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Contents.

(Illustrated articles are marked with an asterisk.)

PHYSICAL LIFE AFTER DEATH.

Man is a physiological trinity. His life is threefold. At the base, and embracing the phenomena of circulation and nutrition, is the organic life, as Bichat terms it—the life which the animal shares with the plant. Resting on this is the animal life, as exhibited in the phenomena of the sensory nervous system; and intimately connected with the latter, as its highest development, is the mental life, characteristic of man. These three are one, but not inseparable. They are not born together, nor do they always die together.

Death is not a simple phenomenon, nor one of instantaneous occurrence. When man dies normally, as of old age, he dies like a tree, in detail, beginning at the top. The series of slow and partial deaths which, with the old man spared by disease, result in the last end of all is eloquently described by Papillon.

"All the senses in succession are sealed. Sight becomes dim and unsteady, and at last loses the picture of things. Hearing grows gradually insensible to sounds; touch is blunted into dullness; odors produce but a weak impression; only taste lingers a little while. At the same time that the organs of sensation waste and lose their excitability, the functions of the brain fade out little by little. Imagination becomes unfixed, memory nearly fails, judgment wavers. Motions become slow and difficult on account of stiffness in the muscles; the voice breaks; all the functions of outward life lose their spring. Each of the bonds attaching the old man to existence parts by slow degrees. Yet the internal life persists. Nutrition still takes place, but very soon the forces desert the most essential organs. Digestion languishes the secretions dry up, capillary circulation is clogged, in their turn that of the large vessels is checked, and at last the heart's contractions cease. This is the instant of death. The heart is the last thing to die."

This orderly sequence and painless closing of life is, however, comparatively rare. Sometimes the mind dies long before the animal life is seriously affected, as when death is preceded by years of imbecility. Sometimes death seizes first upon the extremities and creeps upward, the mental powers remaining intact to the last. Again the mind may flicker with unwonted brilliancy after the animal life has seemed to go out. In all cases, however, the organic life is the last to yield.

A tree does not die instantaneously when felled, though death begins at that moment; similarly life persists in the animal body after the thread of animal life is severed. And as slips from a felled tree may be grafted upon a living trunk, and thus escape the death of the parent stem, so may portions of a dead animal be transplanted to the living, and so have their life perpetuated.

If death were immediate throughout the entire organism, such a transference of members without any interruption of their physiological activity would be utterly impossible.

Thus the vital knot of Flourens, the point in the spinal marrow which that physiologist made the seat and center of vitality, is effectually disposed of. It is true that any disturbance of that portion of the nerve is more fatal than a like disturbance of any other part of the organism; but that is not because it differs in kind from other portions of the nervous system. Life is not more concentrated there than elsewhere; that is simply the initial point of the nerves which animate the lungs; and the breath ceases, and death quickly ensues, when their office is interfered with.

Unlike the remarkable small dog of the nursery rhyme, animals, even the highest of living creatures, do not die "all over" at once. Our bodies are composed of many more or less independent parts, each living its own life, while contributing to the life of the whole, and each dying by itself. The human tissues may not retain their individual vitality so long as those of the lower orders of life, still they are very slow of dying. The hair and the nails continue to grow, and even the complicated processes of absorption and digestion go on for hours after the life of the organism has apparently ceased.

The throbbing of a frog's heart after its complete separation from the rest of the body is often described as a characteristic illustration of the persistent vitality of reptilian structures. But the human heart will do the same. In the case of decapitated criminals, it has been observed that the uncovered heart, even when the stomach, the liver, and the intestines have been removed, will continue the pulsations for an hour or more after the guillotine has done its fatal work. One day when Robin was operating on the body of a criminal an hour after his execution, an example of reflex action was observed as remarkable as any of the seemingly intelligent movements recorded of the limbs of decapitated frogs.

"The right arm," says Robin, "being placed obliquely extended at the side of the trunk, with the hand about ten inches away from the hip, I scratched the skin of the chest, at about the hight of the nipple, with the point of a scalpel, over a space of nearly four inches, without making any pressure on the muscles lying beneath. We immediately saw the great pectoral muscle, then the biceps, then the anterior brachial, successively and quickly contract. The result was a movement of approach of the whole arm toward the trunk, with rotation inward and a half flexion of the forearm upon the arm, a true defensive movement which threw the hand forward toward the chest as far as the pit of the stomach."

