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No. 525

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A NEW INVENTION TO SECURE SAFETY IN COAL MINES.

We illustrate this week a very interesting and remarkable invention by Mr. Henry Guy Carleton, of this city, designed for the humane purpose of indicating the presence or approach of fire damp or other dangerous gases in coal mines. It consists of a pair of balances, each having at the beam a receptacle containing a given quantity of hydrogen gas; the receptacles are duly counterbalanced. The moving parts of the two instruments are electrically connected; and when properly adjusted, any motion of one balance will instantly affect the balance of the other instrument, no matter how far apart the instruments may be located. Thus, one instrument may be placed within a coal mine and the other in the superintendent's office. Should an inflow of fire damp occur in the mine, the beam of the balance will instantly turn, carrying warning signals and alarms wherever wanted, together with information to the office showing the degree of change in the atmosphere of the mine. Ample time thus will be afforded, whether in night or day, to secure the safety of the miners; and the condition of the mine, whether safe or dangerous, will at all times be indicated by the instrument. The general adoption of this admirable invention will put an end to those appalling horrors of the coal mine, by which so many lives are now annually sacrificed, and so many families reduced to misery.

The author, influenced by the noblest of motives, gives the free use of his invention to the world, and will take no patents on any of the novel parts or devices which enter into its construction. In view of these considerations, and also because the invention may be put in at trifling expense, we presume it will be gladly adopted, without delay, by mine owners in this country and in all parts of the world. Mr. Carleton will cheerfully aid this good work by further explanations or advice in respect to any features not made plain in the description as presented on our first page. Copies of the plans and description have been sent to the Royal Commission on Accidents in Mines, England, of which Sir Frederick A. Abel is president, and to other persons of prominence likely to be interested in the subject.

IS NERVE FORCE AN AGENT IN COLORATION?

We are compelled to admit that the tints of the skin of the human countenance depend to a certain extent on the mental condition. A deep blush and a deadly pallor may succeed each other with great rapidity over the same face, because, perhaps, an emotion of modesty or shame is followed by some fearful fright. But in this case we say that the color of the skin is dependent on the relative amount of blood in the superficial capillaries, and that no real change of color has been produced. The perturbation of nerve force concerned in the mental condition which has made the temporary change has neither produced color nor removed it. The true color of the skin, as in a person of swarthy complexion, or in freckles or blotches, we say is produced by pigmentary material deposited in certain cells, which we call pigment cells. Has nerve force any control over this?

The answer to this would seem to be necessarily in the negative, for we know that they remain year after year without change; but perhaps we may learn from observations on the lower animals some facts which can give us a better understanding. We are well aware that their colors vary according to circumstances. Many of them are habitually of the color of the substance on which they rest, so that the species cannot be said to have any color which is its own. Others change their colors rapidly, the chameleon being a notable instance. We need not, however, seek so far as to a foreign lizard for an example. Our common flatfish may often be seen to undergo such extreme changes as this. Lying on the light sandy bottom of a shallow pool, his entire aspect is of a dark brown with numerous much darker spots. If you approach the pool, the dark fish disappears almost instantly, and yet he has not moved away. He lies where he was before, but has discharged his color so completely that he matches the sand, and all that can be detected is his *two black eyes*. If left undisturbed for a few minutes, he regains his dark hue and the darker spots.

Once more, our common squid, or cuttlefish, *Loligo pealii*, is ornamented with great numbers of round spots of an exceedingly rich, dark, mahogany brown, making it a most conspicuous object; but, if alarmed, these spots disappear almost like magic, and the entire animal becomes colorless and nearly invisible. And so quickly and freely can this be done that bands and waves of dark and light can be seen running back and forth over its surface.

Here are true pigment cells as can be found anywhere, of very striking richness and strength, whose color is discharged at the owner's will, that is, they are subject to the control of nerve force. If we ask in what manner it is possible this can be done, there may perhaps be diversity of opinion. If the color of the pigmentary material is dependent on its structure, we can scarcely admit that the color can disappear and return; its disappearance would imply destruction. But we are by no means sure that the color is associated entirely with structure; it may very possibly have its relation to position as well.

