

of Wales, and about the same time was chosen as a Fellow of the Geological College, an honour peculiarly gratifying to him. In 1869 he found himself, from the great pressure of work, obliged to resign the professorship at Cambridge, and soon after he was appointed to the canonry of Chester. As long as he held this position (which he only left to take one in Westminster Abbey) he resided three months of the year in Chester, and, as usual with him, threw himself heartily into all the work that came to hand, and that of the most varied character. He inaugurated a botanical and geological society at Chester, bringing parties of the members, accompanied by friends, ladies included, on excursions into the country, where he lectured in the fields on geology and botany, with hammer in hand and box for dried specimens on his shoulder. "These were bright afternoons," writes his biographer; "all classes mingling together; people who had lived next door to each other in Chester for years, perhaps without exchanging a word, now met on equal and friendly terms, and found themselves all travelling together in second-class carriages without distinction of rank or position, to return at the end of the long summer evening to their old city, refreshed and inspirited, with nosegays of wild flowers, geological specimens, and happy thoughts of God's earth and of their fellow-creatures. Perhaps the moral gain was as valuable as the scientific results of these field lectures."

But his activity was not confined to one department. He improved the condition of the city library and reading-room, delivered lectures on general subjects, and did much to check the mischief done by the annual Chester races. He was most diligent as a preacher at the cathedral; he had always large congregations of attentive hearers, and towards the close of his residence they increased in numbers.

About this time he went to Birmingham, to deliver a lecture at the Midland Institute, of which he had been appointed president for the year. The subject he chose was the Science of Health; and it bore fruit at once. A rich manufacturer of Birmingham, who had long been deploring the ignorance prevailing among the working classes on that subject, immediately decided to devote the sum of £2,500 to found classes and lectures on human physiology and sanitary science, believing that physical improvement would be followed by moral and mental, and that hospitals, and even prisons and madhouses, would be relieved of many cases which owe their origin to ignorance of the laws of health.

Mr. Kingsley visited the West Indies at the end of 1869, and the result of his travels appeared in a series of papers first published in "Good Words," and then in a volume, under the title of "At Last."

In 1874 he visited America, where he met with a warm reception from many who knew him well by reputation. The year before he had given up the canonry of Chester for that of Westminster, at the request of the Premier.

But he was not to hold it long. The vigorous frame and active brain had been taxed to the uttermost, and his health began to break. In December, 1874, he caught cold in the cloisters of the abbey, and could not shake it off. His wife was so dangerously ill that her life was despaired of; he ministered to her with unflinching courage and tenderness, suppressing his own sorrow to sustain her spirits; but the pressure was too much

for his enfeebled frame, bronchitis came on, and at last severe pneumonia laid him completely low. His love, strong in death, nerved him for a moment to rise from his own sick bed and make his way, in spite of all medical prohibitions, to his wife's side. Taking her hand, he said, "This is heaven, don't speak." But, the cough returning, he could say no more, and they never met again. For a few days he sent her pencilled notes from his bed, but at last illness and anxiety of mind overcame him, and he could write no more. For the last two days he asked no questions about his beloved sufferer, thinking her gone before him, and only said, "I, too, am come to an end; but it is all right, *all as it should be.*" His last words were expressive of his lively faith and childlike confidence in his Heavenly Father. When he thought himself alone he was heard murmuring intense and earnest prayers. On one of these last nights of his life his daughter heard him say, "How beautiful God is!"

His last words were in the language of that beautiful collect in the service for the dying, "Thou knowest, O Lord, the secrets of our hearts; shut not thy merciful ears to our prayer, but spare us, O Lord most holy; O God most mighty, O holy and merciful Saviour, thou most worthy Judge Eternal, suffer us not in our last hour from any pains of death to fall away from thee." He never spoke again, and expired on the 23rd of January, 1875, without sigh or struggle.