Such spontaneous exhibitions of life by the dead are trifles, however, as Papillon observes, compared with those which may be excited by means of certain stimulants, particularly electricity. In evidence he cites the experiments of Aldini on two criminals beheaded at Bologna, and those of Ure, in Glasgow, on the body of a criminal that had remained an hour hanging on the gallows: the details of which are too horrible for repetition.

Less horrible, but not less remarkable and instructive, was an experiment made by Brown-Séquard on the head of a decapitated dog. Having beheaded the animal, taking pains to make the section below the point at which the vertebral arteries enter their bony sheath, the operator fitted to the arteries little pipes, connected by tubes with a reservoir of freshly oxygenated blood. At this stage the head failed to respond to the action of electricity; but when a current of blood was forced into the arteries, irregular motions of the eyes and the facial muscles began, succeeded by regular harmonious contractions, as if prompted by the animal's will. The injection of blood into the cerebral arteries was kept up for a quarter of an hour, during which the mimicry of life was continued. On stopping the injection, the motions ceased, and the spasms of a second death ensued.

The question was raised whether such a temporary renewal of life could be brought about by the same means in a human subject. Brown-Séquard was confident that it could be done, even with the head of one decapitated by the guillotine, provided certain precautions were taken to prevent the filling of the arteries with air. But when it was proposed to him to try the experiment on a condemned criminal, he declined, not wishing, he said, to witness the agony of such a human fragment temporarily recalled to sensibility and life.

Enough has been given to show that life and death are not such simple affairs as is popularly supposed; and that in another sense than the poet meant, it is not all of life to live, nor all of death to die.

We will close with a suggestion to sensational novelists: Having "snarled up" the hero of the tale in a maze of circumstantial evidence, it would make a very stunning *denouement* to save him at last, by means of a *post mortem* confession of the crime by a murderer executed for another crime, the confession to be extorted through the combined agency of galvanism and the transfusion of fresh blood!

Or the clever concoctor of scientific hoaxes for the *World* might surpass himself by giving a detailed account of such an operation on some obscure victim of rural justice, wherein the resurrected man might make confession of the Nathan murder and reveal the whereabouts of Charlie Ross.

THE KEELY MOTOR DECEPTION.

The Chicago *Railway Review* avers that the SCIENTIFIC AMERICAN and other papers have proceeded to kill, dissect, analyze, and condemn Keely's pretended motor, when they confessedly know nothing about its operation or construction. But the *Review* is evidently in error here, for the Keelyites have given many details, not only of the mode of operating the motor and producing the "cold vapor," but also of the manner in which the treasury of the Keely Motor Company was supplied with cash. It is from this information, furnished in pages full at a time by the parties themselves, in their anxiety to get their scheme before the public, that the adverse conclusions complained of by the *Review* have been reached.

The concurrent testimony of the leading members of the Keely Company, as voluntarily published by themselves, is that Keely produces his alleged power by blowing with his mouth, for 30 seconds, into a 3½ gallon kettle, then lets in a little water, then turns a cock, and behold! he has produced a "cold vapor," having an energy of from two to ten thousand pounds per square inch. The inner arrangement of the apparatus, with its pipes, chambers, nozzles, valves, and connections, is described, and great pains is taken to reiterate that no heat, electricity, chemicals, or other substances save air and water are employed, and nothing is done except to operate the faucet. Now you see it, and now you don't, according to the way the cock is turned. Such in brief is the Keely motor. Mr. Collier, the Philadelphia lawyer and financial agent of Keely, testifies that he made three visits to New York, and obtained in all the sum of one hundred thousand dollars from capitalists here. This money, he says, he obtained by exhibiting to the parties the averment of Keely substantially to the above purport, Charles H. Haswell, who had witnessed Keely's performances and personally tested and reported upon the apparatus, being among those present. After a portion of the money was paid, the victims were, by agreement, allowed to witness the motor for themselves, and the balance was then obtained from them. A curious fact in connection with this business is that Mr. Haswell now earnestly denies that he assisted the deception or endorsed the integrity of Keely's operations.

