Drummond Light, Limelight: a Device of its Time

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Abstract

This paper relates the story of 'limelight', a very widespread and intense light source used throughout the 19th century. Not only the physics and technology of limelight are stressed upon, but mainly limelight connections with many aspects of the western societies of the time, from topography and science experiments to entertainment and even politics.

Introduction

Everybody in the world knows Charlie Chaplin's wonderful film *Limelight*. However, apart from native English speaking people, the relationship with the mineral 'lime' is far from being obvious. For example, in French, the film title has been transcribed into *Les feux de la rampe* ('Lights of the stage border'), thus showing no allusion to anything such as 'lime'. Actually, what is behind the Limelight story is a device – the *Drummond lamp* – closely related to the society of the nineteenth century: scientific experiments, technology, topography-geodesy, lighthouses, politics, theatres lighting and spot-lighting, projection lanterns and emerging cinematograph, safety laws in entertainment places. Such is the story we are telling now.

The 'Drummond lamp' also called 'Drummond Light' or 'Limelight' was the most intense light source used for most of the nineteenth century, after the heliostat and before the widespread use of the electrical arc with which it competed during several decades. It is a kind of blowtorch, fed, first with oxygen, and secondly, either with town gas, hydrogen, alcohol or ether. The flame is directed onto a piece of quicklime that, becoming white hot, emits extremely intense light, almost blinding (Fig. 1). This is the 'Quicklime effect'.

Fig. 1 *The 'quicklime effect': an image today, of a Drummond light obtained by violently flaming a piece of quicklime with a modern blowtorch. Foreground: the concentric nozzle of an original lamp, of course not in service.*

The Drummond lamp could be either of the 'vertical' or the 'horizontal' type; this last one particularly used for spotlighting in theatres. A series of lamps (many of them built by the French manufacturer Duboscq) have been found in the collections of French schools, in the *Fondazione Scienza e Tecnica* in Florence, in the Universities of Torino (Italy) and Coimbra (Portugal), in the *Collège Saint-Marc* in Alexandria (Egypt), in the Teylers Museum in Haarlem (The Netherlands); several 'horizontal' ones in Ireland corresponding to specific items of the *Yeates & Son* catalogue (Trinity College, Dublin; Queen's University in Belfast; Birr Castle in Co. Offaly). Of course, this list is far from being exhaustive. Some examples are shown on Figs 2 and 3.

Origins of the Drummond Light

Thomas Drummond (1797-1840), an ordnance officer of the Royal Engineers born in Edinburgh, adapted and improved a device invented by another Scott, Goldsworthy Gurney (1793-1875), a many-sided inventor, *circa* 1820. Gurney was developing the new oxy-hydrogen blowpipe. He then directed the flame on various earths and thus discovered the 'quicklime effect'. Two main books are devoted to Drummond's biography by J.F. McLennan (McLennan 1867) and R.B. O'Brien (O'Brien 1889).

Thomas Drummond joined Colonel Colby in Edinburgh in 1820 in the work of Ordnance Survey of the Highlands. In order to 'afford points of observation that might be seen at remote distances' a main problem was to 'combine, with the heliostat [in use during daylight], a means of exhibiting a bright light at night'. The Argand lamp, generally used with a reflector, was inadequate for very long distances, especially in countries in which the light was hazy.

As his duties required him to remain in London during Winter Drummond went to complete his knowledge in studying Chemistry. Attending Faraday's lectures, he heard about the quicklime effect. He immediately understood that '[Gurney's invention] could be employed with advantage as a substitute for Argand lamps in the reflectors used in the Survey, for rendering visible by night the distant stations' (McLennan 1867, pp. 66-67). He immediately started experiments at home before departing for the *Trigonometrical Survey* of the Highlands for which he had been recruited. Details are given in his 1826-report in the *Philosophical Transactions* (Drummond, 1826) and in McLennan's book (McLennan 1867,

