SCIENTIFIC AND PRACTICAL INFORMATION.

BLACK PHOSPHORUS.

The essential feature of this body, says M. Blondlot, is that in a state of fusion it does not differ from normal phosphorus. At the moment of solidification, however, it suddenly becomes black. On re-fusing, it again turns white, and so indefinitely.

A SIMPLE LEVELING INSTRUMENT.

M. Goulier proposes for the above a pendulum hung by a double point, which carries, rigidly attached, a collimator formed of a small tube hermetically closed at one extremity by a piece of ground glass. At the other end is a converging lens, 18 inches in diameter and 54 inch focus. The radius of the exterior face of the lens should be six or seven times less than that of the interior face. At the principal focus is a diaphragm pierced with a hole 0·06 inch in diameter, across which is a thread of black cotton. By suitable construction, the pendulum being at rest, the plane passing through the thread and the optical center of the lens is horizontal. On looking through the lens, the observer sees the thread as a horizontal line, which marks on the field the intersection of horizontal plane through the instrument. By placing the eye in proper position, the thread and exterior objects may be seen at the same time, and the mark on a leveling rod may be adjusted to coincide with the thread, so obtaining a level.

DANGERS OF METHYLIC ALCOHOL.

Serious maladies, says the Lyons *Médical*, have been engendered among the workmen in two industrial establishments by the employment of methylic alcohol, that is, wood naphtha, or alcohol derived from wood. The material is used in the finishing of felt hats and of silk fabrics. Its action is directly upon the mucous membrane exposed to its emanations, and also, through the nervous system, upon the entire organization.

The effect is first noticed upon the ocular *conjunctiva*, which becomes inflamed and injected, producing a sensation of sand in the eyes. A copious flow of tears and extreme sensibility to light (photophobia) follow, incapacitating the sufferer for work. Further symptoms include intense coryza and inflammation of the pharynx and bronchial tubes, together with trouble of the digestive organs. Severe headaches and feelings of heaviness and depression are always present. The rigor of the malady depends upon the extent to which the person is exposed to the alcoholic fumes. The workman who finishes the bottom of a hat is attacked more severely than the one who prepares the rim. It has also been noticed that cabinet makers who use the material in varnish are frequently attacked with tetanic convulsions of the fingers, unknown previous to the employment of the alcohol.

THE COMMERCE OF THE WORLD.

Les Mondes says that the eleven principal nations of the world, Great Britain, United States, France, Germany, Belgium, Austria, Russia, Italy, Spain, Holland, and Sweden, have more than doubled their aggregate commerce in less than twenty years. The foreign trade of these countries amounted in 1855 to $4,251,700,000, and in 1872 to $9,272,000,000, showing in 17 years an increase of $5,034,300,000, or 118·5 per cent. The increase in population during the above period is 40,177,000 souls, or 14·8 per cent; and during the first-mentioned year the commerce *per capita* was $15.62, in the last year $29.76, or an increase of $14.14 to each person.

Mr. Gladstone, we notice, recently stated that during the last half century Great Britain had accumulated more wealth than during the entire period of her history. The figures above given would seem to prove this view.

The Warmth of Clothing.

In a careful study of the subject of the warmth of clothing, recently published, Dr. Max von Pettenkofer has pointed out that the permeability of stuffs to air is a condition of their warmth. The *London Medical Record* gives the following abstract: Of equal surfaces of the following materials, he found that they were permeated by the following relative quantities of air, the most porous, flannel such as is used ordinarily for clothing, being taken at 100:—Flannel. 100; linen of medium fineness, 58; silk, 40; buckskin, 58; tanned leather, 1; chamois leather, 51. Hence if the warmth of cloth depends upon the degree in which it keeps out the air from our bodies, then glove kid must be 100 times warmer than flannel, which every one knows is not the fact. The whole question, then, is resolved into that of ventilation. If several layers of the same material be placed together, and the air be allowed to permeate through them, the ventilation through the second layer is not much less than through the first, since the meshes of the two form a system of continuous tubes of uniform diameter, and the rapidity of the movement of the air through these is effected merely by the resulting friction. Through our clothing, then, passes a stream of air, the amount of which, as in ventilation, depends upon the size of the meshes, upon the difference of temperature between the external and internal atmosphere, and upon the velocity of the surrounding air. Our clothing, then, is required, not to prevent the admission of the air, but to regulate the same so that our nervous system shall be sensible of no movement in the air. Further, our clothes, at the same time, regulate the temperature of the contained air, as it passes through them, so that the temperature of the air between the clothing and the surface of our bodies averages 84° to 86° Fah. The hygroscopic property of different materials used for clothing essentially modifies their functions. This property varies with the different materials: wool, for instance, takes up more water than linen, while the latter takes up and gives off its watery contents more rapidly than the former. The more the air is displaced by water from the clothes, the less will be their power of retaining the heat; in other words, they conduct the heat more readily, and hence we are quickly chilled by wet garments.

Transparent Photographs.

