PROGRESS OF FOREIGN INVENTION.

There seems to be considerable activity in invention abroad. The stimulating effect of the war on military invention seems, however, to be gradually subsiding. Among the chemical patents issued we notice a new process, patented in England, for making

ILLUMINATING GAS FROM TAR.

To prepare the material for this purpose the acid tar is placed in a suitable vessel (by preference lined with lead) and boiled up with open steam. The condensed water from the steam combines with the acid and sinks to the bottom and is drawn off. The alkaline tar is then run in, and the whole of the tars again boiled up. In this way any acid that may be present is neutralized, and leaves the tars in a purified state floating on the surface of the solution of salts, alkali, and other matters (the alkali may be recovered by evaporation). The purified tar can now be used for gas making by mixing it with small coal, or by running it into the retorts after the charge of coal has been introduced, but it does not do so well to run it into the retorts in this state, as it is apt to choke up the running-in pipe with carbonaceous matter.

Interesting to nautical men is a newly patented

STEERING GEAR,

which is an ingenious application of hydraulic pressure to move the rudder. The rudder head is provided with a strong tiller, which is actuated by means of a pair of hydraulic rams placed horizontally on each side of the tiller athwart the ship. These rams are connected together at their inner ends, between which they carry a block or bush, which works on the turned cylindrical end of the tiller, and which permits the tiller to slide radially. These hydraulic cylinders have branches attached to their outer ends, to which strong hydraulic pipes terminate in a slide valve chest having three ports—namely, one of the end ports, communicating with one of the above named hydraulic cylinders, which the inventor calls the port cylinder; the other extreme part with the other or starboard cylinder, and between these two ports the exhaust port is laid.

Of higher scientific interest is an

ASTRONOMICAL INSTRUMENT

called the "Heliade," by means of which the true time at any portion of the day may be discovered, as well as the latitude, longitude, and meridian line of the place where the instrument may be. It consists of a rectangular box hung so as to turn on two pins, and the axis of which passes through the center of the volume of the box in the direction of its length. The axis of the two standards is perpendicular to the base, which pivots horizontally on a support, whose legs are composed of screws, by means of which the base may be maintained in a perfectly horizontal position, which forms an essential condition for the exactitude of the observations. This true horizontal position is ascertained by means of two water levels fixed at right angles on the base. A screw nut serves to arrest the pivoting movement when the box is in the desired position. Inside the box are two hollow demi-cylinders with their concave parts standing back to back at the center of the volume of the box. Their bases form exact half circles. These demi-cylinders are graduated in their concave part by means of lines parallel with the hemicycle of the base, and of others perpendicular to the first, and parallel with the generating line of the cylinder. This instrument resembles in its general features the heliorama, recently illustrated and described in this journal. It is the invention of F. M. Pannerat, of Paris, France.

The question of the disposal of sewage is now attracting the attention of the most able chemists as well as engineers throughout the civilized world. Among others, C. M. Tessie du Motay, the discoverer of the process for making oxygen, so often referred to in these columns, has devised and patented a process for

TREATING EXCREMENTS

which may prove valuable. The chief objection to it will probably be the cost, though as some of the substances employed are useful as fertilizers, they may perhaps add enough to the value of the matters treated to in a measure compensate for their use. Taking human or animal excrement the inventor disinfects it by one of the metallic salts or antiseptic agents which are now employed, when it contains ammonia in the state of sulphur hydrates or sulphurets, or sulphureted hydrogen in the free state. After this operation he adds to the mixture of solids with liquids or separately or united in one and the same liquor, soluble phosphate, acid, or neutral magnesian salts, fluosilicic acid, or even soluble fluosilicates, alkaline tenons or metallic, such as fluosilicates of lime, of magnesia, of alumina, of iron, and the like. When the reagents separately or collectively employed have reacted upon the soluble portion of the excremental matters in such a manner as to form a combination with them, the inventor adds, in order to cause them to pass from the acid into the neutral or alkaline state, either lime or carbonate of lime or magnesia or carbonate of magnesia. If after this treatment the excrement still gives off sulphohydric odors, a metallic salt should be added in order to complete its disinfection.