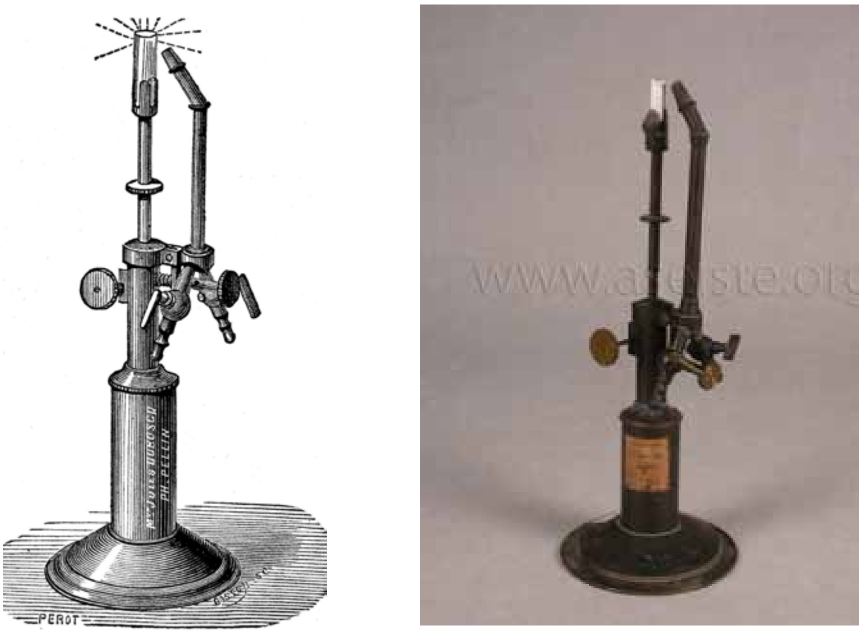


Fig. 2 *Duboscq-type Drummond lamps.* Left: *catalogue* Duboscq-Pellin, c. *1900.* Right: *collection of Lycée Guez de Balzac, Angoulême, France (courtesy of the ASEISTE*[1]*).*

Fig. 3 Left: *a Drummond lamp at the Collège Saint-Marc in Alexandria (Egypt), manufacturer unknown.* Right: *'horizontal' Drummond lamps. Top: Queen's College, Belfast (N. Ireland), manufacturer:* Yeates, *note the platinum nozzle for use with hydrogen.* Down: *a beautiful model made by* J. Salleron *(Paris, 1869), Teylers Museum, Haarlem (The Netherlands).*

pp. 68-69). The first trials, conducted with 'a stream of oxygen directed through the flame of alcohol' showed that:

> 'among several incandescent substances, lime resulted in the highest relative intensity: 37 times an Argand burner (while 31 times with zirconia and 16 times with magnesia)… and by a more perfect adjustment of the apparatus 83 times' (Drummond 1826, p. 331).

Besides its strong intensity, a main interest of the limelight was that the shape of the piece of lime itself could be easily and accurately shaped to a sphere in a lathe; contrary to the 'large and unsteady combustion flames', the sphere of lime, exactly placed at the focus of a parabolic reflector, retained its shape; furthermore, since light is emitted from the surface of the luminous sphere, 'its size [could be] regulated by the spread to be given to the light'. Drummond also compared the relative advantages of the parabolic reflector, and of the new Fresnel lenses already in use in French lighthouses and recently used, with Argand lamps, across the Channel in 1821 for connecting the meridians of Greenwich and Paris under supervision of Colby and Arago. Though Fresnel lenses yielded 3¼ times the intensity of the reflector,

> 'the properties of the simple parabolic reflector appeared still to give it a preference for the service of the Trigonometrical Survey, provided a more powerful light could be substituted in its focus, instead of the common Argand lamp' (Drummond 1826, p. 329).

We can particularly think about the practical advantages of portability and expenses.

The Physics of Limelight

The 'quicklime effect', sometimes called *candoluminescence*, is in fact a *thermoluminescence* effect. It occurs with some metal oxides (e.g. Ca, Mg, Zr) in which, though no chemical change takes place, the high-temperature emission spectrum contains an additional short wavelength band-component in addition to the usual black body radiation: the emitted light looks very much whiter than expected from the flame temperature. Though quicklime is the most efficient, Mg-oxide was sometimes preferred for its increased durability. A comprehensive presentation of the phenomenon can be found on the website of the university of Leeds: http://www1.chem.leeds.ac.uk/delights/texts/Demonstration_19.htm

The thermoluminescence effect has been reported and studied by scientists (i.e. Nichols & Crehore 1894). It should not be confused with *flame luminescence*, a greenish glow briefly occurring on the same materials at much lower temperatures, when a hy-