More than a year ago we published portions of Mr. Haswell's report given in endorsement of Keely, on the strength of which, Mr. Collier tells us, he obtained the first ten thousand dollars from the New Yorkers. Mr. Haswell has never until now complained of our comments then made. Under date of June 26, 1875, Mr. Haswell writes another report in behalf of the Keely motor, published by us on page 37, current volume. In this report he confirms, at some length, all that he had previously written, specifies the tests he personally made, and again commits himself in support of the scheme. But in the next breath, he writes us complaining that we have done him injustice, and especially requests us to print the subjoined note for his vindication, which we do with pleasure, leaving him to reconcile, as best he can, the denials which he now makes with the various reports in behalf of Keely which he has placed before the public.

To the Editor of the Scientific American:

Your notice of my query to you of the 17th inst. involves a repetition of it.

Thus: Am I to understand that my mere report of certain results, which I saw developed by a vapor in Mr. Keely's house, are held by you to be an endorsement of the integrity of the operation Mr. Keely claims for the generation of it I being wholly ignorant of the construction of the instrument of generation, or the manner of operating it?

Further, I never was employed, as asserted by you, to test the motor, neither have I done it, or do I know of any one who has.

The gentleman to whom my query was confided appears to have overlooked the fact that observation and analysis are very different matters. I am, respectfully,

CHAS. H. HASWELL.

New York, June 28, 1875.

We have received from all parts of the country many original contributions relating to the Keely motor, *pro* and *con*, also many new plans for motors quite as wonderful, if not exceeding in merit, the Keely device. Our limited space will only permit the publication of a few of them. Among the essays received is one in which the writer bases his advocacy of the Keely nonsense upon the fallacious but popular idea that water, like nitroglycerin, contains a vast amount of force, ready to be liberated by the mere pull of a trigger. We are unable to publish the entire article, but we make the leading thought of its contents the basis for a few remarks in an article upon some of the practical differences between the two substances mentioned.

ENGLISH PATENT LAW DISCUSSION.

We gave a brief abstract not long ago of the Patent Law Reform Bill introduced in the House of Lords by Lord Cairns. The bill was full of objectionable clauses, its main purport being to bring about the abolition of patent grants in England. The aristocracy of Great Britain have reached the conclusion, substantially, that inventors and their patents are a nuisance, do more harm than good, and ought, as far as possible, to be legislated out of existence. So the bill passed the House of Lords, and was sent to the House of Commons, where it now is.

It is almost unnecessary to say that the adverse sentiments of the Lords, expressed during the discussion of the bill and confirmed by its passage, created the greatest dissatisfaction among working men, engineers, manufacturers, and all who have at heart the advancement of knowledge, Science, and useful industry. Meetings were immediately called in remonstrance against the further movement of the bill, and large numbers of petitions to that end from societies and influential personages have already been sent in to Parliament. The prospect now is that the bill cannot pass the Commons, and will therefore fail to become a law.

For several years past there has been going on in England a discussion of reforms thought to be necessary in the patent law, the prevailing idea being that some radical alteration was necessary, although no agreement could be reached as to what precise change was essential. The present endeavor of the Lords to abolish patents has quickened the discussion, and induced a more practical examination of the present law than ever before. The result appears to be that the existing English law, when compared with that of

other countries, is found to contain many excellences, and the general impression is that it really needs only a few changes.

Under the existing British patent law, any person, whether the inventor or the mere introducer of a new invention, may receive a patent. A specification and drawings are required, but no model. No official examination is made. The question of the validity of the patent is settled by the courts. If the invention described in the patent is proved on trial before the court to have been an old or known device, the grant is void; otherwise, its validity is maintained. The principal points of change now suggested are:

1 A reduction of fees, $875 being the official charges now made for a fourteen year patent.

2. The granting of patents only to inventors, mere introducers of novelties being at present allowed to take patents.

A third point of reform, very strongly discussed, is the propriety of having examiners to decide upon the novelty of the invention, before issue of the patent, as in this country.

The general drift of the discussion on this head in England appears to be that, while an official preliminary examination has certain advantages, it is also attended with serious disadvantages; and that, on the whole, it would be better to let the law stand as it is, leaving the applicant to make his own examinations. All agree, however, that better facilities for the printing, indexing, and access to existing patents should be provided.