His funeral was attended by friends and admirers of all classes—young officers from Aldershot and Sandhurst, with whom he had held most kindly and cordial intercourse, sailors, governors of distant colonies, the bishop of the diocese and the dean of his abbey, the representative of the Prince of Wales, and, close by, the gipsies of Eversley Common, who used to call him their "priest-king." The tributes of affectionate sympathy poured in on all sides.

He was buried in his own beloved churchyard, and over his grave was placed the motto he had himself chosen, commemorating his life-long attachment to his wife:—

"Amavimus, amamus, amabimus,"

and above it the words—

"GOD IS LOVE."

## NATURAL MAGIC

BY JOHN NEVIL MASKELYNE.

### II.—OPTICAL ILLUSIONS.

IN a previous paper it has been shown that the art of the magician chiefly consists in skilful use of nature's wonders. This is specially the case in regard to the illusions effected through knowledge of optical laws and appliances, with which the majority of people are not acquainted.

For the purposes of the magician no instrument is more valuable than the concave speculum, a mirror in shape like the inside of a watch-glass.

To illustrate one of the many forms of illusion obtainable by its aid, let a partition, as in Fig. 1, have an aperture in it on a level with the eye of the spectator, and behind the screen place a concave mirror (A) reflecting the inverted skeleton, placed in

a strong light at B. This will appear to the person in front in an upright position at the opening (C), and upon his advancing towards it the spectre will vanish altogether.

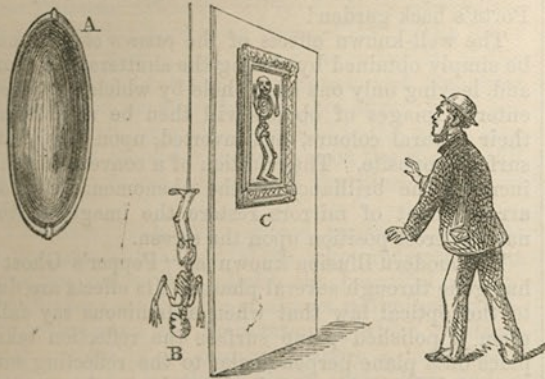


Fig. 1.

By a combination of plane mirrors—ordinary looking-glass, having perfectly flattened and parallel surfaces—many curious effects may be produced.

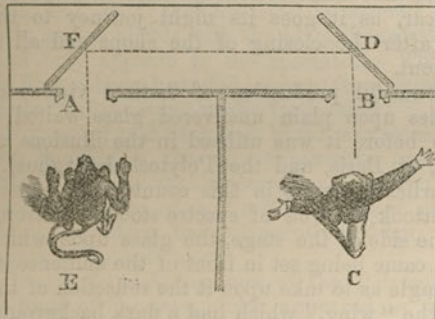


Fig. 2.

Suppose a room divided by partitions, as in Fig. 2, in which are two apertures, some five feet from the ground, at A, B. The aperture at B is filled in with

but if a curtain be drawn in front of the aperture, and, simultaneously, the mirror behind be raised above it, then, when the curtain is once more pulled aside, he will be astounded by the apparently magical

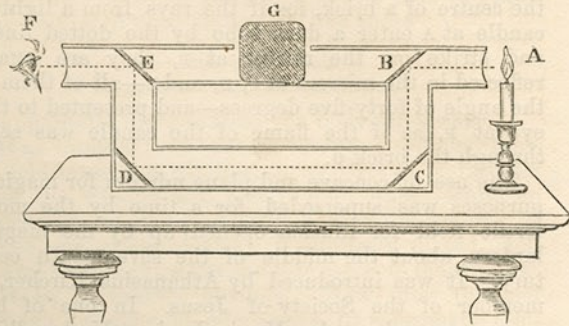


Fig. 3.

transformation, for, by the aid of a mirror at D, placed at an angle of forty-five degrees, and which he cannot distinguish from the one in which he pre-