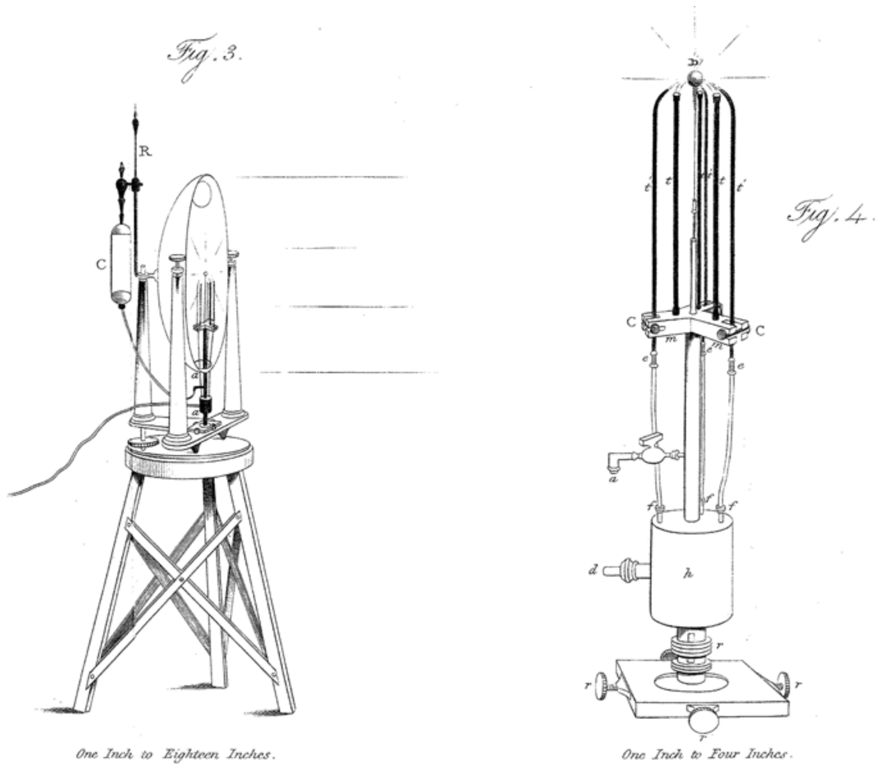


Fig. 4 *Drummond's oxygen-alcohol limelight as described in his Phil. Trans. report. The alcohol from the cistern C* (left picture) *entered at a* (right) *and ascended through the tubes t, while the oxygen, introduced at d ascended trough the tubes t'. Both gases were directed on the small ball of lime placed at the centre of the reflector (Drummond 1826, p. 328).*

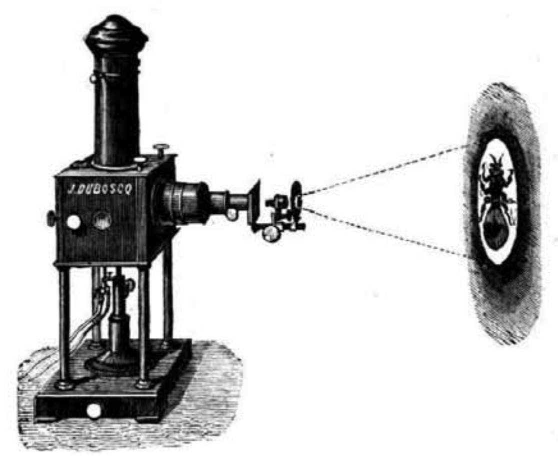


Fig. 5 *The Jules Duboscq Lanterne photogénique and Solar microscope. The same lantern could accept either a Drummond lamp (shown here) or an electric arc. For projection of micrographs, it is here equipped with the Solar microscope that could fit either the lantern or a heliostat, hence its name (Duboscq 1885, p. 15).*

Fig. 6 *But what are those people doing? The picture shows a projection of microscopic dispatches during Paris siege by the Prussian army, 1870-1871. The collodion microfilms were sent by pigeon post over the enemy's lines. The projection lamp was either a Drummond light (here, as revealed by the two feeder pipes) or a regulated electric arc (Duboscq 1885, p. 16).*

drogen flame is directed on the slowly cooling piece of lime (Nichols & Wilber 1921).

The 'quicklime effect' was finally a by-product of the discovery of oxygen at the end of the eighteenth century. Later, it will be at the root of the new Auer gas mantle which appears around the 1880s, and which rests on the same principles but with thorium/cerium oxides instead of calcium or magnesium: a small fabric bag is impregnated with metallic salts that, first heated in a flame, convert to metal oxides.

Limelight, the Ordnance Survey of Ireland and Lighthouses

The 'Drummond lamp' acquired an immediate fame when Drummond applied it for the first time during the Ordnance Survey of Ireland, a specially 'hazy' country, in 1825: '*light could be observed 68 miles away and would cast a strong shadow at a distance of thirteen miles*'. The lamp was then fed with alcohol, more expensive and less efficient than hydrogen, but 'not being subject to explosion'. Drummond's original drawing is shown on Fig. 4.