The iridescent inner surface of so many shells gives us a perfect illustration of this. And the suggestion may fairly be made that the nerve force of the cuttlefish has such relations to the pigment of its rich mahogany spots that it can change their cell relations, and thus render invisible that which was strongly marked a moment earlier. This is given only as a possible solution, and it is given only in relation to these lower forms of life.

It is certain, however, that we can argue from these to the higher and more differentiated types, in which all changes are effected more slowly and with much greater difficulty; and it is, therefore, with some degree of confidence that we may advance the idea that though no direct agency of our will or nerve force can produce pigmentary changes, yet it is quite possible that long continuance of environments which control and modify nerve force may develop results of change which have not hitherto been taken into account.

The peculiar tints characteristic of various types of the human race are certainly not dependent on heat or cold, burning sun, or any other meteoric conditions. It is fair to raise the question whether nerve force may not have some agency in the matter, or we will modify it—may not *have had* for ages past.

REMOVAL OF SNOW FROM STREETS BY STEAM.

Some years ago, the project was discussed of removing snow from streets by melting it, the plan having then been proposed to melt the snow by steam blown directly into it or upon it from a steam pipe or hose. It was satisfactorily shown that such a use of steam would be attended with great waste of fuel. Not only the heat required for melting the snow would, by this method, be required, but large quantities would be expended in useless heating of pavements and vast volumes of cold air, which must unavoidably be drawn into and mingled with the steam escaping from the hose.

Notwithstanding this, the use of steam for removing snow is feasible, both in a practical and economical point of view.

To melt a ton of snow when the latter is at a temperature of 20° F. will require an expenditure of 147·4 heat units $\times 2{,}000 = 294{,}800$ heat units. Each pound of steam used will deliver 966·5 heat units while becoming condensed to water at 212° F.; therefore, $\frac{294{,}800}{966 \cdot 5} = 305$ would be the number of pounds of steam required to reduce a ton of snow to water at 32° F., exclusive of all waste.

Any method of applying the steam would be attended with some waste, but it is probable that the method of confining the steam in pipes inclosed in a box with insulated sides, the snow to be shoveled or by some other means put into the box as fast as the melting would make room for more, would reduce the waste as nearly as possible to a minimum. In this way no heat could escape from the pipes without at once passing into the snow, where it would be almost totally absorbed in producing the required effect. The losses would mostly arise from defective combustion and exposure of boilers; but it would seem that the latter source of loss might meet with effective resistance from some of the many excellent boiler coverings now obtainable.

If an effective evaporation of 6 lb. of water per pound of coal could be secured, which is only about half what is now obtainable from well constructed and housed boilers, we should have $\frac{305}{6} = 50\frac{5}{6}$ pounds, say 51 lb., of coal required to do the work.

The water from the melted snow could easily be conducted by hose into the sewer openings at the street corners.

Now, as to the economy, we have for a ton of snow removed the cost of 51 pounds of coal or about $\frac{1}{40}$ of a ton, which, at five dollars per ton, would be 12½ cents. To this must be added the interest on the cost of plant, cost of labor for attendance, and deterioration, all reduced to the basis of one ton of snow removed. These items are, of course, not susceptible of estimate without data of cost of machine, etc., but we think their total could not reach, or at least exceed, 37½ cents, making the cost of removal not to exceed 50 cents per ton, which is, we believe, not more than half what it now costs to shovel snow into carts and convey it to the rivers which receive it.

It would seem that there is a field for inventive enterprise here that might be profitably worked by some engineer skilled in designing portable heating apparatus.

AT the meeting of the Royal Academy of Sciences of Stockholm, Sweden, December 9, 1885, Dr. R. H. Thurston, Professor of Mechanical Engineering of Cornell University and Director of Sibley College, was elected one of its "Membres Etrangers."