A laundress's flat iron is, perhaps, the most convenient thing that can be made available for mounting the print upon the glass—using a piece of bibulous paper between the iron and the print to absorb the superfluous paraffin. Such a mounting may be very usefully employed for securing the soft effect produced by placing a second picture behind the transparency.

In this method of manipulating it will be necessary to melt the paraffin, and perhaps the following mixture may be utilized with advantage, as it is fluid at ordinary temperatures, or, if not so, the warmth of the hand will render it liquid. The small quantity of Canadian balsam is introduced for the purpose of making the print more adhesive to the glass; but we really have grave doubts as to its proving of any great advantage in practice, because even this substance is, to a certain extent, amenable to the action of the light and oxygen: Paraffin 2 drachms, benzole 5 fluid drachms, Canadian balsam half a fluid drachm.

The paraffin should be melted, removed some distance from the light, and four fluid drachms of the benzole added during agitation. The Canadian balsam is to be dissolved in the other drachm of benzole, and the whole is then to be mixed together. Paraffin and Canadian balsam do not mix very well; but with interposition of the menstruum, benzole, they seem to blend perfectly.

The advantages of such a mixture as the above are that it can be applied cold with a brush, and that it drys perfectly in a very short time if the benzole be of good quality. To perfect the adhesion, however, we would recommend that the warm iron should be passed over the surface after it is quite dry. Such an operation also ensures the volatilization of any traces of the benzole that might remain. The same solution might, perhaps, be used with advantage to preserve prints from atmospheric influence.—*British Journal of Photography.*

Transmission of Power by Wire Ropes.

At a meeting of the Institution of Mechanical Engineers, London, Mr. Morrison described the mode of transmission introduced by the Brothers Hirn, and now extensively used at Schaffhausen, on the Upper Rhine. It appeared that they first used flat metallic bands to transmit the power; but these being found objectionable, round wire rope was subsequently adopted instead. The rope is usually made of fine steel wire, as it must be very tough and flexible. This wire rope, which is about 1 inch in diameter, and contains 72 strands, is run at a high velocity, over pulleys of large diameter. The total loss of power by friction, etc., was stated to be 2½ per cent, and it appeared that, of 120 horse power existing at the motor wheel, 100 horse power was utilized at 2,200 yards distance; but it could not be elicited in the discussion how these figures had been arrived at. It was also estimated that iron shafting, capable of transmitting the same power, would involve the use of 3,000 tuns of material. Various materials were tried for facing the grooves of the pulleys, such as copper, leather, etc., as there either was excessive wear in the groove, or the facing destroyed the rope. The best arrangement was found to be a dovetail groove, filled in with gutta percha, in which the rope soon made a channel for itself, after which the wear was not excessive. The pulleys run at the rate of 50 miles per hour, and the ropes last from 1½ to 2 years.

Dr. C. W. Siemens, F. R. S., remarked that there was no doubt that, by running ropes at from 30 to 60 miles per hour over pulleys, a large amount of power could be transmitted with but little waste.

Mr. William Smith said that in 1837, soon after his father had invented wire rope, it was used very similarly, and in 1839 and 1840 it was introduced on the Regent's canal for towing barges through the tunnel beneath the Harrow road, and it was also taken 3½ or 4 miles along the bank of the canal. The bargeman simply threw a catch line over the running wire, and let go when necessary. It was tested against the screw, duck foot propeller, and others, but was not found to be economic. He had many times seen a similar application of the principle; the fly rope of an ordinary ropery was an illustration, but that had long since been obsolete. He would like to know whether the paper claimed, as a novelty, the introduction of endless wire ropes for transmitting power to a distance; if so, he doubted whether the claim could be substantiated. If the novelty merely consisted in the running of the ropes at a high velocity, which was all he could see in it, there might be something in the claim.

It appears from the soundings made by the Challenger expedition, from both the New York and the Halifax sections, that the true Gulf Stream or Florida current is a limited river of superheated water, of which the breadth is about sixty miles near Sandy Hook, while near Halifax it has separated into divergent streams forming a sort of delta; its depth (as determined by the use of the current drag) being nowhere more than 100 fathoms. This river rests upon the remarkable stratum of 60° to 65°, the thickness of which distinguishes the Western from the Eastern Atlantic between Bermuda and Azores, while at less than double the depth of that layer we come into what is clearly polar water.

Permanence of the Hydrocarbon Gas.

A very natural doubt has existed in the minds of some of our best gas engineers whether the hydrocarbon gas could have the same permanence under the influence of low temperatures as ordinary coal gas. Considering the ease with which air or even poor coal gas which has been naphthalized parts with an important portion of its illuminants at a low temperature, it has been argued that the non-luminous substratum of combustible gases, got from water by the hydrocarbon process, would in like manner part company with the illuminants derived from the bituminous coal distillation as soon as the mixture should be powerfully refrigerated.

