

the construction of a large telescope. Definite action in regard to this matter should be taken immediately. Let some one take hold and do something; success is almost certain.

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REMARKS BY THE EDITOR.—The suggestion here made by our esteemed correspondent for the construction of a reflecting telescope of unlimited power is novel and ingenious. It is, moreover, theoretically correct. But when we come to consider the difficulties which beset astronomers in using their present large instruments, though these are small as compared with the gigantic machines intended by our correspondent, we confess his idea seems to us to be impracticable.

Whoever has attempted so simple a matter as the adjustment of the wires of a three inch transit instrument, by looking through it upon a small plane mercurial mirror, knows how considerable the difficulties are. Even the insensible pressure of the wind, upon the exterior of a solid stone building in which the adjustment was attempted, has been known to produce such vibrations of the surface of the mercury, although it was insulated by elastic supports, as to render the work of adjustment impossible; and success is only attained during an almost perfect calm. If these difficulties attend the use of a mercurial mirror of only a few inches in diameter, are we not justified in believing it to be impossible, in the present state of human mechanical skill, so to arrange a plane mercurial mirror of several feet in diameter that it shall remain free from vibration? But granting that it could be done, can we conceive of any method by which the rotation, necessary to produce the requisite concavity of the mirror, could be imparted and maintained without inducing vibration? We will grant that the motion could be sufficiently regulated, though an absolutely accurate clock has never yet been made.

But we will suppose the mirror to be complete, and the objections mentioned successfully overcome. The instrument necessarily occupies a horizontal position; it is, we will say, twenty feet in diameter, and we now wish to use it to the best advantage. For this purpose, two plane mirrors, equal in size to our mercurial mirror, will be necessary; and whether they are made of glass or metal, the difficulties connected with the final polishing of their surfaces into a condition of proper accuracy are seemingly as great as the maintenance without vibration of the rotating mercurial mirror.

We are of opinion that it would be considerably less difficult to construct a concave mirror of speculum metal or other solid material, of the dimensions stated, than to produce either of the other mirrors; while the speculum concave, by its capabilities for change of position, would render the use of the two plane mirrors unnecessary.

We should be glad if our correspondent, and other writers who desire, would point out the particular methods that may occur to them, by which the objections we have suggested might probably be overcome. The subject is one of much interest, and its further discussion may lead to profitable developments.

THE PROTECTION OF PLANTS BY ARTIFICIAL CLOUDS.

The practice among gardeners of protecting vegetables from the effects of frost, by lighting fires at such points that the wind will carry the heated air and smoke over the plants, is not new, and in some countries is one of the commonest agricultural operations. In Chili, where large vineyards exist upon the slopes of the Cordilleras, the plan has been found of the greatest value in saving the vines from the cold wind which sweeps down from the mountains; and it is stated that even the tenderest shoots are defended from the frost, at temperatures as low as 21° Fah.

The most recent experiments in this direction, and perhaps also the most extensive of late date, have been carried on by M. Fiabre de Rieunègre, one of the largest vine growers in France. It may be remembered that about a year ago we briefly adverted to this subject, and said that it had elicited commendation from a congress of vintners in the above mentioned country. Since then, however, M. de Rieunègre's experiments have been made, and with such remarkably good results that the matter is invested with a new and, at this season of the year, timely importance to all engaged in the cultivation of the vine in our Northern States. The investigator in the record of his researches considers that fires of tar or heavy oils are not suitable, notably from the fact that cheaper and more efficacious material can be obtained, and also that, in order to keep the former burning over a considerable period of time, an amount of attention is required which eventually becomes very onerous. Wheat chaff, he says, answers the purpose better than any substance he has used, as it burns slowly, produces large quantities of smoke, and costs but very little. Moss, saw dust, or worthless hay may be employed when chaff is not conveniently obtained. The material is piled in heaps of about eight feet diameter and forty feet apart. Three fires thus disposed are sufficient to protect two and a half acres of vines.

In describing his mode of experimenting, M. de Rieunègre says that, having selected a night when the thermometer appeared to be rapidly falling, he collected all his laborers, together with a large concourse of neighbors from the surrounding country. As soon as the mercury fell to 32° Fah., a signal was given and the match was applied to three hundred heaps of chaff and straw. The flames were carefully kept under; and in a very few minutes, a dense cloud of smoke had settled over a plain of 360 acres. The fires were continued until the thermometer had risen above the freezing point of water, but were renewed within twenty-four hours, when one of the coldest nights of winter set in, with a

strong breeze blowing from the northeast. New heaps were kindled in the direction of the wind, the great cloud was agitated; and although, it is stated, the vineyards of the surrounding country presented after the frost a scene of desolation, those protected by the smoke were unharmed. Thirty thousand dollars worth of plants were saved by the operation, at the sole expense of a quantity of worthless chaff and straw.