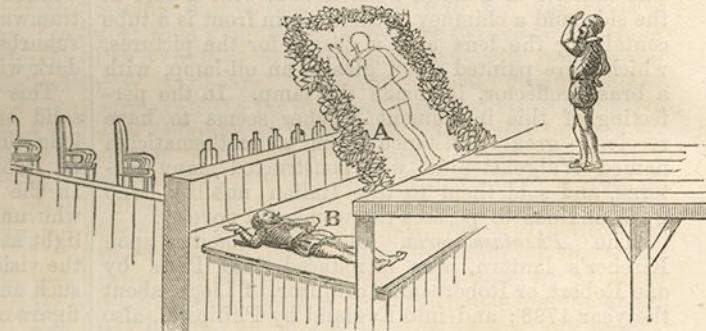


Fig. 4.

viously looked, he will see, not his own reflection, but that of his supposed (Darwinian) progenitor—which is rather a reflection upon his manhood—

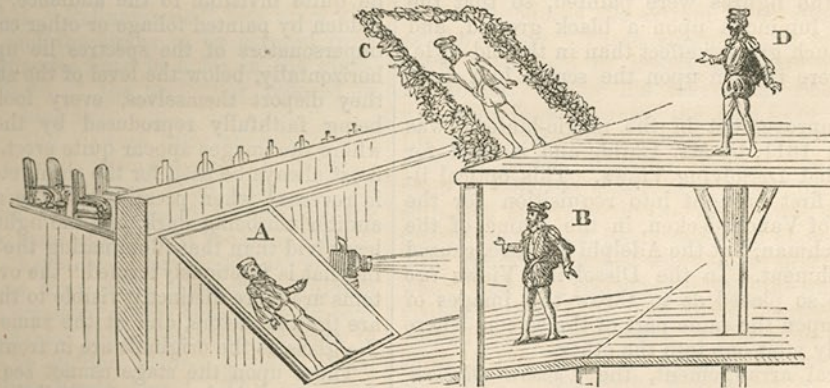


Fig. 5.

a plain sheet of glass, and behind this a silvered glass is arranged to run up and down upon pulleys. To complete the deception, a gilt frame may be placed round the opening, to give it the appearance of a mirror hanging upon the wall. Now, the spectator at C, who looks towards this while the silvered glass remains there, will see a reflection of himself,

E, whose image is transmitted along the dotted lines from the mirror at F. The preceding illusions are more fully explained in Sir David Brewster's admirable "Letters on Natural Magic." Upon the principle of the latter optical deception is the device by which one appears to look through a

solid object. An elderly gentleman of my acquaintance was wont to say, with perfect truthfulness, that he could see as far through a millstone as most people. By the illusion in Fig. 3 he might have been persuaded that he actually looked right through the centre of a brick, for if the rays from a lighted candle at A enter a dark tube by the dotted lines, and strike on the mirror at B, they are again reflected in the mirrors at C, D, and E—all of them at the angle of forty-five degrees—and presented to the eye at F, as if the flame of the candle was seen through the brick G.

The use of concave and plane mirrors for magical purposes was superseded for a time by the more fertile field for illusion opened up by the magic-lantern, about the middle of the seventeenth century. It was introduced by Athanasius Kircher, a member of the Society of Jesus. In one of his numerous works, "*Ars Magna Lucis et Umbrae*," he described one used by him in the Jesuits' College at Rome. There is an engraving in which a room is seen divided by a partition. Upon one side of this is a lantern and the operator; on the other the spectators, and a screen to receive the images. The lantern is a large wooden box, with a door at the side and a chimney at the top; in front is a tube containing the lens and a frame for the pictures, which were painted upon glass; an oil-lamp, with a brass reflector, is inside the lamp. In the perfecting of this instrument Kircher seems to have received great assistance from a mathematician named Walgenstenius, who constructed many lanterns, and sold them to the Italian nobility, who were anxious to possess the wonderful novelty.

The *Phantasmagoria*, an improvement upon Kircher's lantern, was introduced into Paris by one Robert, or Robertson, a conjuror, of Liege, about the year 1798; and into England by Philipstal, also a Frenchman, in 1802. This instrument differed from Kircher's in being made to run upon wheels, and was so readily brought close to, or removed from, the screen, causing the figures to grow larger or disappear altogether. The pictures on the glass, or "slider," were also opaque, excepting those parts upon which the figures were painted, so that the figures were luminous upon a black ground, and produced a much greater effect than in the old style, where they were thrown upon the screen in a circle of light.