Later, Drummond made many innovative improvements to his lamp in order to apply limelight to lighthouses (O'Brien 1889, pp. 33-35). At the beginning of the 1830s, the improvement of the intensity of lighthouses had become a matter of public discussions:

> '…the Drummond light held a foremost place, in the opinions of experts and scientists. In 1834, a Select Committee of the House of Commons was appointed to inquire into the state and management of lighthouses. Drummond was examined before this Committee, and stated with characteristic frankness the advantages and disadvantages of the light' (O'Brien 1889, p. 50).

Alcohol was replaced by hydrogen 'not only much more economical but productive of a considerable increase of brilliancy in the light' (McLennan, 1867 p. 116). It was in competition with the Argand lamp. A series of very successful comparative experiments took place between Purfleet and Trinity Wharf (a distance of 10¼ miles) in London but, though 'this light approaches, in its properties more nearly to solar light, than any other produced by artificial means' (O'Brien 1889, p. 54), strong limiting issues finally prevented its use.

Indeed, there were serious objections to the use of limelight in lighthouses, and Drummond was quite aware of them: greater expense and danger due to the extreme heat produced, difficulty to supply pressured hydrogen and oxygen (compressed 2 or 3 times) to the gasometers in lighthouses often situated on remote sites or in islands; overall, its handling required a highly skilled personal, which was not the case of the lighthouses keepers of the time. Finally, the Committee recommended that

> 'means should be adopted without delay for prosecuting still further the experiments recommended by him and under his direction if possible' (O'Brien 1889, p. 54).

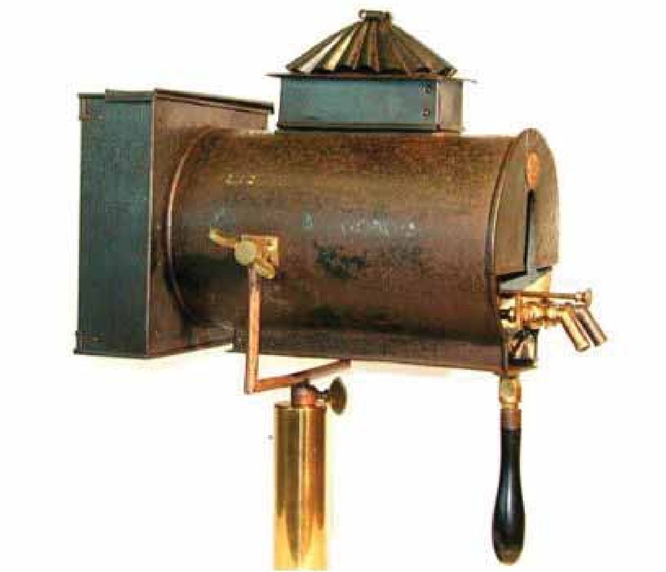
Following this suggestion, Sir David Brewster proposed that the Drummond light

> 'should be employed as a separate instrument in every lighthouse for occasional use … to be used only in hazy weather' (McLennan 1867, p. 127).

However, Drummond, deeply impressed by the terrible situation of Ireland he had observed during the Survey, had suddenly glided into politics and the Drummond light would never be really applied to lighthouses. Ireland became Drummond's adoptive country and he was appointed from 1835 to his death in 1840, as 'Irish under-secretary' in Dublin, a very high position in which he acquired 'the affections of the masses of the people'. His untimely death was a long-term consequence of 'a long and severe illness' caught during the Survey where 'he had suffered much from inclement weather and from frequently standing in deep water' (McLennan 1867, p. 114).

Limelight and Optical Experiments

The Drummond lamp was widely used for optical experiments, in particular by Fizeau in his famous measurement of the speed of light – the first terrestrial measurement of it – with a toothed wheel device in 1849. Indeed, this night experiment required a very concentrated and intense light source, in order to send a beam through a toothed wheel from Fizeau's home in Suresnes, to a mirror placed on the Montmartre hill 8 km away, and back to the toothed wheel. The Drummond light was logically chosen by Fizeau (Fizeau 1849; Frercks, 2000). Cornu would use it again at his duplication and improvement of Fizeau's experiment in 1876 between Paris Observatory and Montlhéry (Cornu 1876).