Experiment, before which all preconceived notions must bow, completely disproves this hypothesis, and we are able to declare most positively, say Professors Silliman and Wurtz, that the hydrocarbon gas is far more permanent under the influence of extreme cold than any coal gas we have been able to put to the same severe test.

The results of many careful experiments by these gentlemen show a loss of from 10 to 40 per cent of illuminating power for street gas under the influence of cold, and no loss for hydrocarbon gas.

THE policy of the Russian Government is to compel all its subjects to worship under the forms of the Greek Church, otherwise to leave the country. A large and flourishing body of Russian Baptists, known as Mennonites, have been obliged to leave, and are now coming to this country. They have purchased large tracts of lands in Nebraska and Kansas. The advance guard, 185 in number, arrived here a few days ago with $60,000 in coin. The total number to be expected is about 25,000. They are industrious, reliable people, and will be gladly welcomed here. All despots who have similar good people to spare will please ship them to the United States. We have eight billions of acres of good lands in reserve, from which they may choose homes.

MM. Crouzet and Colombat have just brought before the notice of the Paris Academy a method for rendering ships insubmersible through a new application of compressed air. They propose that the hull be divided into two parts by a bridge across at the water line, in such a way that air cannot penetrate from the lower to the upper part. If a hole be made in a hull through a collision, the water will immediately enter; but it will not wholly fill the lower compartment, for the inclosed air, not having any outlet, will be compressed, and will ere long equilibrate the external force. From this moment the ship will cease to sink. It will, in fact, be in the position of a diving bell.

PHOSPHORUS AS A CURE FOR CATARACT.—Dr. Combas gives a case of a girl, aged twenty-four, of nervous, lymphatic temperament, suffering from capsulo-lenticular cataract, hardly able to discern light from darkness; suffered frequent headaches. Two or three drops of phosphorized oil were dropped into the eye daily, and frictions of the same used over the forehead. After four months of this treatment, which was used perseveringly, the eye improved, colors could be distinguished, and the opacity of the lens so far diminished that it could not be discerned at a distant of two or three paces.

M. ALVERGNAT has devised an ingenious apparatus which shows that an electric current will not pass equally well in two directions. Two glass tubes are connected together at the ends by arched pieces, and in one the points of a number of small glass pipes are turned in the opposite direction from those in the other tube. The current instantly passes through the tube in which the points are apex toward the negative poles. The tubes are filled with hydrogen, showing the oscillation of the luminous zones with great clearness.

AN old and dirty sponge may be cleaned by first soaking it for some hours in a solution of permanganate of potass, then squeezing it, and putting it into a weak solution of hydrochloric acid—one part acid of commerce to ten parts water.

DECISIONS OF THE COURTS.

United States Circuit Court---District of New Jersey.

[In equity.—Before Nixon, Judge.—Decided April, 1874.]

PATENT FASTENING FOR TRAVELING BAGS.—WILLIAM ROEMER *vs.* EDWARD SIMM *et al.*

NIXON, *District Judge:*

The bill is filed in this case for an alleged infringement of letters patent granted to the complainant July 31, 1866, for "Improvements in Traveling Bags."

The defendants, in their answer, aver that the complainant is not the original and first inventor of the improvement claimed: that it had been previously in use and was known to a large number of persons named; that a knowledge of the invention has been acquired by the complainant abroad; and that he had surreptitiously and unjustly obtained said patent here; and that it had been described in a printed publication by one Samuel Fisher, in London, prior to the supposed invention thereof by complainant.

There was no contradiction of the witnesses, and their evidence seems to establish the defendants' proposition that there was a foreign prior use of the improvement described and claimed in the complainant's patent.

In reference to the knowledge and public use of the invention in this country, if the witnesses speak the truth, and there was no attempt made to impeach the accuracy of their statements, there is no reasonable doubt that the patented improvement of the complainant was known and in public use in the United States for several years prior to his application for a patent.

It must be borne in mind that it is not necessary to hold, in order to avoid the patent, that the complainant knew of the prior existence and use of his invention. He must not only believe himself to be, but he must be, both an original and the first inventor. If he acquires his knowledge of the invention from another, he is not the original inventor; and if another has anticipated him, without his knowledge, he is not the first inventor.

After a most careful examination of the testimony of the witnesses, and after reasonable allowances for the imperfections of human memory—giving such examination and making such allowance, from a strong predisposition in favor of the validity of the Roemer patent, arising from the adjudication of this court in the case of the same complainant against Samuel Logowitz *et al.*, in which the patent was sustained—it seems impossible to doubt that the device of the complainants for fastening together the jaws of satchels and traveling bags was known and used in this country for many years before the patentee claims to have made his invention; and that its use was not a single experiment by an inventor who afterward abandoned it from its supposed inutility, but was so frequently applied to, and used upon, traveling bags, as to invest the public with the rights to use the device, notwithstanding the patent.

The evidence sustains the defence of want of novelty and prior use, and there must be a decree for the defendants.

[*Jonathan Marshall, Esq.*, for complainant.
Frederic H. Betts, Esq., for defendants.]