Another improvement in the magic-lantern was introduced in 1811, by Mr. Child, and is used for what are called Dissolving Views. This optical illusion when first brought into requisition for the spectral ship of Vanderdecken, in the drama of the "Flying Dutchman," at the Adelphi Theatre, caused great astonishment. In the Dissolving Views two reflectors are so placed as to throw the images of two pictures upon the same part of the screen, where they gradually melt one into the other.

That optical arrangement, the *Camera Obscura*, literally the "Dark Chamber," was the discovery of Baptista Porta, a Neapolitan philosopher. To the great astonishment of a circle of literary and scientific friends, he brought sea and landscapes into his darkened room. This was managed by arranging panoramic effects outside the house, where many a "painted ship upon a painted ocean" lay at anchor; and boys, concealed behind fictitious trees and mountains, started real animals, or pulled "property" ones about. Possibly that zoological curiosity, the

elephant of the pantomimes (with a gentlemanly "super" at one shilling per night in the fore legs, and another equally favoured being in the other two), may have first seen the light in Baptista Porta's back garden!

The well-known effects of the *camera obscura* may be simply obtained by closing the shutters of a room and leaving only one small hole by which light may enter. Images of objects will then be seen in all their natural colours, but inverted, upon any white surface opposite. The addition of a convex lens will increase the brilliancy of the phenomena, and an arrangement of mirrors restore the images to the natural erect position upon the screen.

The modern illusion known as "Pepper's Ghost" has gone through several phases. Its effects are due to the optical law that when a luminous ray falls upon a polished plane surface the reflection takes place on a plane perpendicular to the reflecting surface, and the incident and reflected rays form equal angles with it. This may be observed in the plate glass of such places as the Burlington Arcade, the polished windows of a first-class railway carriage as it rattles through a tunnel, or the well-cleaned windows of that humbler conveyance, a metropolitan tramway-car, as it goes its night journey to the suburbs, after the closing of the shops and all is dark without.

This beautiful production of distinct visions of solid bodies upon plain unsilvered glass waited a long time before it was utilised in the illusions of M. Robin, at Paris, and the Polytechnic "ghost." In the earlier attempts in this country the person who undertook the rôle of spectre stood in a strong light at the side of the stage, the glass upon which the vision came being set in front of the audience at such an angle as to take upon it the reflection of the figure at the "wing," which had a dark background of the same colour as that upon the stage. The difficulty in this instance was to get the phantom into a perpendicular position.

Another method, and one in very general use now, for "ghost" exhibitions, is shown in Fig. 4. The large glass (A) upon the stage is so arranged as to be quite invisible to the audience, its edges being hidden by painted foliage or other contrivances. The impersonators of the spectres lie upon their backs horizontally, below the level of the stage at B. Here they disport themselves, every look and gesture being faithfully reproduced by the glass above, where the images appear quite erect. The left hand must always be used for the right, etc., as the image is reversed when presented to the spectators. The auditorium being dark, and the light upon the stage less vivid than that illuminating the figures below—in what is facetiously termed "the oven"—the phantoms are more distinctly visible to the audience than are the real actors, and at the same distance behind the glass as the originals are in front of it.

Those upon the stage cannot see the visions that "come like shadows, so depart," therefore the positions to be occupied at certain times, when they have to pass a sword or even walk through a ghost, has to be carefully arranged beforehand. Startling effects are also at the command of the exhibitor by keeping the stage dark so that a performer, dressed exactly as the ghost below, cannot be seen. The bright light upon the figure beneath shows the vision distinctly, but this gradually subdued while, simultaneously, the lights upon the

stage are raised, the ghost will appear to develop into the actor now visible behind the glass, and in the exact position occupied by the apparition.