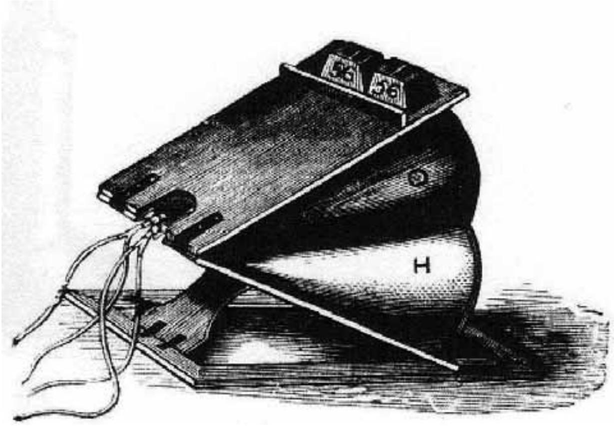


Fig. 7 Left: *a spotlight including a horizontal Drummond lamp, in use in the mid-nineteenth century.* Right: *a double bag with two compartments for oxygen (O) and hydrogen (H); note the compression system made of two planks, hinge and weights (Duboscq 1885, p.6).*

Drummond lamps were widely used as light sources for optical experiments in Science Education, as attested for example by the comprehensive inventory made by the ASEISTE in France (see note 1). Four Drummond lamps have been found by this association in French *collèges* and *lycées*, three of them signed *Duboscq*, and another one (see Fig. 2) in the collections of the *Collège Saint-Marc*, a French *collège* in Alexandria (Egypt).

Our personal interest into the Drummond lamp go back to the lending by the ASEISTE, some years ago, of a Drummond lamp from the collection of the *Lycée Bertran de Born* (Périgueux, France): this original lamp can be seen among Fizeau's original instruments in our film *Les magiciens de la lumière*, a film devoted to the historical measurements of the speed of light.[2] The lamp body is fitted with a dovetail allowing its adaptation on an optical bench, thus attesting its use for optical experiments in teaching.

Limelight and Projection Lanterns

The Drummond lamp has been used, during several decades until the beginning of the twentieth century, as a light source for projection lanterns. It is thus associated with the precursors of the cinematograph such as the *phenakistiscope* and similar devices aiming at giving the illusion of motion. It is worth mentioning that a Drummond lamp (fed with ether) was used in the *Biograph* ('bio' stands here for 'animate'), one of the first cinematographs built by *Normandy-Joly*, in use in Paris during the 1890s (see Fig. 8, left).

A remarkable projection lantern, the *lanterne photogénique,* can be found in the *Jules Duboscq* catalogue of the year 1885. It could accept any type of light sources in use at the time, including Drummond light and electric arc. An important application was the Duboscq 'Solar microscope' that allowed projecting micrographs (e.g. Foucault's microdaguerreotypes) on large screens: the light source could be either a heliostat or a *lanterne photogénique* with either a Drummond or electric arc source (Fig. 5). Such a lantern has been found and preserved at the *Fondazione Scienza e Tecnica* in Florence (Brenni, 1995, pp. 6 and 9). A very unexpected military use of the Drummond lamp in a projection lantern during the Paris siege in 1870 is shown in Fig. 6.

Finally, though this goes beyond its use in projection lanterns, we can't help reporting its use in searchlights from the following anecdote related to Queen Victoria's visit to Napoleon III in 1855:

'it was this light from many similar [Drummond light] arrangements that illuminated the British men-of-war when Napoleon III left her Majesty's yacht at night in the docks at Cherbourg.' (reported on the website of the School of Chemistry, university of Leeds: http://www1.chem.leeds.ac.uk/delights/texts/Demonstration_19.htm).

The use of Drummond light for street lighting has also been seriously proposed in France, such as reported by Abbé Moigno (Moigno 1868, pp. 269-271), but, as is known, without any success.

Limelight, Theatres Lighting and Fire Hazards

Limelight (produced with oxygen and hydrogen) was used in the theatre for the first time in the second Theatre Royal, Covent Garden, in 1837. It allowed spotlighting the performers on the stage (Fig. 7, left). The 'Drummond light' became widely used in the nineteenth century for stage lighting in theatres and music-halls (Banham 1995, p. 1026; Moigno 1868, pp. 370-371). The oxygen was produced *in situ* via a chemical process – generally heating of potassium chlorate – and stored in *caoutchouc* balloons, bladders or pressured tanks, just like the hydrogen component (Fig. 7, right). The hydrogen was prepared from dilute sulphuric acid on zinc or stored from industrial production. Many details about those preparations can be found in the book of Abbé Moigno *L'art des projections* (Moigno 1872, pp. 22-37). This was not without entailing strong fire hazards: the Drummond lamp, together with other lighting devices, is connected to the emerging safety laws at the end of the century.