Among the curiosities of the patent announcements, we find one completed for a

PERPETUAL MOTION,

the invention of R. M. Marchant, of Torrington Square, London. The inventor compresses by stages the air, steam, or gas to be used as a motive power by means of pumps, a separate pump and chamber being provided for each stage, and the pumps being constructed in such manner as to prevent leakage by the provision that the air charge shall in every pump or chamber be passed, by the law of gravity, through the water in such pump or chamber to a higher level, so that all pressure tending to leakage shall as far as practicable be exercised by water on the joints, with which joints the air is precluded from coming in contact by the difference of its gravity. This meager description hardly indicates where the self-motive power is to come from, but those who are sufficiently versed in the attempts made to secure perpetual motion by the use of fluids of different densities will see in this device a familiar principle which has always failed to secure the desired result. A more complete description would therefore only show in a clearer light the folly of the inventor.

Mr. E. Weare, of Stonehouse, England, has patented a method of

UTILIZING WASTE THREAD

in the manufacture of textile fabrics. He accomplishes the end sought by returning the waste threads to the condensing carding engines by means of mechanism, the greater part of which is attached to one of the scribblers, by preference to the last. Over the end of the carding engine, rollers are fixed, over which rollers the waste thread from one side of the engine is conducted to the other side, and the threads from the two sides of the engine thus brought side by side. The waste threads are taken up by or coiled upon, a roller or spool driven by any convenient gearing from the carding engine or otherwise; and the said roller or spool, when filled with the waste threads, is conveyed to the scribbler (the axis of the roller or spool placed in suitable supports), and made to bear or rest on a second roller or drum, which has a slow, uniform rotary motion communicated to it, whereby the waste threads are uniformly delivered into the sliver as it comes off the scribbler. The sliver passes to the condensing carding engine in the usual way.

PENTAGRAPHIC EMBROIDERY

is a name applied to an ingenious method of performing ornamental needlework, invented by Mr. Billwiller, of St. Gall, England. A number of jointed frames are employed, each carrying tambouring or sewing apparatus. They are so arranged and connected together that the needles they carry may be made to traverse in any direction over the surfaces of the fabrics to be embroidered, and that the movements of the several needles shall be simultaneous and similar. The needle frames are also connected with a pentagraph having a tracing point capable of being led by the workman over the lines of a pattern which it is desired to copy, and when this is done the needles will each travel in and work along a path similar to that passed over by the tracing point. Thus each needle will produce embroidery resembling the pattern, but not necessarily of the same size; usually it is preferred that the pattern should be on a larger scale than the work produced by its means.

Professor Helmholtz on Faraday.

Preface to the German Edition of "Faraday as a Discoverer." Translated by Prof. Tyndall.

The name of Faraday is one to be held in reverence by all natural philosophers. Many times in London, in connection with lectures which I delivered at the Royal Institution, I had myself the privilege of his obliging help and the pleasure of his amiable society. The perfect simplicity, modesty, and undimmed purity of his character gave to him a fascination which I have never experienced in any other man. I had therefore a duty of gratitude to fulfill towards him.

But apart from this, and apart from that friendship for Faraday's younger associate and successor, the author of this book, which induced me to undertake the task, I believed that I should render a service to German readers by facilitating, as far as in me lay, an insight into the action and character of a mind so richly and peculiarly endowed, and so entirely the product of natural growth.