ELOQUENCE AND PATENT FUEL.

When we have subjects to write about which call for beautiful displays of rhetoric (and it may be remarked that the editorials of a scientific journal are not popularly supposed to sparkle with such brilliant coruscations of literary genius), we think, by sufficient study, we might prove equal to any ordinary requirement; but we doubt if, under the inspiration of so prolific and poetic a theme as "patent fuel," we could evolve from our inner consciousness anything approaching the following, with which a writer in *Les Mondes* introduces that topic. The quotation is remarkable in that it broaches an entirely new theory of the origin of fire, the peculiar ingenuity of which will doubtless commend itself to all scientific minds:

"The world was born yesterday. One day an unknown meteor rushed with the wind (!) upon the summit of a forest. The horizon reddened, trees burst in flames, the leaves driven by a breath of summer whirled in torrents through the atmosphere: birds driven from their nests uttered cries of distress, panthers fled howling away, reptiles writhed upon the cinders, and crocodiles plunged into the lagunes. Alone, immovable and erect, man regarded with mute astonishment the bloody shadow of the new guest. Suddenly he felt a gentle heat penetrate his fibers, as the prescience of a novel destiny. Fire was found. Then braved he the frost, drove back the night, and caused the grain to leap from the bosom of the earth. Lighting the forge, he melted, molded, and mastered metal; and metal, vibrating under the orchestra of the forge, sounded the chant of the victory of humanity." And after two pages of this to descend to the advantages of a patent fuel!

THE SUPPRESSED MEMBER.

Of all tyrants, the most tyrannical is custom. As capricious as the King of Dahomey, she is as inexorable as Mrs. Grundy. There is no king or kaiser whose rule is so burdensome or so meekly endured, the secret of her power lying in the delusion of her subjects that they are wholly free. Her laws are the only laws that perpetuate themselves; and though originally mere freaks of barbaric fancy, or usages of some forgotten stage of social development, they have shaped the lives of so many generations that they have become part of the social framework, and are harder to shake off than Sinbad's old man of the sea. Our heaviest taxes are those we pay to custom, her tribute takers, with fernseed in their shoes, finding their way into the innermost recesses of our daily life and controlling our conduct where we least suspect it.

A thousand illustrations might be given; but just now our wish is to call attention simply to one: our habitual and unreasonable suppression of a member whose cultivation would immensely increase our executive power, and prevent our being utterly disabled by certain accidents which all are liable to. The oriental custom of restricting education to the male half of the race seems to occidental minds at once unprofitable and absurd. What then would we think of a custom which should effect the systematic repression, not of the girls merely, but of half the boys; requiring number one of every pair of boys to be trained to the utmost strength and skill, and condemning number two to awkwardness, inaction and weakness? Worse than that: allowing him to do nothing not directly and necessarily subservient to number one, yet requiring him always to take number one's place in case he should meet with an injury. Such unprofitable servitude to other customs than our own would certainly be accounted ridiculous in the extreme; but after all, is it so much worse than our careful repression of the sinister half of each boy's working members?

"Don't use that hand" and "Use your right hand" are injunctions that the child hears from the very first; and before he is old enough to understand the spoken words, the outstretched left hand is put back and the coveted toy given only to the right.

"Why?" he asks as soon as he is old enough to demand a reason for the slight put upon the unoffending member.

"Because," replies mamma, sagely, "it is awkward," or, "it isn't polite."

Why it should be awkward or impolite to use the left hand, mamma never thinks to enquire. That the exigencies of military discipline in some fighting age of forgotten barbarism made it necessary that all men should give preference to the same hand, or some other equally wise and potent reason established the custom at a time when one skillful hand was enough for one person, mamma neither knows nor cares; nor does it occur to her that times change, and that a good rule for one generation may be a bad one for another. Grant that social convenience is favored by the uniform use of the right hand for certain purposes, that is no sufficient reason for subordinating the left hand in all things, especially when the conditions of our lives and occupations make it very frequently imperative that the untrained left hand shall learn to do the work of the disabled right hand.

From the nursery the boy goes to school, and here the same unreasonable prejudice awaits him. Through instinct, accident, or caprice, he grasps his pen or pencil with his left hand, and his knuckles are sharply rapped for it. Why should he not be taught to write and draw with both hands?