Indeed, most theatres fires in this century were caused by *stage lighting*, and they were numerous! Let us list some of them:

- Richmond Theatre, Virginia, US (1811), 72 killed: a *stage chandelier* was lifted towards the ceiling and set fire to the cords;
- Lehmann Theatre and Circus, St Petersburg (1836), 800 killed: a *stage lamp*, hung too high, ignited the stage roof;
- Brooklyn Theatre, New-York (1876), 294 killed: '*perforated stage border catching*

Fig. 8 *The Paris Charity Bazar fire (1897).* Left: *the Normandin-Joly reversible cinematograph.* Right: *report of the fire in* Le Petit Journal *(16 May 1897).*

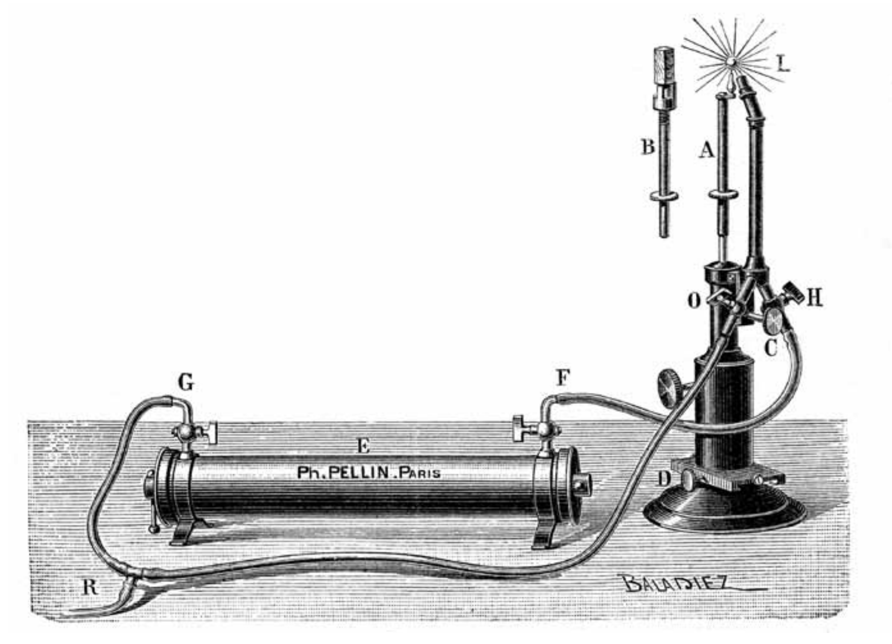


Fig. 9 *The Zahm-type oxyetheric carburator for the Drummond lamp in the Pellin-Duboscq catalogue (Pellin* c. *1900). The ether was stored in the horizontal cylinder E, or carburator. The oxygen flow, coming through R, was partially used to drag the ether vapour through G and F to C.*

fire from the stage border lights' (possibly limelight);

- Ring Theatre, Vienna (1881), 384 (officially), 600 (estimated) killed: a *long-arm igniter* to light the raw of *gaslights* above the stage, ignited some gauze;

- the three Exeter Theatres fires : the New Theatre fire (1820), a *gas-lit chandelier*, too high in the roof, set fire to the rafters; the First Theatre Royal fire (1885), caused by '*oxygen/hydrogen fuelled limelight, making for a very dangerous fire hazard*', there were no casualties except a pig belonging to a clown! The Great Theatre Royal fire (1887), 186 killed, '*a naked gas flame ignited some drapes in the fly's*' (about the Exeter fires, see: http://www.exetermemories.co.uk/em/theatre_fire.php);

- Charity Bazar, Paris (1897), 129 killed: an *oxyetheric* Drummond projection lamp exploded;

- Iroquois Theatre, Chicago (1903), 605 killed: an *arc light shorted out* and sparks ignited a muslin curtain.

The most surprising fact is perhaps that the use of limelight didn't provoke significantly more fires than the other lighting modes. However, it played its own part. Let us refer to W.P. Gerhard's book *Theatres Fires and Panics* listing, among the causes, '… Carelessness in lighting border lights. The careless use of the oxy-hydrogen or lime-light …where lime or calcium light is used on the stage for special illuminations it should be most carefully handled and manipulated' (Gerhard 1896, p. 22).

Let us turn our attention to three items from the above list that put light on the safety policies (or lack of) at the time:

- from the last Exeter Great Theatre Royal fire in 1887, the British Parliament legislated requiring, amongst other things, the well-known *fire proof safety curtain* which had to be lowered and raised before every performance.