It is, moreover, by no means for the philosopher only that such an insight possesses interest. His interest, certainly, is the most immediate, for it has hardly been the lot of any single man to make a series of discoveries so great and so pregnant with the weightiest consequences as those of Faraday. Most of them burst upon the world as surprises, the products, apparently, of an inconceivable instinct; and Faraday himself, even subsequently, was hardly able to describe in clear terms, the intellectual combinations which led to them. These discoveries, moreover, were all of a kind calculated to influence in the profoundest manner our notions of the nature of force. In the presence of Faraday's magneto-electric and diamagnetic discoveries more particularly, it was impossible for the old notions of forces acting at a distance to maintain themselves without submitting to essential expansions and alterations. The clearer expression of these changes is at the present hour the object of physical science.

In what way such extraordinary results were achieved is naturally a question of the first interest to the investigator who strives after similar though more modest ends. But Faraday's development appears to me to possess no small human interest in relation to many theoretic questions of psychology, and to the art of education. The external conditions under which he cultivated those striking capacities which excite our wonder were the simplest that can be imagined. He was completely self-taught; brought up in humble circumstances, having received no more than the commonest instruction, and having been only favored by fortune in the circumstance that when he was a poor apprentice to a bookbinder, he found, at the right time, a helper in Humphry Davy, who recognized his peculiar gifts, and procured for him the possibility, though in a subordinate position, of working in the direction towards which his genius impelled him.

And throughout his whole life and labors the advantages and disadvantages of such a mode of development reveal themselves in simpler and larger traits than in the case of most other similar celebrated names. The principal advantage rose undoubtedly from the fact that his intellect was not too soon subjected to theoretic fetters, but enjoyed its freedom in the presence of natural phenomena; and that instead of book learning, he permitted the fulness of nature herself to operate upon his open mind. The disadvantages are, perhaps, of a subordinate kind; but they reveal themselves in quite as unmistakable a manner when he strives to give expression to his ideas, and to supply, by all kinds of sensuous imagery, the want of mathematical culture. This is manifestly the way in which he alighted upon his lines of force, his ray vibrations, and other notions, which bewildered the investigators of his time, and the truer and clearer meaning of which has been in part made out by mathematical theory since Faraday himself ceased from his labors.

And still, in this unlearned son of a smith, who held fast throughout his life the pious creed of his fathers, ran a vein of philosophy which gave him the right to be ranked among the foremost of those engaged in the general intellectual travail of our age. That, as Tyndall informs us, he retained the term "natural philosophy," usual in England to express physical science, and the name "philosopher" for the cultivator of that science—lies essentially in the nature of his work. After the science of our age, in its laudable efforts to make human knowledge a true image of the actual universe, had shattered many an old metaphysical idol, it halted amid the transmitted forms of physical ideas regarding matter, force, atoms, and imponderables. These names were even converted into new metaphysical shibboleths by those who thought themselves most advanced in the way of enlightenment.

It was these ideas that Faraday sought in his riper labors to purify from everything theoretical which was not the true and immediate expression of the facts. More especially he opposed the action of forces at a distance, the assumption of two electric fluids and of two magnetic fluids, and, in like manner, all hypotheses which contradicted the law of the conservation of force, of which he had an early presage, though he singularly misapprehended its mathematical expression. And in these precise directions he exercised, in the first place, the most unmistakable influence on the physicists of England. The mathematicians among them, especially, labor to render theories of phenomena the pure and true expression of the laws of fact, to the exclusion of all arbitrary theoretic devices. In this way Faraday's ideas, though in a modified form, often reveal themselves with their true significance assigned to them.

Responsibility for Detention of Advertised Trains and for Accidents.

The English courts hold the railway companies to a pretty strict rule in regard to their relations with the public convenience and the public safety. A case of long standing has recently been tried in the Court of Exchequer, the result of which is a case in point. A season-ticket holder found the advertised train not going to start, in consequence of the fireman having neglected to keep up steam, and ordered a special train. The bill for this was about two hundred dollars. The sharp passenger paid it, and then brought an action for the recovery of the money and some fifty dollars additional for his own loss of two hour's time. The judge expressed himself "astonished" that the company had resisted such a claim, and the jury gave the plaintiff a verdict for all he asked.