The diverse workings of the system of official examinations is shown in Prussia, where almost every application for patents is rejected, and in the United States, where four fifths of all applications are finally granted. In both of these countries, especially in the United States, in addition to court trials, a vast amount of litigation attends these official examinations at the Patent Office, which is almost unknown in England.

We give, on another page, as an example of the current patent law discussions now going on in England by the ablest minds, an abstract of the recent proceedings of the Institution of Mechanical Engineers on the subject.

CENTENNIAL TRADE MARKS.

As the time approaches for the opening of the great Centennial Anniversary and Exposition, the word "Centennial" becomes more and more familiar and popular in the public mind; hence it has become a favorite stamp for trade goods of almost every description. "Centennial" hats, caps, gloves, brushes, "Centennial" this, that, and the other, are all the rage now; and quite a little rush has been going on at the Patent Office for several months past, for registration of these Centennial trade marks.

The Patent Office has sought to gratify and satisfy the applicants by allowing registration in every case where it had not been previously granted for the same class of goods or articles. But it would appear that such registrations are not likely to be sustained, in any broad sense, by the Courts.

In the United States Circuit Court at Philadelphia, recently, there came up the case of Hartell *vs.* Viney. In the bill of complaint, in which the court was asked to restrain the defendants from the use of a design of the Centennial buildings on medals and the use of the word "Centennial," it was argued that, though the design upon the medals manufactured by the defendants was not an exact copy of the one used by the complainants, it bore so close a resemblance to it as to deceive the public, and that the use of the word "Centennial" was a clear violation of the law of trade marks.

The judge refused to grant the injunction. He said there were two questions to be determined—first, as to the patented design of the complainants and the effect of the two patents. The former had not been copied, but defendants had merely used one of a similar kind. In doing so, there had been no abridgment of their labor and no appropriation of the subject matter.

In considering the second question, that of the trade mark, the judge did not think the word "Centennial" could be appropriated by any person or association exclusively. It had been applied to works of art for several years, and had been used in the public laws of the United States since 1871. It had been applied to lager beer, to fancy soaps and fancy clothing, and to an infinite number of articles, ornamental and useful. A word of such general use and of so common application could not be the exclusive property of any one. And in the use of such as a trade mark, no court of equity would afford a remedy against a person who had appropriated it.

It has all along been held that no person was entitled to the exclusive use, as a trade mark, of the mere name of a well known article of trade. For example, no hatter could register, as his exclusive mark, the word "hat." The present decision places the word "Centennial" in the same category, and declares that this word cannot, of itself, become a lawful trade mark: and therefore the registration of combined words, such as "Centennial hat," will not prevent others from using the same words upon similar goods.

In order to secure an exclusive right, in connection with the word "Centennial," it will be necessary for the applicant for registration to add a new pictorial device, or some new and distinctive word or title, to be used in connection with the word "Centennial." The following is the statute upon the subject, section 79, law of 1870:

The Commissioner of Patents shall not receive and record any proposed trade mark which is not and cannot become a lawful trade mark, or which is merely the name of a person, firm, or corporation only, unaccompanied by a mark sufficient to distinguish it from the same name when used by other persons, or which is identical with the trade mark appropriate to the same class of merchandise and belonging to a different owner, and already registered or received for registration, or which so nearly resembles such last-mentioned trade mark as to be likely to deceive the public: Provided, that this section shall not prevent the registry of any lawful trade mark rightfully used at the time of the passage of this act.

THE DIFFERENCE BETWEEN WATER AND NITROGLYCERIN.

One of our correspondents, writing to us in advocacy of the possible truth of the Keely motor deception, bases his conclusions upon the following premises:

"We know that there is an enormous power stored up in nitroglycerin, which may be liberated by a small mechanical force. We know that there is a similar power in water; and because we have never discovered a mechanical means of liberating it, it does not necessarily follow that it cannot be done."