It would take but little if any more time; and if it did, it would only keep him busy during moments which he would otherwise devote to idleness or mischief. The acquisition would never be worthless, and it might be of immense convenience to him. He might never have occasion to use his double capacity after the fashion of the popular scientist and teacher whose two-handed black board sketches are such a delight to his auditors, and who is said to pursue his microscopic studies with a pen at one side and a pencil at the other, drawing with one hand and writing with the other as the development of his subject may require; nevertheless his two-fold skill would ever be a possible source of satisfaction and advantage to him. He would be free at any moment to rest a hand exhausted by protracted use without any interruption of his work; he would be less likely to be disabled by trifling hurts; and in case one hand were stiffened by heavy labor, the other might be kept in readiness for delicate manipulations, for writing, drafting and the like.

We have seen more than one ambidextrous artizan whose ability to handle tools with either hand, as occasion demanded, gave him constant advantages over his one handed mates, not only in the avoidance of fatigue, but in the performance of nice work and the overcoming of difficulties, hard to come at by those restricted to the use of a single hand. The right handed man who can use a hammer or a knife readily with his left hand, or can tie or untie a knot when his right hand is otherwise engaged, will find frequent use for his skill. Indeed the advantages we miss through the non-cultivation of the neglected member are infinite in number and of incessant recurrence. They are among the taxes we pay to custom.

It would be useless to recommend the mature to undertake the culture of their left hands. They have been "left" unused and untrained too long; and the proper time for such work is in childhood and youth, when the muscles are tractable and time abundant. But need it be useless to urge parents to encourage such training on the part of their children, or, at least, not to discourage it?

SCIENTIFIC AND PRACTICAL INFORMATION.

EUROPEAN RAILROADS.

According to the most recent statistical data, the total length of all the railroads in Europe is 58,650 miles. The largest number of lines is in Great Britain, aggregating 15,351 miles; Germany is next with 10,739 miles, then France, 10,511, Austria, 4,492, Russia, 4,758, and Belgium, 1,392.

ADULTERATION OF TEA IN ENGLAND.

The London *Globe*, in an article on the above topic, says that the ill effects, often attributed to tea drinking, in the majority of cases are not due to the properties of the leaf itself. Adulteration has become so common that out of 183,000,000 pounds which passed through the British Custom House in 1872, during the month of July alone a Sanitary Commission found 10,000,000 pounds utterly unfit for human consumption. In a single chest a magnet brought out 43 per cent of the whole in bits of iron, colored green. This wholesale rascality is done by the Chinese before exportation.

RED AND WHITE MUSCLES.

M. Ranvier points out that the red and white muscles of a body,—very clearly seen by removing the skin of a rabbit,—which exist mingled in the same region, are different both in structure and properties. On applying the electric current, the white portions contract almost instantly, and respond even to rapid and continuous shocks. The red portions, on the contrary, are much more sluggish; it requires a certain time for them, apparently, to feel the excitement, while, on quick interrupted discharges of electricity being administered, they simply assume permanent contraction. It is believed by the author that the latter are involuntary and of the nature of the muscles of the heart or other portions relating to the animal existence; the former, however, he thinks, are controlled by the will.

NEW DERIVATIVES FROM CAOUTCHOUC.

While recently investigating the properties of Gaboon caoutchouc, M. Aimé Girard has succeeded in isolating a white crystallizable substance which, on analysis, became resolved into methylic ether and grape sugar. In a second series of researches, the same author, with Borneo rubber, has found another material analogous in aspect to the first, and containing the same elements, but differing in that it contained grape sugar condensed, in other words, answering to the formula C¹² H¹² O¹² instead of C⁶ H⁶ O⁶, as in the former instance. Continuing his studies to Madagascar caoutchouc, still another substance appeared, of which the sugar gave a molecule containing C¹⁸ H¹⁸ O¹⁸, or doubly condensed.

The series thus determined also has regular relative differences in physical properties. Thus the first derivative melts at 414° Fah., the second at 418°, and the third at 455°, the temperature rising with the degree of condensation, thus conforming to established laws. As regards optical properties, the first component is inactive on polarized light, the second turns the plane of polarization 32° to the right, the third determines a rotation of 79° in the same direction. M. Girard has therefore discovered an intimately connected series, representing ethers of which the acids are isomeric forms of grape sugar.

Instead of an edition of sixty thousand of the "special" as promised to advertisers, we shall print of this number seventy-five thousand to commence with, and probably a second edition of twenty-five thousand before the first of next January.