

o the discovery of some efficient protection for the miner, the result of which was, the now celebrated safety-lamp.

The instrument by which he accomplished this was as remarkable for its simplicity as for its perfect efficiency. A common lantern, containing a lamp or candle, instead of being as usual enclosed by glass or horn, was enclosed by wire gauze of that degree of fineness in its meshes which experiment had proved to be impervious to flame. When such a lantern was carried into an atmosphere of explosive gas, the external atmosphere would enter freely through the wire gauze, and would burn quietly within the lantern; but the meshes which thus permitted the cold gas to enter, forbade the white hot gas within to escape without parting with so much of its heat in the transit as to deprive it of the character and properties of flame; so that although it passed into the external explosive atmosphere, it was no longer in a condition to inflame it.

The lamp thus serves a double purpose; it is at once a *protection* and a *warning*. It protects, because the flame cannot ignite the gas outside the lantern. It warns, because the miner, seeing the gas burning within the lantern, is informed that he is enveloped by an explosive atmosphere, and takes measures accordingly to ventilate the gallery, and meantime to prevent unguarded lights from entering in.

As wire gauze drains flame of its danger in the safety-lamp, it drains air of its poison by another felicitous application of a physical principle in the case of the needle-grinder's mask. In that department of industry, the health of the artisan was impaired, and the duration of his life abridged, by respiring continually, while at work, an atmosphere impregnated with steel-dust. A mask was invented composed of a gauze formed of magnetized wire, through which the artisan was to breathe. The air in passing from the external atmosphere to the mouth and nostrils, left all the steel-dust which it held in suspension on the wire of the mask, from which, from time to time, it was wiped off as it accumulated.

Electricity has proved a fertile source of benefits conferred on Art by Science. When a galvanic current is passed through a fluid which holds in solution any substance which has the property of being attracted by one of the poles of the battery, such substance will desert the fluid, and collect upon any object, being a conductor, which may be used to form the attracting pole.

This fact has been already variously applied in the arts, and in no case with greater felicity and success than in the process of gilding and silvering the baser metals.

Let us suppose that it be required to gild an object formed of silver, copper, or any inferior metal. The object being first fabricated in the form it is designed to have, is submerged in a fluid which holds gold in solution. It is then put in connection with the attracting pole of the galvanic battery, while the solution of gold is put in connection with the other pole. The galvanic current thus passing through the solution, will decompose it, and the gold will attach itself to the metallic object, which, in a few seconds, will be sensibly gilt.

An object may be silvered in some parts, and gilt in others, by a very simple expedient. Let the parts intended to be gilt be coated with some non-conducting substance, not affected by the solution of silver, and let the object be then immersed in the solution, and put in connection with the galvanic battery, as already described. The parts not coated will then be plated. Let the parts thus plated be now coated with a non-conducting substance not affected by the solution of gold, the coating previously applied being removed, and let the object be immersed in a solution of gold, and being connected with the battery, the parts not coated will be gilt.

But of all the applications of electric agency to the uses of life, that which is transcendently the most admirable in its effects, and the most important in its consequences, is the electric telegraph. No force of habit however long continued, no degree of familiarity can efface the sense of wonder which the effects of this most marvellous application of science excites.—*Dublin University Mag.*

FREE PUBLIC EDUCATION IN CANADA.

Extract from the Lecture of John Kirkland, Esq., Local Superintendent of Guelph and Puslinch.

Men who would submit to be taxed without murmuring for the purpose of carrying the horrors of war into the borders of a hostile nation, losing sight of the great prospective blessings which the universal diffusion of education would impart, were grudging

the possible appropriation of a part of their Educational tax to the benefit of their neighbours' children. He said the possible appropriation, because, as a general principle, the changes which took place in families caused almost any given family, which might happen at one time to pay more than it received, to be almost certain, in the revolution of a few years, to receive more education than it paid for; so that in the end, even on the score of profit and loss, in mere dollars, the account was almost sure to be balanced. Such penny-wise persons, however, might rest assured that, though they might possibly succeed in retarding the adoption of the Free School System in their own locality, and thus ensure to themselves the censure of posterity whose interests they had endeavoured to sacrifice, they could not altogether prevent it. The signs of the times were so unequivocal as to the universal adoption of the Free School System, that he hazarded nothing in saying it was a mere question of time: but at the same time on the prompt solution of that question depended the intellectual and moral status of the coming generation. Any system of practical education would be seriously defective, which did not provide for the development of the essential attributes which crowned man with glory and honour, and sustained him in his proud position as "lord of creation," in accordance with the great principle, that whilst the laws of God were all true and exact, they were so made to operate as to give expansion to every created thing up to the full elevation of its nature; and that not in a sort of indefinite aggregate condition of the being as a whole, but in the full development of every separate part or faculty in its due proportion—physical, mental, moral, and spiritual. Supposing the physical effects of the fall of man to remain unchanged, if human sorrows were limited to such as necessarily flowed from that source, they would be immeasurably lighter than they were; and true wisdom would direct educational efforts with a view to arrive at such a consummation as nearly and as quickly as possible. The prophetic Scriptures shadowed forth such a state of things; and its advent, looking to the operation of cause and effect, with the sanction and blessing of Almighty God upon the agencies which, for the first time in the world's history, were being put into operation on a large scale, was not so chimerical or distant as it would appear at first sight. Were we to draw an imaginary picture of the state of human society, on the supposition that man had retained his original innocence, in combination with the expansion of the faculties of every human being, "up to the full elevation of his nature," and then make the necessary deductions for the physical curse, we might arrive at a pretty definite idea of the practical elevation of which human society was susceptible. We might suppose that whilst man's sensual and intellectual pursuits were regulated by moral rectitude, his necessary intellectual and bodily exertions would neither be oppressive nor of doubtful results. In the absence of the curse, regular attention would secure an un-failing supply of food; in the universal prevalence of competence, morality, and content,—every man's conscience being a law unto himself,—there would be no necessity for written laws being added, "because of transgression," or for the education of "gentlemen learned in the law," or for complaints of the exorbitance of lawyers' charges, or for constables, magistrates, bailiffs, jailers, and those periodical displays of human depravity and legal cunning, furnished by assizes and quarter sessions, in which the concentrated power of society had to deal with the erring man whom, when a child, it had neglected to train "in the way he should go," and to punish him as a felon at four-fold the cost which would have been required to furnish him with knowledge and motives to become a blessing to his generation. Despotism and anarchy, civil wars and international disputes would be out of the question; and naval armaments would not be needed; the butchery of battles and sieges would not cause the blood of human brotherhood to cry from the ground, nor "soldiers of fortune" to "seek the bubble reputation at the cannon's mouth;" nor would the resources of nations be laid under contributions for generations to come, to gratify the passions and carry out the schemes of unprincipled and unfeeling men; nor have to contend in self-defence, against unjust aggressions. The expenditure of public property on the erection of prisons, fortifications, penitentiaries, poor-houses, or the pensioning of those wrecks of human beings whom the fiendish appliances of war had not dispossessed of life, would have been equally avoided; and every day's walk, and every dollar expended, would, like the rain and the sunshine, have brought blessing to man.