If we should import a little English law or an English judge or two, it might prove of advantage to the American public. In England likewise accidents to persons or property, from the carelessness or neglect of railway officials or employés, are punished by heavy pecuniary assessments under the head of damages. Verdicts to the amount of thirty or forty thousand dollars for personal injury have been recovered, and we read of one case where the jury rendered a verdict of over fifty thousand dollars. These heavy verdicts, however, do not seem to prevent disasters. In the Board of Trade Returns for Great Britain, for 1868, it is stated that nine railways in England and Wales paid for compensation for accidents on their roads the sum of $2,103,855, of which $1,407,940 were for injuries to persons, and $605,915 were for damages to goods. The compensation for accidents in 1869, it is anticipated, will amount to a larger sum than that above stated.

The English managers are much in favor of settling claims for damages by arbitration instead of trusting the matter to a jury, and in this we think they are wise; and we believe likewise it is better for both parties. Arbitration simplifies the whole proceeding, saves time and expense, and, if the arbitrators deal fairly with the facts of a case submitted to them, justice will not be so likely to be delayed or defeated by merely legal technicalities. Another very sensible decision was recently decided by an English court, to this effect, that a railway company is not responsible for the loss of articles from a passenger's portmanteau, which had been left by the owner in one carriage while he traveled in another, his own negligence having made the loss possible.—*Railway Times.*

A NEW MODE OF EVOLVING LIGHT.—Mr. Andrew Pritchard writes to *Nature* as follows: "A singular phenomenon of the evolution of light has been recently observed by me. By tearing sharply a piece of twilled calico into strips in a room well guarded from light, a perceptible luminosity was clearly distinguishable, which appeared at its maximum at the final parting of the fabric. This phenomenon is exceedingly well marked in dry, new calico, and appears to me due to the dressing, as after being washed no light is evolved. Whether attributable to electricity, phosphorescence, or fluorescence, I leave for further investigation. The light appears similar to that produced on breaking a lump of sugar in the dark. So far as I can ascertain, the phenomenon of light being evolved on tearing a fabric is new."

Effects of Compressed Air on the Men Employed in the Caisson of the East Pier of the St. Louis Bridge.

[From the Report of the Chief Engineer, Capt. James B. Eads.]

The first symptom manifesting itself, caused by the pressure of the air, is painfulness in one or both ears. The eustachian tubes extending from the back of the mouth to the bony cavities over which the drums of the ears are distended, are so minute as not to allow the compressed air to pass rapidly through them to these cavities, and when the pressure is increased rapidly the external pressure on the drums causes pain. These tubes constitute a provision of nature to relieve the ears of such barometric changes as occur in the atmosphere in which we live. The act of swallowing facilitates the passage of the air through them and thus equalizes the pressure on both sides of the drums, and prevents the pain.

The pressure may be admitted into the air lock so rapidly that this natural remedy will not in all cases relieve it. By closing the nostrils between the thumb and fingers, shutting the lips tightly, and inflating the cheeks, the eustachian tubes are opened, and the pressure on the inner and outer surfaces of the tympanum is equalized, and the pain prevented. This method must be used and repeated from time to time as the pressure is let on, if it be increased rapidly. No inconvenience is felt by the reaction when the pressure is let off, as the compressed air within the drums has a tendency to open the tubes, and thus facilitates its escape through them; whereas increasing the pressure has the effect of collapsing them, and therefore makes it more difficult to admit the compressed air within the cavities of the ears. It frequently occurs, however, from some abnormal condition of these tubes, as when inflamed by a cold in the head, that neither of these remedies will relieve the pain. To continue the admission of compressed air into the lock, under such circumstances, would intensify the suffering, and possibly rupture the tympanum; therefore the lock tenders were particularly instructed to shut off the compressed air at the moment any one in the lock experienced pain about the ears; and then, if it could not be relieved by the above means, the lock was opened and the person was not permitted to go through into the air chamber. Sometimes fifteen minutes were occupied in passing persons through the first time, after which they usually had no further trouble from this cause.