Another, and perhaps the best method to work these illusions, is shown in Fig. 5. Here two glasses are seen, each placed at an angle of  $45^\circ$ . The lower one (A) is a mirror, and throws the reflection of the performer at B upon the plain glass C, and the ghost appears upon the stage behind this at D. Here the performer can, by walking parallel to the glass, give the effect of the vision walking upon the stage. All the movements are natural, and the illusion is most complete.

This class of exhibition, indeed, appears marvellous to the uninitiated, and those who understand its principles cannot but admire the beautiful results. The illusions are capable of almost unlimited extension. One more may be mentioned, which produces great wonder in an audience, where a large black board is placed unmistakably in their view, and a spectre hand writes in white characters upon it. This is managed by having a duplicate board below the stage, so arranged that its shadow falls exactly over the one in view of the audience. Upon this duplicate black surface the performer writes with chalk, and, as all save his hand is covered by black cloth, and so blends with the black board above, the hand only appears to the spectators. This leaves the flesh-coloured stuffed gloves (the "materialised hands") of the spirit media far behind!

Visions of real flesh and blood may sometimes be seen floating in the air, apparently unsupported. This is also an optical deception, as the performer stands upon the edge of a thick sheet of plate glass which, its edges being carefully hidden, does not appear to the spectators.

One of the achievements of the Polytechnic was the head of Socrates, which appeared in the centre of the stage without any body attached to it, and delivered a set speech "with good accent and discretion." The sensational effect was produced by simple means, the actor's head being merely thrust through a hole in a silvered glass plate, which, by a skilful arrangement of lights and drapery, was invisible to the audience.

The trick called "Palingenesia" was upon the same principle, and the limbs to be severed from the body were dummies fixed in holes in the glass, while the real limbs of the performer reposed in perfect security behind it.

The illusion of the "sweet little cherubs" who sat (or, rather, floated, sitting being an impossibility under the circumstances) "up aloft," at the Polytechnic, after the celebrated picture by Sir Joshua Reynolds, were produced by the same means; but might also have been arranged as successfully by reflections from some interesting children engaged for the occasion, whose bodies, being considered superfluous for the characters they were to represent, could be hidden behind a dark cloth, through which their heads peered. This matching in colour the background of the stage, and skilful blending with it in the reflection, would assist the illusion.

Having briefly indicated the leading points in the public use of optical illusions, I may name a few for private examination, alike curious and instructive. A deformed, or an amorphous, drawing upon a flat surface can be so arranged that, though it have no shape or meaning to the eye, it shall yet be reflected,

in perfect form and proportion, on the convex side of a cylindrical mirror placed in the proper focus, or the picture may be painted on the convex surface, and reflected on the plane. An ordinary statuette, say of a child, can be so distorted by the use of a prism with a small refracting angle, that the head may be placed upon its breast, like those

" ——— men whose heads  
Do grow beneath their shoulders;"

or apparently severed from the body altogether.

If an intaglio (a sunken device, as an ordinary seal) be held towards a window, those parts of it farthest from the window will receive most light; while an impression of the seal (which may be called the cameo, or raised device), if similarly placed, will receive more light upon the side nearer to the window. This is, of course, obvious. Now view the seal through a compound microscope, or achromatic telescope, and you invert the position of the object, and find the depressed portions have become elevated, and appear exactly as the *impression* of the seal is to the naked eye.

But the eye is literally "open" to deception without employing such instruments. Its power of retaining impressions induces it to see that which is not; thus a lighted stick rapidly twirled round looks like a circle of fire, and bodies in swift rotation appear stationary. Natural causes produce other curious effects, for instance, sustained vision of objects seen obliquely is impossible. This may be demonstrated by placing a pea upon a green cloth, and a narrow strip of white paper at some distance from it, but so as to be perfectly clear by indirect vision. Gazing steadily upon the pea, you will notice that shortly a part, or possibly the whole, of the white paper will vanish, the green cloth seeming to cover the spot upon which it lay. The paper may be again visible, after an interval, and once more fade away.

