The Objects of the Howgate Polar Expedition.

Favorable reports relative to Captain Howgate's plan for exploring the Arctic regions have been made in both Houses of Congress, and a bill providing for a suitable appropriation will shortly be considered. Captain Howgate has pointed out the cardinal objects of his plan with much clearness, and in a way which must go far to satisfy those who can see no national benefit to accrue from Polar expeditions, the ostensible end of which is the empty glory of showing the flag at the pole, annexing new territories of ice fields, and bringing polar bears and Esquimaux under the blessings of a Republican government. The fact is, however, that the benefits to be gained by Captain Howgate's scheme are really of great importance; and perhaps most especially so in the additions to our knowledge of the laws of meteorology which will be secured. In reducing meteorology to an exact science, an experienced German student and explorer has shown the necessity of a comprehension of the conditions existing in the Polar zones. The general movements of the atmosphere arise from the exchange of cold and warm, of dry and humid air, between the poles and the equator. How enormous must be the influence of the huge masses of polar ice upon the distribution of the earth's heat is obvious. Greenland and Iceland afford proofs how the movements of ice, driven by winds and oceanic currents, may affect the climate of a country, but our knowledge of these movements is very defective. Now it is possible that the ice of the Polar zones may be the regular cause of our own climatic conditions, the origin of many of the furious storms which sweep destructively along our coasts and over our own land. It is probably not saying too much, adds the same authority, when we assert that the Polar regions are the most important portions of our globe for the study of the natural sciences.

The extreme conditions under which the forces of nature act in the vicinity of the poles produce phenomena which offer us the best means of investigating the nature of the forces themselves. As in meteorology, so, also, in terrestrial magnetism and electricity, these have to do with forces of the most tremendous magnitude, often exhibited in destructive energy, but never yet subdued to the service of man. So, too, if it is desired to investigate the ocean currents, and the laws of the tides upon which depend the safety and success of ocean commerce, influences are found centering in the North which must be traced to their source. Probably there is not one of the laws which govern the elements in their movements, a better knowledge of which will not result in material benefit to the race in cheapening the means of supporting life, in increasing the sources of human happiness, or in averting the perils to which we are now subject.

Captain Howgate's plan is simply that the explorers shall go as far north as they can and settle there, building themselves a suitable habitation. As soon as fixed good weather or other conditions indicate the possibility of an advance, they are again to push forward and again settle when stopped, and thus it is believed, by slow, gradual progression, the adventurers, who meanwhile will become acclimated to the cold and other abnormal phenomena, will be enabled in time to reach the pole.

The Astor Library, New York.

The Astor Free Library in this city is rich in valuable scientific and technical books and works of reference in all departments of science. It is a student's library; and as doubtless many of our readers avail themselves of the facilities here presented, we intend to offer from time to time a list of the recent additions.

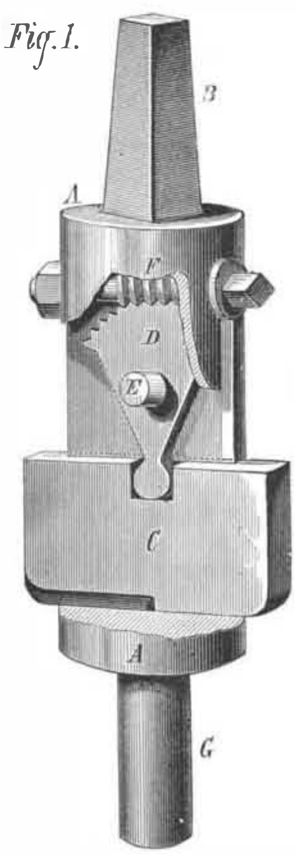
The following is a list of recent additions in the department of mechanics and engineering, which has been prepared by the courteous assistance of the librarian:

Shreve, Samuel H., Treatise on Strength of Bridges and Roofs, New York, 1873, 8vo. Matheson, Ewing, Works in Iron, London and New York, 1873, 8vo. Fanning, J. P., Practical Treatise on Water Supply Engineering, New York, 1877, 8vo. Krepp, Frederick Charles, The Sewage Question, London, 1867, 8vo. Spon's Dictionary of Engineering, 8 vols., New York, 1874, 8vo. Whipple, S., Elementary and Practical Treatise on Bridge Building, New York, 1873, 8vo. Auchincloss, Wm. S., Slide Valve and Link Motion, New York, 1875, 8vo. Burgh, N. P., Treatise on Boilers and Boiler Making, London, 1873. 4to. Francis, J. B., Lowell Hydraulic Experiments, New York, 1871, 4to. Burgh, N. P., Modern Marine Compound Engines, London and New York, 1874, 4to. Burgh, N. P., Treatise on Condensation of Steam, London, 1871, 8vo. Burgh, N. P., Link Motion and Expansion Gear, London, 1872, 8vo. McCord, C. W., Treatise on Movement of Slide Valves, New York, 1873, 4to. Spon, Ernest, Present Practice of Sinking and Boring Wells, London and New York, 1875, 8vo. Neville, John, Hydraulic Tables, etc., London, 1875, 8vo. Jackson, L. D'A., Hydraulic Manual, London, 1875, 8vo. Downing, Samuel, Elements of Practical Hydraulics, London, 1875, 8vo. Stevenson, Thomas, Design and Construction of Harbors, Edinburgh, 1874, 8vo. Clark, Daniel Kinnear, A Manual of Rules, Tables, etc., London, 1877, 8vo. Weissenborn, G., American Locomotive Engineering, 2 vols., 1 text, 1 plates. Humber, Wm., Treatise on Water Supply of Cities and Towns, London, 1876, folio. Merrill, Col. W. E., Iron Truss Bridges—Railroads, New York, 1875, 4to. Stevenson, David, Principles and Practice of Canal and River Engineering, Edinburgh, 1872, 8vo. Debauve, A., Manuel de l'Ingénieur, 8 vols., 6 text, 2 plates, Paris, 1871–3, 8vo.

A NEW TOOL.

A new and very useful tool has of late been introduced into the marine engine manufactories of Glasgow, Scotland, and it is likely to find an extended field of usefulness, because it is capable of performing a class of work which is somewhat troublesome to manipulate and usually requires a great deal of hand finishing. With this new tool, however, most, if not all the hand manipulation can be dispensed with.

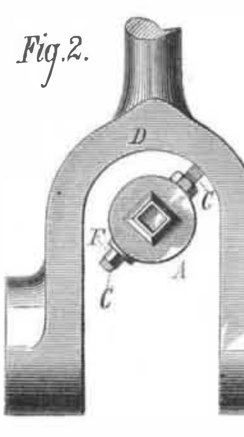
Fig. 1.



In our engravings, Fig. 1 shows the construction of the tool, which consists of the stock, A A, with the shank, B, made tapering to fit the socket of a boring or drilling machine. Through the body of the stock is a keyway or slot, in which is placed the cutter, C, provided in the center of the upper edge with a notch or recess. Into this slot fits the end of the piece, D, which is pivoted upon the pin, E. The radial edge of D has female worm teeth upon it. F is a worm screw in gear with the radial edge of D. Upon the outer end of F is a square projection to receive a handle, and it is obvious that by revolving the screw, F, the cutter, C, will be moved through the slot in the stock, and hence the size of the circle which the cutter will describe in a revolution of the stock, A, may be determined by operating the screw, F. Thus the tool is adjustable for different sizes of work, while it is rigidly held to any size without any tendency whatever either to slip or alter its form. The pin, G, is not an absolutely necessary part of the tool, but it is a valuable addition, as it steadies the tool. This is necessary when the spindle of the machine in which it is used has play in the bearings, which is very often the case with boring and drilling machines. The use of G is to act as a guide fixed in the table upon which the work is held, to prevent the tool from springing away from the cut, and hence enabling it to do much smoother work. It is usual to make the width of the cutter, C, to suit some piece of work of which there is a large quantity to do, because when the cutter is in the center of the stock both edges may perform cutting duty; in which case the tool can be fed to the cut twice as fast as when the cutter is used for an increased diameter, and one cutting edge only is operative. The tool may be put between the lathe centers and revolved, the work being fastened to the lathe saddle. In this way it is exceedingly useful in cutting out plain cores in half core boxes.

In addition to its value as an adjustable boring tool this device may be used to cut out sweeps and curves, and is especially adapted to cutting those of double eyes. This operation is shown in Fig. 2, in which D is the double eye, A is the tool stock, F is the adjusting screw, and C is the cutter. The circular ends of connecting rod strips and other similar work also fall within the province of this tool, and in the case of such work upon rods too long to be revolved this is an important item, as such work has now to be relegated to that slowest and most unhandy of all machine tools, the slotting machine. The tool was invented by one of the engineers of the transatlantic steamships, who unfortunately neglected to patent it.

Fig. 2.



Improvement in Car Lighting.

Some of the Western railroads—among them the Lake Shore and Michigan Southern—have recently adopted an improvement in car lighting which bids fair to supersede the old method of lighting by candles. This is a 300° fire test illuminating oil, made by Corrigan & Company, at Cleveland, Ohio, from petroleum, and the light it gives is stated to be 8 times greater than that of candles, while it is cheaper to produce. By the use of this oil the railway coaches are said to be brilliantly lighted and passengers are enabled to read with ease. The old system has been the cause of much complaint from the traveling public, who will welcome an improvement that, it is thought, will be adopted by railroads generally.