The fact that the depth penetrated by the air chamber was considerably greater than that hitherto reached in any similar work, left me without any benefit from the experience of others in either guarding against any injurious effects of this great pressure upon the workmen and engineers subjected to it, or of availing myself of any known specific for relieving those affected by it.

When the depth of sixty feet had been attained some few of the workmen were affected by a muscular paralysis of the lower limbs. This was rarely accompanied with pain, and usually passed off in the course of a day or two. As the penetration of the pier progressed the paralysis became more difficult to subdue. In some cases the arms were involved, and in a few cases the sphyncter muscles and bowels. The patients also suffered much pain in the joints when the symptoms were severe. An average of at least nine out of ten of those affected suffered no pain whatever, but soon recovered, and generally returned to the work.

The duration of the watches in the air chamber was gradually shortened from four hours to three, and then to two, and finally to one hour.

The use of galvanic bands or armor seemed, in the opinion of the Superintendent of Construction, the foremen of the chamber, and the men, to give remarkable immunity from these attacks. They were all ultimately provided with them. These bands were made of alternate scales of zinc and silver, and were worn around the wrists, arms, ankles, and waist, and also under the soles of the feet. Sufficient moisture and acidity were supplied by the perspiration to establish galvanic action in the armor, and as the opinion of those most accustomed to the chamber was almost unanimous in favor of this remedy, I am very much inclined to believe it valuable.

Immediately on the manifestation of greater severity in the symptoms, a hospital boat was fitted up at the pier, and one of the ablest physicians in the city (Dr. A. Jaminet) was engaged to attend those affected, and also to institute such sanitary measures as his judgment should dictate. A careful examination of the health and bodily condition of every workman was daily made, and none were permitted to engage in the work without the approval of Dr. Jaminet. Those most severely affected were sent to the city hospital and had the benefit of the advice and treatment of its resident physician, Prof. E. A. Clark.

The total number of men employed in the air chamber of this pier was 352. Of this number about thirty were seriously affected. Notwithstanding the care and skill with which those most severely attacked were treated, twelve of the cases proved fatal. Each one of these, without exception I believe, was made the subject of careful inquest by the coroner, aided by an autopsy conducted usually by some of our most skillful surgeons and physicians.

Whilst the exciting cause in all of these cases was doubtless the exposure of the system to the pressure of the condensed air of the chamber, the habits and condition of several of those who died were, at the time they went to work, such as would have excluded them from it if subjected to the examination of Dr. Jaminet, and the verdict in about one half of the cases gave a totally different cause for the death of the patient. Nearly or quite all of these deaths happened to men unaccustomed to the work; several of them to men who had worked but one watch of two hours. In contrast to this is the fact that quite a large number of the men (certainly one half of those constantly employed) commenced with the work at its inception and remained throughout its continuance entirely without injury or inconvenience.

The gentlemen composing the engineer corps of the bridge all visited the air chamber, some of them quite often, either in the discharge of their professional duties, or from motives of curiosity, and none of them suffered any injury whatever.

Much diversity of opinion was expressed by the medical gentlemen who investigated the symptoms and held autopsies of the deceased. Some of these gentlemen maintained that a slower transition from the abnormal to the natural pressure would have been less injurious; others claimed, on the contrary, that it was from the too rapid application of pressure in passing from the natural into the compressed air. The fact that the air lock tenders were in no case affected, although subjected many times during a watch of two hours in the air lock to rapidly alternating conditions of the atmosphere, at one moment in its normal state in the lock, and five minutes later exerting a pressure of fifty pounds per square inch upon every part of the body, would seem to prove both of these theories unsound, and lead us to believe that in the length of time to which the human system is subjected to this extraordinary pressure exists the real source of danger, and not from any rapid alternations of pressure to which it is exposed.