Atmospherical phenomena account for many ghosts, and are almost as guilty in this direction as the finger-posts at country cross-roads, that have scared so many rustic Tony Lumpkins, with their white outstretched arms, standing grimly pointing in the deserted lanes at night. The refractive power of the air produces the extraordinary illusions known as the *mirage*. These singular and magical effects have been seen in nearly all parts of the world. Humboldt, during his travels in South America, witnessed from Cumana the islands of Baracha and Licuita apparently floating in the air. Upon the coast of Africa, towards evening, the "look-out" upon a schooner observed the tall masts of another ship rise slowly from the sea. They appeared distinctly, and other parts came up above the horizon until the whole vessel was seen to first rest upon the water, and then rise above it until the hull was plainly visible. Mariners are often superstitious, and viewed such phenomena in the light of "phantom ships;" but it was the coldness of the sea and the air above it gradually decreasing in density that caused the illusion. Among the marvels of the Paleocretic Sea are frequent magical effects where glittering icebergs appear to float, inverted, in the air, where ships are seen keel upwards and magnified in size, and ice-floes assume the appearance of fair cities, gay with "cloud-capped towers and gorgeous palaces." This phenomenon, called "the Enchanted Coast," was witnessed by Mr. Scoresby, on his voyage to Greenland in 1822, and he also per-

ceived an inverted ship in the air, which was afterwards found to be the image of his father's vessel, at that time thirty miles distant.

The "Fata Morgana," or "Castles of the Fairy Morgana," seen in the Straits of Messina, like the visionary cities of the Arctic regions, present pictures of hill and dell, towns, and people, ever swiftly changing, as the forms in a kaleidoscope, and these effects arise from unequal aerial refraction.

Sometimes spectral phenomena are produced by clouds. The good people of Florence were startled by seeing, floating above the city, a great figure of an angel, and for some hours they were duped into a belief in a miracle, until it was found that the shadow of a gilded angel surmounting the Duomo was thrown upon the cloud by the rays of the setting sun. Hogg, the "Etrick Shepherd," mentions the astonishment created by a similar illusion, in which the vision of a man, attended by an enormous dog, was seen in the sky. Both these effects are due to the same cause as the spectre of the Brocken (one of the loftiest of the Hartz Mountains in Hanover), where colossal figures in the air imitate the movements of the observers. These cloud phantoms are not inverted. The old adage, therefore, that "seeing is believing," must not be accepted as a truism, the eye, indeed, wonderful as are its powers of taking in form, size, position, and colour, can yet be, in its turn, "taken in" very easily, and is, as we see every day, a most innocent and gullible organ. Our eyes are frequently made "the fools o' the other senses," conjuring up, when the mind is ill at ease, or when bodily ailments afflict us, apparitions as genuine to all appearance as the dagger of Macbeth. In our dreams there are no objects presented to the eye, though we apparently see many and in great detail; and they frequently create so great an impression upon the mind that the scenes are re-enacted in the waking moments. Spinoza avows that one morning, when starting from a dream, the vision was yet as vivid as though palpable to the touch. It is similar illusion that "informs the eye" of the misanthrope. In his waking dreams he sees not the landscape spread before him; his eye—slave of the mind—raises phantasms unsubstantial, yet terribly real. So is it with other passions and moods of the human spirit.

Overwork and anxiety, too, readily induce such phenomena. It is related of Sir Joshua Reynolds that "when, after being many hours occupied in painting, he walked into the street, the lamp-posts seemed to him to be trees, and the men and women moving shrubs." Such visual peculiarities are warnings to the overtaxed brain, being symptoms of cerebral disorder, that might end in mental disease. We refer to these things as proofs that the sense of sight is easily open to deception from natural causes, apart from the tricks of the "magician" and "illusionist."