- In the US, we can read in the in *The New York Times* of Dec. 31, 1903, following the terrible Iroquois Theatre fire, a comment on previous fires:

> 'After each of the worst disasters there has followed a great wave of public sentiment demanding the enactment of new laws designed to make such calamities impossible in the future… The Brooklyn Theatre fire (1876) led to the passage of many laws in many States, designed to make places of popular assemblies safer.'

However, they couldn't prevent the Iroquois fire in Chicago.

- The Paris Charity Bazar fire in 1897: the Charity Bazar was an annual charity event organized by the Catholic aristocracy, held in a wooden shed, 80 by 13 metres near the *Champs Élysées.* Panic of the crowd resulted in 129 killed, mostly aristocratic women including the Duchess of Alençon, sister of the late Austria's Empress (Fig. 8).

> One of the most horrible feature of this fire was the cowardice displayed by many of the men, who beat down women and children and loft them to their fate.' (*The New-York Times*, December 31, 1903).

The cause of the fire was the *explosion of a Drummond lamp fed with vessels of*

Fig. 10 *Charlie Chaplin,* Limelight *(1952): Claire Bloom and Charlie Chaplin.* © Roy Export SAS. *Scan Courtesy Cineteca di Bologna*

oxygen and ether, this lamp was part of a *Normandy-Joly cinematograph* built by *Molteni*. The lamp was fed from a *Zahm-type* '*carburator*', a device in use when there was no town gas facility (see Fig. 9):

• the ether was stored in an horizontal cylindrical tank – or 'carburator' – filled with felt, in which liquid the ether was slowly poured.

• to ensure that all the ether had really been absorbed into the felt, you were supposed to 'turn the carburator vertically, taps open, and check that no liquid ether flows out'!

• such an '*oxyetheric*' Drummond lamp was described in the Pellin-Duboscq catalogue as *absolutely secure* (Pellin, *c.*1900), see Fig. 8. However, handling errors by untrained users couldn't be anticipated.

An indirect consequence of the Charity Bazar fire in France – especially in high social classes – was the emergence of many opponents to the cinematograph that was temporarily relegated to fairground stalls where it would attract new adepts. The cinematograph really resumed in France only on the occasion of the 1900 World Fair, with *Brothers Lumière*.

Limelight: A Multidisciplinary Topic

The history of the Drummond light – a pivotal key between science and technology – is connected to various disciplines: physical sciences (optics, chemistry, physics, trigonometry), geography and land survey, history of theatres and of Ireland, politics and safety laws. Thus, limelight yields an entry into the nineteenth century world.

Let us point to some items:

• the Drummond Light was made possible only from the discovery and separation of oxygen at the end of the eighteenth century, a discovery in which famous scientists took part: Scheele, Priestley, Cavendish and Lavoisier. And how hydrogen and oxygen were prepared *in situ* for theatres lighting is a matter of retrospective frights! Limelight is also connected to mathematics and geography through its use for 'Trigonometrical Survey' (triangulation). And with optics: why parabolic reflectors for land survey and why Fresnel lenses for lighthouses?

• the Physics of *thermoluminescence*. If you have the chance to live in a country where classroom experiments with flames, gases and blowtorches are not yet forbidden: then, try the limelight by directing the flame of a modern blowtorch on a piece of quicklime or chalk and everybody will be amazed at the spectacle! Furthermore, at least at the university level, you may combine this experiment with a spectrometer, analyze the optical spectrum and check the disparity with the black body radiation. See, for example, the excellent website of the School of Chemistry, University of Leeds (UK): http://www1.chem.leeds.ac.uk/delights/texts/Demonstration_19.htm

• note the limited efficiency of analogies in the development of technology: limelight, an application that revealed highly efficient in the field of land survey, finally – though it was the best for the resulting brilliancy – encountered strong obstacles, practical and economical, when tentatively transferred to lighthouses.

• the first practical use of limelight for the survey of Ireland is an illustration of the relationship between social needs and the development of science and technology: political needs underlying the Ordnance Survey of Ireland (1824-1825) and the Boundaries Commission (the Reform Bill of 1830-1832), at a time where this country suffered extreme misery, strong political agitation and religious feuds:

> 'The object of the Legislature [1824], in directing a new survey of Ireland to be made… [was] to consider 'the best mode of apportioning more equally the local burthens collected in Ireland'. The burthens had previously been apportioned by Grand Jury assessments…[but] the divisions, in either case, contributing in proportion of their assumed areas, which bore no defined proportion to their actual contents. The Committee reported that it was expedient to give much greater despatch to this work than had occurred in the Trigonometrical Survey of England. They recommended that every facility, in the way of improving instruments, should be given to the Ordnance officers by whom the survey was to be conducted' (McLennan 1867, p. 64-65).