After the caisson reached the rock, I have frequently, when passing through the air lock, admitted the compressed air into it so quickly that none but those well accustomed to it could relieve the pressure upon their ears, and yet I felt no ill effects whatever from this rapidly increased pressure; and in going out I have let the pressure off so fast that the temperature in the lock has fallen thirty-two degrees (F.) in consequence. These transitions occupied but three or four minutes.

The fact that the air chamber was briefly visited by thousands of persons, including many delicate ladies, even after it had reached the bed rock, some remaining as long as an hour in it without any of them experiencing the slightest ill effects from the pressure, and the fact that no cases of any importance whatever occurred among the workman after the watches were reduced to one hour, satisfies me that this is the true cause of the paralysis, and that by lessening still more the duration of the watches, a depth considerably greater can be reached without injury to the workmen. Too long a continuance in the air chamber was almost invariably followed by symptoms of exhaustion and paralysis. Dr. Jaminet, on one occasion, remained in two and three quarter hours when the depth was over ninety feet, and was dangerously attacked soon after reaching home.

Hoosac Tunnel---Trial of Dualin.

EAST END.

About fifteen hundred pounds of dualin in cartridges ready for use, reached here from Neponset ten days since, being the sixth attempt to supersede nitro-glycerin. The inventor of this compound arrived on the 28th ult., for the purpose of superintending its application in person. As this parcel had been specially prepared for the purpose, guided by the results of five previous experiments at various points of the tunnel, "great expectations" were raised, as to the results. One of the slopes then being operated upon by nitro-glycerin and having a burden of eight feet, which was being thrown down every blast, bottoming every hole, was offered for the experiment. Similar charges of dualin were substituted for nitro-glycerin; the dualin was utterly unable to move the rock—the inventor asserting that this failure arose from the cold weather having affected the compound, the charges were thereupon warmed, but with no better result. Some charges were now inserted in holes having a burden of two feet, instead of eight; these removed the rock, but as powder would have done the same work, this was not deemed a seccess. Meanwhile some 400 pounds of dualin were teamed to the central shaft, but as the results of three days' blasting at the east end were reported of "no account" this has not been used. We believe the results now attained with nitro-glycerin at the east end, and above described, viz.: Taking out the roof full width of the tunnel with a single series of seven drill holes having an eight-feet burden, and bottoming every hole, indicates admirable direction of the work, and argues well for the speedy completion of the tunnel. Progress during November, 133 feet.

WEST END.

Well No. 4. Messrs. Hocking & Holbrook have commenced using nitro-glycerin in their sub-contract, for the purpose of removing the rock preparatory to putting in the brick arch at that point; their first blast of nitro-glycerin in five holes, was tried on Monday with satisfactory results, and hereafter they intend to substitute it for powder, except in trimming. It seems to produce less jar, and it is anticipated will be less injurious to the brick work that is completed, than blasts with powder—besides expediting the work and saving money. Sixty-three feet of brick arch were completed during the month ending November 30.

WEST SHAFT.

The progress of the heading at this end, we understand, during the month of November, has nearly equaled that attained at the east end. When it is remembered previous to the present contract 40 feet was more than average at this point, the progress, 130 feet during the past month, is very satisfactory.

CENTRAL SHAFT.

The advance made in the two heading just opened during November was 76 feet. Considering that this rock has to be twice handled, and then lifted over 1,000 feet to the surface; such progress by hand drilling is very extraordinary work, but as Mr. Walter Shanley has been on the ground during the month, all the time, this may afford the clue how it is the headings are being driven at such a rate, by handdrilling.

It will be observed that with the most strenuous efforts at hand drilling the progress was not one third of that accomplished at the east end where the Burleigh compressed air drills are used.

Photographs of Arctic Scenery.