[For the Scientific American.]

WHY NUTS COME LOOSE AND BOLTS DROP OUT.

A correspondent asks: "Can you explain why it is that nuts come off, which they will do when subject to rapid motion or vibration, though they may be a tight fit upon the bolts and screwed tightly home with the wrench? Why indeed should it take two nuts to lock one bolt?"

The tendency of a nut to unwind and recede from the pressure upon its radial face is proportionate to the pitch of the thread and the diameter of the bolt, and the finer the thread upon a given diameter of bolt, or the larger the diameter of bolt with a given pitch of thread, the less is the tendency of the nut to move back. In the case of ordinary bolts and nuts a given diameter of bolt is given a standard pitch of thread, and these pitches are not so fine as to prevent the nuts from unscrewing in many cases unless checknuts are used.

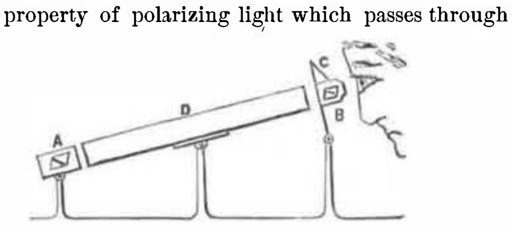
It would appear that if the nut thread fits reasonably tight upon the bolt and the nut is screwed well home, it should remain there, but there are palpable explanations why it does not do so. Of these the principal are the errors which ensue from the alteration of form which takes place in the screw cutting tools during the hardening process. As a rule all steel increases in dimensions from being hardened. What the amount of increase or expansion is we have at present no very definite knowledge, because it varies considerably; although it is probably equal under equal conditions. Suppose, then, that a tap is made of the correct diameter to a vernier gauge, and that it increases in diameter and in length (as it almost invariably does) during the hardening, the pitch, the thickness, the depth, and the diameter of the thread will be altered and "out of true."

Unless both the tap and the die are tempered to precisely the same shade of color, the amount of the contraction will vary. As a result of these at present irremediable errors taps are made to suit existing solid dies, or adjustable dies are set to suit the taps, and though the nut may fit closely to the bolt so as to be just movable by hand, or under a moderate pressure of a wrench, yet the sides of the thread do not fit properly, nor can they be made to do so under any ordinary conditions. The result is that under vibration the threads give way on the contact sides, for vibration is a number of minute blows. Under reciprocating motion the result is precisely similar, for the whole pressure upon the nut is supported by that part of the surface of the thread which is in contact, which compresses or recedes. Any machinist who desires to test this matter may do so by taking a nut that fits very tightly upon a bolt, and, striking upon the sides, he will find it will lose the fit to the bolt. J. R.

THE SACCHAROMETER.

BY SELIMO BOTTONE.

The action of the saccharometer depends on the fact that ordinary light, when transmitted through or reflected by certain bodies, acquires certain properties which it did not before possess. Among other properties conferred upon the light is that of displaying gorgeous prismatic colors when caused to traverse certain liquids and crystals. These colors, when brought into view by means of a solution of cane sugar, are the more vivid as the solution is more concentrated. In the best form of saccharometer, a tube about 10 in. long is closed at each end with a clear glass disk. An orifice, closed at will with a stopper, is left at about the center of the tube, so as to admit of the introduction of the sirup to be tested. This tube is placed between two prepared crystals of Iceland spar, called Nicol's prisms, which have the property of polarizing light which passes through



them. One, at which the eye of the observer is placed, is termed the analyzer; the other, through which the light enters, the polarizer. The analyzer is attached to the body of the instrument in such a manner that it can be made to rotate on its axis; and the amount of rotation can be measured by means of an index affixed to the analyzer, which points to divisions on a circle. To use the instrument, the analyzer is turned until the field of view (before the tube containing the sugar solution is interposed) appears dark by effect of polarization. At this point the index shows zero on the scale. The sugar solution is now introduced, when color immediately becomes visible, and the analyzer is rotated until a certain standard tint is produced. The angle of rotation is then compared with that required to produce the same given tint with a saturated solution of perfectly pure cane sugar. It is not absolutely necessary that the polarizing portion of the instrument should consist of prisms of Iceland spar, as the light reflected from a plate of glass may be made to answer, but the above arrangement is found more convenient in practice.

The illustration furnishes a rough sketch of the essential portions of a polarizing saccharometer, as seen in section. A, the polarizer, being a short piece of tube containing the Nicol's prism; B, the analyzer, a similar piece of tube containing also a Nicol's prism, free to rotate on its axis, the rotation being measured by the pointer, C; D, the tube in which the sirup is placed, closed at each end by plates of glass.