### Varieties.

POPE PIUS IX.—Signor Bonghi, formerly President of the Italian Chamber, thus, in brief, expressed his estimate of the character of Pius IX: "He is a man of limited intelligence, of scanty knowledge, of quick temperament, but of a pure mind, is conscious of no wrong or fault, of no unworthy motive on his part. He has known adversity, but he can think of no mishap for which he is himself to blame. He brooks no opposition, and is beset by

flatterers whose safety depends on confirming in his error a Pontiff whom they have proclaimed free from error. The cardinals have been so long awed by the absolute and imperious disposition of the Pope's mind that it has at all times been impossible to get at their real way of thinking. Though neither harsh nor fierce by nature, Pius IX is extremely self-reliant and conceited, and ready to visit contradiction, however slight, to his wishes with punishments, the severity of which is heightened by his conviction that those wishes are the incarnation of God's will. All resistance to his behests angers him, inasmuch as he deems it not only irreverent, but sinful."

THE YELLOWSTONE REGION.—The Earl of Dunraven, in his recently published work, "The Great Divide," describes the strange colouring of the region. Speaking of one part of it he says: "The clays are dyed into brilliant and startling combinations of colours, sometimes beautifully blended together, sometimes opposed, with that glaring contradiction to the laws of man of which Nature is so fond, and with that perfect success which always attends her efforts. Every shade of yellow is represented, from a delicate cream-colour to glaring saffron; bright reds and scarlets and most glorious purples, shading off into black, are relieved by occasional patches of vivid verdure, or by the more sombre green of the few audacious pine-trees that cling triumphantly to the cliff."

DUO DE BROGLIE.—Many people over here must have met the Duc de Broglie in society when he was in London, soon after the war, as Thiers' ambassador. "Nobody could converse with this eminent personage without being struck by his fulsome manner and his sour smile, his academic coxcombry and primness, and his piping treble voice. He seemed the very type of the Jesuit lay-brother or confessor, possessed of that indescribable air and tone of the adept in double dealing and every kind of obliquity. When he was not abusing England, he was sneering at the Government he represented and the chief he professed to serve. The secret of his political career is, that he is at heart a priest, and that he is nerved by the same base fear of the popular majority which drew the noblesse across the frontiers to Coblenz in the first Revolution."

GAMMON AND BACON.—There was a grand Liberal dinner given at Oxford not very long ago at which Sir W. V. Harcourt, as senior member for the city, attended. Some Conservative wag a few days previous to the event, filled with the desire to cut a joke at his political adversaries' expense, wrote a letter to Sir Henry Dashwood, a county gentleman of Liberal belief, asking him to send some provisions for the dinner, including some bacon, which was a favourite article of food with Sir William, as the committee were so short of funds. This letter was signed "John Bacon," a noted local politician, and well known to Sir Henry. The things were readily sent, in all good faith. When the hoax was discovered, and the good-natured baronet was complaining at being "shot at," Sir William laughingly replied, "But, Sir Henry, you ought to have known Bacon from gammon!"

COUNT GREFFULKE.—Count Greffulke, now a French "Life Senator," is the nephew of the famous usurer of his name and title, who died fourteen years ago. He had an office in London, and "accommodated," to a large extent, heirs to English estates. The late Sir Robert Jakes Clifton borrowed money of him at seventy-five per cent. Lady Cowley annually extracted from him £40 for the British Charitable Fund. This was considered a triumph of her ladyship's diplomacy, which, indeed, it was. The fortune of this usurer in France amounted at his death to 44,000,000 of francs, which was divided between his two nephews. They inherited besides the next best thing to English landed property, namely, mortgages on fat estates in the United Kingdom.

DOG LICENCES.—A lover of dogs proposes the issue with each licence of a small medal, bearing the number of the licence, the name of town or place of issue, and the year, requiring the same to be worn by the dog, attached to the collar. In the case of a dog biting a person, the police could find out the owner by reference to the number of the licence. Stray dogs, having no apparent owner or medal, should be destroyed. This would soon put a stop to so many curs being kept without a licence and allowed to roam about the streets, and would make all keepers of dogs look better after them, as they would become liable for any damage done by the animals. Should the medal get lost, then by the production of the receipt for the licence the authorities might grant another for the payment of a small sum. The medal would be rather an ornament to the dog's collar than otherwise.

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