One of the most interesting and instructive entertainments of the season was given at the Somerville Art Gallery last week by Mr. Bradford. It is known that Mr. Bradford and Dr. Hayes revisited the polar regions in the summer of 1869, and that they brought back with them several hundred photographs and sketches of a region hitherto unknown to the world except by description. The photographs have been copied upon glass for exhibition with the magic lantern on a canvas 20 feet square. The pictures are remarkable for their sharpness and definition, and afford a better idea of that wonderful region than it would be possible to obtain without personal inspection. The interest of the occasion was greatly enhanced by the explanations made by Dr. Hayes, who courteously gave an account of the adventures of the party, with the necessary statistical and scientific information in reference to the size of the icebergs and the geological character of the rocks. We understood Dr. Hayes to say that there was enough ice in one of the floating masses so truthfully delineated upon the canvas, if brought to the New York market and sold at the price we are accustomed to pay, to bring in enough money to pay off our national debt and leave a balance in the treasury. This startling statement affords the best idea of the enormous weight of these icebergs, and we can better understand, after viewing them, how readily they can grind out valleys, and change the whole contour of the bed of the ocean in which they float. At the close of the exhibition Dr. Barnard, of Columbia College, made some eloquent remarks on the educational value of such studies and urged upon the Board of Education the importance of affording an opportunity to our school children of seeing representations of this entertaining and instructive character.

Mr. Bradford then invited the company to partake of some ices evidently not of arctic manufacture, and of edibles very different from the pemmican and blubber with which his traveling companions were obliged to be content in their northern journey. The entertainment was one to be remembered by all who had the pleasure of being present.

New Projection of the Earth.

G. R. Nash, C. E., of North Adams, Mass, has calculated and constructed a new system of projections, which he designates "The Conoidal," on which linear position, area, angles, and distance, are in harmony, as also "form" when sectional maps are used. It seems to us better adapted for general purposes than any of the projections now used.

On 'Mercator's" projection, the young student of geography is at once misled respecting the comparative sizes, positions, and forms of countries, islands, seas, etc., resulting from its variable scale, and many persons carry these early impressions through life. "Mercator's" is a special projection for the use of mariners, and not suited for general purposes. The "Spherical" has three disadvantages: One that it is not a delineation of the earth's surface on one representation; another, that parallels of latitude are not parallel; and thirdly, it embraces more area than really exists. The new projection corrects these disqualifications in both projections, besides possessing other favorable features, and is, therefore, we believe, eminently qualified to be the basis for the future construction of maps, charts, and atlases. A great advantage is also apparent in the lines at right angles with each other, dividing the chart into squares, as any person can see at once the distances north and south, east and west of the equator, or prime meridian, or other points, thereby greatly assisting in teaching sizes and areas.

Charts showing only small subdivisions on this projection are necessarily very correct, and can be constructed with any meridian as a "prime."

We have seen a drawing on this projection, which represents the first map of an atlas. It is proposed next in order to project the New World, then the Old World, then each continent with its sectional maps, which arrangement would gradually reduce any distortion produced on a chart showing the whole surface of the earth.

Lamy's Thermometer.

The pyrometer invented by Lamy is founded upon the dissociation of carbonic acid from calc spar in a porcelain tube, and an arrangement for reading the amount of gas thus expelled. He has since extended his experiments upon other salts and finds the double compound of ammonia chloride of calcium to be admirably adapted to the accurate determination of slight variations in temperature. This is in consequence of the ease with which the ammonia vapor can be expelled, and the variations in its tension under different degrees of heat. Lamy incloses about a gramme of the ammonia chloride of calcium (made by passing ammonia gas over dry chloride of calcium) in a flat copper box of the size of a five franc piece, with a tube 4 or 5 mm. wide and 150 millimeters long. This tube is attached to a leaden tube of 1·51 mm. diameter and of any required length, on the end of which is plaeed the manometer for reading the force of expansion of the gas. For lower temperatures a column of quicksilver will answer every purpose. As long tubes can be used this form of thermometer is admirably adapted for determining the temperature of wells and caves into which it can readily be sunk.

The subject is one of peculiar interest as affording more accurate methods for measuring small degrees of heat than can otherwise be obtained.