Now the fact is that we know there is not a similar power in water, because water is water, and it is not nitroglycerin, nor anything equivalent to it. Nitroglycerin consists of unburnt carbon and unburnt hydrogen, with oxygen enough to burn it up, which oxygen is loosely held by the nitrogen; the latter is ready to give up or let loose its oxygen on the least cause being given, such as a jar or a blow, when at once it is taken hold of by the carbon and hydrogen, which are then as rapidly, and even more rapidly, burnt than the carbon and sulphur in gunpowder, which also find the oxygen needed for their combustion in the niter mixed with them. It is in these cases the combustion of the nitroglycerin and of the gunpowder, and not so much their expansion by the enormous heat produced, which is the cause of their power. This is proved by the explosion of the mixture of two volumes of hydrogen gas with one volume of oxygen; the result of the combustion, watery vapor, has a volume ⅓ less than the mixture, and the water produced by its condensation a volume of some 500 or 600 times less; but the temperature developed, that of the oxyhydrogen blowpipe, is one of the highest we are able to produce, and this heat it is which expands the gases so enormously that a soap bubble, filled with this mixture and touched by a flame, explodes with a report like that of a pistol. The result of the explosion is a few drops of water. Water is thus the product of the combustion of hydrogen; in other words, it is burnt up hydrogen, which lost its latent energy at that early period of the earth's formation when all the free hydrogen was burnt up into water. To suppose that water could again develop so much energy is equivalent to attempting to burn the ashes of wood, the cinders of coal, the vapor of gunpowder or of the exploded nitroglycerin, over again. The products of the combustion of the latter substance are mainly water and carbonic acid, and there is the end of it.

Any one who possesses a little knowledge of the elementary principles of chemistry knows that water and air consist mainly of three gases, oxygen, hydrogen, and nitrogen, with a small amount of carbonic acid; he knows that the most learned chemists, men devoting their whole lives to the science, have during a century exhausted their ingenuity and patience to study the properties of these elements and their possible combinations, so that at last these have become parts of the most positive science. Therefore, such startling announcements as of a gas with a volume 500,000 times greater than water, as have been made by Mr. Keely, can, by any person possessing the least information, be only received with serious suspicion.

THE USE OF WIRE IN DEEP SEA SOUNDINGS.

The advantages of wire for deep sea sounding are many and great. Not the least of its merits, compared with rope, are the smallness of its area for the required strength and the smoothness of its surface. By the use of wire, too, the need of cumbrous and expensive apparatus for casting and hauling-in is avoided, and also the loss of three or four hundred pounds of lead at every casting. With rope the work is more difficult and tedious, and less sure at 500 fathoms than at 2,000 with wire. With rope, used in the ordinary way, six men have a heavy haul to bring up the lead in soundings of fifty to sixty fathoms when the ship is under way. By the wire process, a cabin boy can bring up a 34 pound sinker with ease, from the depth of an hundred and fifty fathoms, with the ship going on her course from four or five knots up to full speed. Presenting a smaller surface to the water, the wire is less affected by currents, a lighter sinker can be used, and it is possible to reach the bottom in many cases where sounding by the old method would be impossible. The first experiments with wire were failures, owing to the weakness of the splices made. Though the splice might hold, the stiffening of the wire by the solder used made the joint treacherous, the wire snapping at the edge of the solder. It was sought to obviate this difficulty by using a sounding wire drawn in one piece, and a company in Manchester, England, succeeded in producing for Sir William Thomson a length of crucible steel wire three nautical miles long without a splice. But it was found impossible to make such wire of uniform strength. It would have weak spots, and was liable to kink and snap like packthread. At last Sir William hit upon the happy device of making a strong splice by a long succession of weak and somewhat flexible fastenings, which enabled him to use pianoforte wire, in lengths of two hundred yards. The size employed is No. 22 Birmingham gage, weight 14½ pounds to the nautical mile, and strength exceeding a strain of 240 pounds.

By the use of an auxiliary hauling-in apparatus, it was found possible to avoid the crushing strain on the formerly used apparatus, which made it necessary to abandon the sinker every time a deep sounding was made—a great item in the cost of such observations. Now the sinker can be recovered from depths not exceeding 3,000 or 3,500 fathoms under ordinary favorable circumstances. Where the depth exceeds 4,000 fathoms, a 100 pound sinker is used, with trigger apparatus for detaching it when it reaches the bottom. For depths of 3,000 fathoms or less, a 30 or 35 pound sinker without detaching apparatus is preferred.

