chlorate of potash is mixed with half of its weight of manganese peroxide, and the whole is calcined in a large cast iron bottle provided with a large conducting tube; this apparatus is connected to a rubber bag in which the oxygen is piled up as it goes along, and a purifying system is placed in the circuit.



[4] It is odd that Dubosq gives 1806 as the first date of use in theatre, most other sources give Goldsworthy Gurney (1820) or Drummont (1824) as first users.

Fig 4

In this way, several bags of 100 to 150 litres can be filled in a very short time. But the cost price per cubic metre is very high. If the consumption of oxygen gas becomes considerable, manganese peroxide would have to be used, but so far it has seemed preferable to simplify the operating arrangement.

The photogenic apparatus currently adopted is the gas torch, as modified by M. Deville (fig. 4).

The O tap delivers oxygen gas, which is put under suitable pressure by means of weights placed on the rubber bag containing it, and the lighting gas comes through the H tube.

The two partial ducts lead to a wider pipe, ending in an elbow. It is made up of two concentric envelopes; the oxygen coming through the inner tube thus enters the centre of the hydrogen gas flame, which opens out through the outer circuit: the operation of the taps allows the exhaust of both gases to be regulated.

The cylindrical stick of lime is placed on a straight support, which can be raised or lowered in the column that forms the base of the instrument.

The photogenic apparatus is placed in a lantern, the back of which is fitted with a concave mirror, and the plate which supports this lamp can move forward or backward, with the aid of a screw, so that the jet of light can be adjusted to the focus of the reflector. At the front, the optical devices necessary for the production of the effects are fitted.

This light is very advantageous for producing certain intense effects in the theatre, for which the voltaic arc would be too bright and a set, even considerable, of gas nozzles would be insufficient. Thus, moonlight, coloured light emissions are produced with it in the most advantageous way.

However, if the lighting effect has to cover a large area, to illuminate several figures, too many devices would be needed, and the costs would be higher than those caused by the use of electric light.

Devices required for Drummond lighting applications in the Theatre .

Complete photogenic apparatus, i.e. an oxy-

hydrogen, lantern, coloured glass series,..... 120 fr.

Bottle of lime sticks ... ... 6 fr.

Rubber bag, storage capacity 80 litres ... . . . 80 fr.

Rubber tubes, per metre …. . . . . 1.25 fr

Complete device for oxygen preparation . . . 35 fr.

Production of fantastic ghosts and apparitions.

The reflection, through tinless[5] mirror glass, of objects concealed from direct vision has been very successful, under the name of living and intangible ghost appearances. Almost all the theatres in Paris use this experience to increase the interest in their shows. The technical layout of the experience depends essentially on the nature of the scenario in which the images must engage with the actors behind the glass; however, the following description is sufficient to explain the general layout necessary to produce this optical effect.

The mirrors are set at the right angle to the stage plane (it is essential to operate with mirror glass and not with ordinary glass, as the reflective surface must be of rigorous purity, as the slightest roughness compromises the sharpness of the image). A void is created at the front of the stage against the orchestra. The actors, whose images must be reflected by the glass, are placed there to produce the apparitions. Their position, in relation to the inclination of the mirrors, must be such that the images appear vertical and in contact with the floor of the theatre, for the spectators in the orchestra and the first gallery.

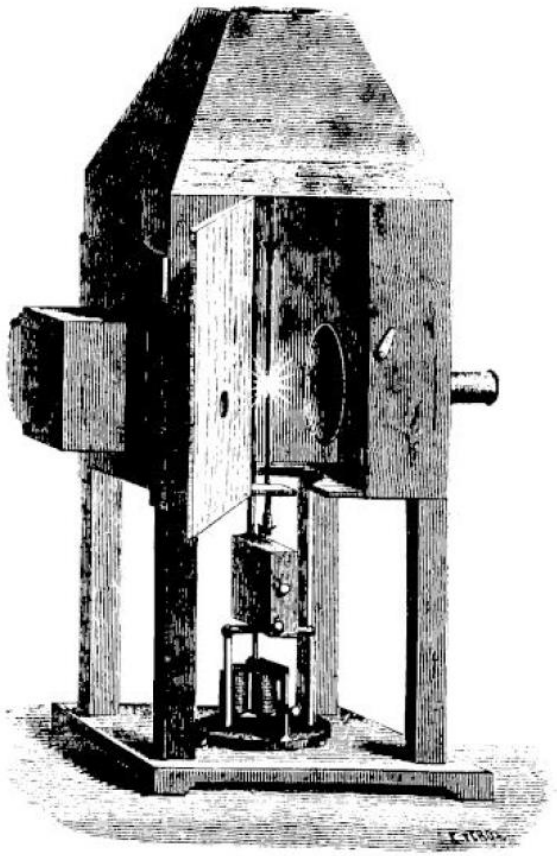


Fig 5

As the spectators climb to the higher seats, while remaining vertical, these images seem to leave the ground. The sudden appearance and fading of the spectral images is created for the spectators by opening and closing the lighting device quickly.

The effect produced is very easy to understand. When looking through a tinless mirror, the space in front and behind is equally illuminated, no image can be seen; the amount of light reflected in front of the mirror is less than the amount of light on the other side. If darkness is produced in this area and then any object is brightly illuminated in direct view of the observer, a virtual image immediately appears to stand out with intensity behind the mirror at a distance equal to that of the object: darkness thus acts as a kind of silvering[6].

Depending on the importance of the scenario, the subjects will be illuminated either with Drummond light or with electric light. The latter is preferable when it is a question of giving the appearances a more fantastic hue by means of coloured glass, the Drummond light, in the latter case, being absorbed too much.

Mirror glass of 3m,20 by 2m,04 . . . . . 600 fr.

[5] In fact, this is mirror glass without any reflecting layer on the back.
[6] What is meant is that it works like the reflective layer of a mirror.

Fantastic apparitions can also take place in other circumstances, using phantasmagorical devices. These effects have been advantageously performed in the ballet Butterfly and the opera The Trojans. These appearances are the result of enlarging, by optical process, photographic prints on glass, i.e. transparencies representing the figures in the painting. These devices are similar to the one shown in figure 5.

Phantasmagorical device - for a single image. 100 fr.

Id. for two simultaneous images..... .. .. 250 fr.

These devices fit exactly to the lanterns of the light sources indicated above.

It is of obvious that the camera does not need to be moved in order to enlarge or reduce the image; it is sufficient to vary the distance from the lens to the photographic print by means of a screw.

The applications of science in theatre are in their infancy, and will certainly soon become more important; not only do we intend to follow the progressive movement in this direction, but we will contribute to its development as far as we are able.

We will send to the directors of provincial and foreign theatres the equipment indicated in the catalogue, ready for the production of the effects, accompanied if necessary by sufficient explanation to allow the employees to operate without any foreign help.

If a special installation is required, we will send an experimenter who will also train the theatre staff in the execution of the effects.

J.Dubosq