Indeed, the Trigonometrical Survey of England, interrupted at the end of the year 1823, would not resume until 1838. Clearly, Ireland was a main political issue at the time. To those political motivations, we must add the availability of a new technical device (the blowpipe); and the presence of a skilful, persevering and rigorously minded man.

Conclusion

With the story of the Drummond lamp, we immerse ourselves into many aspects of the nineteenth century society and it may be a good source of information and of teaching examples for teachers in various disciplines. Let us apply to the Drummond lamp a historiographical model concerning the multiple dimensions of use of scientific instruments recently proposed by S. Gessner (Gessner 2012):

• operational use (solving a fixed series of problems): *Yes*

• empirical use (observing, measuring): *Yes*

• representation use (recording, displaying): *Yes*

• didactic use (teaching, clarifying): *Yes*

• experimental use (exploring, entertaining): *Yes*

• symbolic use (decorating, prestige): *No, or maybe Yes (e.g. Chaplin's film* Limelight*)*

• economic use (making, trading): *Yes*

Thus, the Drummond lamp appears as an almost perfect multidimensional instrument: indeed, it fits practically all items above.

In Great Britain, in the second part of the century, limelight was so intimately associated with theatres and music halls that someone in the public eye was said to be '*in the limelight*'. Hence the title of the wonderful film of Charlie Chaplin: *Limelight,* and this will be our conclusion (Fig.10).

Acknowledgements

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Notes

1. *Association pour l'Étude et la Sauvegarde des Instruments Scientifiques et Techniques de l'Enseignement* (Association for the Preservation and Study of the Scientific and Technical Instruments of Education), http://www.aseiste.org. Contact: giresfrancis@free.fr (current president). See Francis Gires and Pierre Lauginie, 'Preserving the Scientific and Technical Heritage of Education: the ASEISTE, *Bull. SIS*, No. 121 (June 2014), pp. 36-42.

2. *Les magiciens de la lumière* ('Wizards of Light'), a double DVD produced by the Faculty of Sciences of Orsay. Contact: christine.azemar@u-psud.fr

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Current and Future Events

Details of future events, meetings, exhibitions, etc. should be sent to the Editor. For up-to date information of Society's events, see the SIS website, www.sis.org.uk.

Extended to 31 January 2016, Oxford, UK
The Henry Moseley exhibition which marked the re-launch of the Museum of the History of Science's Special Exhibition has been extended to the end of January next year. For information see the museum's website at www.mhs.ox.ac.uk.

April weekend 2016, County of Kent, UK
A possible April weekend visit to Kent including Maidstone Museum's impressive collection of antique photography artefacts, Belmont House Clock collection and Down house former home of Charles Darwin. Exact dates in April to be confirmed (but definitely a Sat-Sunday). The most likely dates are Sat April 30^{th} - Sun May 1^{st} .See the flyer in this *Bulletin* to gauge members' interest.

2-3 July 2016, Cambridge, UK
Provisional dates for the Annual General Meeting at the Whipple Museum and visits are planned during this weekend. There may also be an opportunity to present papers. Those who are interested in presenting a paper should contact our Meetings Organiser Nigel Parkinson at sis@sis.org.uk

5-9 September 2016, Sicily
International Study Trip to Sicily which will be based in Palermo where there are a wealth of University and School collections including, astronomical, physics and chemistry, engines and machines. There is also the likelihood of some visits further afield which will take in the historical and architectural splendour as well as the scientific instrument interests of the Island. Usually the International Study Tour is in the Spring but on advice this has been delayed until September. In consequence the possible autumn visit to Bath has been cancelled for being too close to this visit. There will be another flyer in the March *Bulletin* with more details. A number of members have already expressed an interest.

Provisional Visits for 2017
Programme ideas for the following year that are being considered are reinstating the visit to Bath; Blythe House, the old Headquarters of the Post Office Savings Bank and now used as a store of several of the major London Museums, including the Science Museum and a possible visit to the coastal Sound Mirrors (see http://www.andrewgrantham.co.uk/soundmirrors). All dates and venues to be confirmed both in future Bulletins and on our website. Perhaps you have ideas about possible visits in the future. Email the Editor your ideas.