Using these improvements, it is also found easy to take soundings of 2,000 or 3000 fathoms from a sailing vessel hove to in moderate weather, that is, hove to while the line is running out, and until a few hundred fathoms of wire have been hauled in. When the length out does not exceed 2,500 fathoms, the ship may be driven ahead slowly with gradually increasing speed, rising to five or six knots when 1,500 fathoms are out, and to ten or twelve knots while the last 500 fathoms are being raised. Thus a great saving of time is made; for in the ordinary process with hemp cord, the ship has to lay to while all but a few hundred fathoms have been brought in. The only failures in sounding with pianoforte wire have been owing to a neglect of applying a sufficient resistance to the paying out wheel to balance the weight of wire out.

With a 34 pound sinker. it takes about thirty minutes to reach a depth of 2,000 fathoms. Where greater expedition is required, a heavier sinker is used. A 34 pound sinker can be brought up from 2,000 fathoms in about fifteen minutes, making forty-five minutes for the sounding. But the detention is less than this, since the greater part of the line can be hauled in while the ship is proceeding on her course. Using a 150 pound sinker, without recovery, the sounding can be made at 2,000 fathoms with only about twenty minutes' detention. Soundings of 1,000 or 1,500 fathoms with a 34 pound sinker require a stoppage of twenty minutes while the lead is going down, the ship going ahead at full speed as soon as the lead strikes the bottom.

By a properly planned brake resistance, it is arranged that, as the weight nears the bottom, there is an increasing resistance to its motion, so that the paying out wheel stops promptly; there is no coiling of the wire on the bottom, and no danger of kinks. Even at so great a depth as 4,000 fathoms, the perception of the bottom is instantaneous.

Complaining of the indifference of the British Admiralty to this improved method of sounding, as manifested by their holding to the old cumbrous and tedious method, even in the fitting out of a vessel like the Challenger, Sir William Thomson pays a high compliment to American naval officers. He says:

"They found my apparatus full of defects. They never asked me to perfect it, but they perfected it in their own way and obtained excellent results. [Witness Commander Belknap's soundings in the North Pacific.] I went on independently in another line, and made a considerably different apparatus from that which is now being used by the Americans; but I was very much struck by the great zeal and the great ability which the American naval officers showed in taking up a thing of this description, which had been merely proved to be good, and charged themselves with improving the details and making it a workable process."

To keep the wire from rusting when not in use, Commander Belknap immersed it in oil. The English use a solution of caustic soda, which prevents rusting well enough, but has the bad effect of corroding the solder of the splices.

The Rumored Death of Donaldson the Aeronaut.

Mr. Washington A. Donaldson and a reporter of a daily journal in Chicago started on a balloon trip from that city several days ago. Nothing has since been heard from them, and the fact of their balloon having taken a course directly over Lake Michigan, and probably encountered a severe storm which arose shortly after their departure, is taken as basis for the supposition that both the daring aeronaut and his companion have perished. Captains of vessels report sighting the air ship, with its car dragging in the lake; but as yet there are no tidings of any portion of the balloon nor of the bodies of the men being found. We should regret exceedingly to learn of Mr. Donaldson's death, for, though rash even to foolhardiness, he was one of the most experienced and skillful aeronauts living, and an inventor of no small genius. For the present, we prefer to believe in his safety, and to cling to our first suspicion that the affair is another of those shrewd advertising dodges for which Mr. P. T. Barnum, with whose show Donaldson was connected, is famed.

Grass Planted by Grasshoppers.

A curious fact connected with the grasshopper raid in Western Missouri is that, wherever pastures have been destroyed by the insects, new varieties of grass, which never before have been seen in the localities, have sprung up. The principal species is a green bunch grass of luxuriant growth, covering ground formerly yielding nothing but blue grass. Cattle eat the new species with avidity. It is conjectured that the seed was brought to the region and deposited by the grasshopper swarm which laid their eggs there last fall. Some definite explanation of the phenomenon would be very interesting, since it is not known where the grass originally grew or what may be expected of it, if its growth continues, in the future. Possibly the grasshoppers may prove a blessing yet.

The Electrical News.

This is the title of a new weekly periodical published in London, under the editorship of Professor William Crookes. Its programme of contents is intended to embrace all matters relating to the science of electricity, together with special reports of progress in the art of telegraphy and the various practical applications of electrical machinery. It is a handsomely printed publication, in magazine form, twelve pages. We welcome its advent, and wish for its success.