POLYTECHNIC ASSOCIATION OF THE AMERICAN INSTITUTE.

The Association held its regular weekly meeting on Thursday evening, March 17th; the President, S. D. Tillman, Esq., in the chair. From the President's summary of scientific and industrial news we select the following items:—

AGE OF THE EARTH.

The Rev. Prof. Haughton, in a paper recently read before the Dublin Geological Society, gave the result of some computations, based on the earth's rate of cooling, to determine the limits of the time during which animal life can have existed upon our globe. As the albumen of the blood coagulates at 122° Fah., he regards it as impossible that animal life can exist in an atmosphere above that temperature. He therefore attempts to calculate the time from the period when the polar regions of the earth were at a temperature of 122° down to the period when the mean temperature of the British isles was 77°, the latter being the London clay tertiary epoch of tropical mollusca. His computations give the time between the two periods as 1,018,000,000 years.

UTILIZATION OF SEA-WEED.

It is estimated that 21,000,000 tuns of sea weed are annually thrown upon the coasts of the British isles, and that only 1,000,000 tuns are used for kelp and for green manuring. It is proposed to dry it by the process for burning wet fuel, by which a portion of the weed will be burned to dry the rest.

Mr. Garvey—"Does any one present know the process by which sea-weed is made into artificial horn?"

Mr. Maynard—"I believe that the Indian sea-weed is used for that purpose."

The Association then passed to the consideration of the regular subject of the evening—

SURFACE CONDENSERS.

Mr. Root—"There is one plan of surface condensation which I have tried and found to work very well. It was suggested, I believe, first in some German publication. The end of the exhaust pipe was enlarged in funnel form, and closed with a thin sheet of metal. Then a jet of cold water was thrown with force against the outside of the thin sheet. With a plate only a foot square, I condensed successfully the steam from a 20-horse-power engine. I found that the rapidity of the condensation depended very much upon the force with which the cold water was thrown against the plate."

Mr. Stetson—"I should like to ask the gentlemen present who have devoted much time to the study and practice of surface condensation, if the plan has ever been tried of exhausting into open air down to the atmospheric pressure, and then condensing the remainder of the steam. It is manifest this would economize the cold water, permitting a smaller air pump to be used with a jet condenser, or a smaller number of pipes in surface condensation."

Mr. Root—"I built an engine a few years ago at Madison, Ind., on that very plan. It was for a river boat, and would not work for the same reason that no condensing engine will work on the Western waters."

Mr. Sewell—"One advantage of this plan would be that the steam exhausted into the open air might be used to heat the feed water. In the ordinary condensing engine the advantage of the vacuum is balanced to a considerable extent by the necessity of feeding the water to the boiler at a lower temperature than is obtained in the non-condensing engine. Every 11 degrees is equal to one per cent., and if you have to feed at 100 degrees lower temperature it costs you nine per cent. of your fuel. I think this idea of partial condensation is well worthy of attention."

Mr. Fisher—"The reason why it will not be introduced is that no patent can be secured. The idea has been published, and no man can now claim to be the first inventor, and if any one goes to the expense of the necessary experiments to reduce the idea to practice, he will work for the public, and will have no means of remunerating himself."

Mr. Stetson—"The idea thrown out by Mr. Fisher is correct, and is very important. Still there is an erroneous impression prevailing in relation to patents of these original principles. Though the thing itself cannot be patented, the means of carrying it out generally can be, and in most cases patents on these methods can be obtained which will secure a man the business."

Mr. Sewell—"I was going to remark that though the idea of carrying the water through the pipes, and having the steam outside of them, was not *first* suggested by me for a surface condenser is was original with me. This plan has the great advantage of making all the joints water-joints, which are much more easily kept tight than steam-joints. The Pacific Mail Steamship Company's steamer *Golden City* has one of my condensers in use. She is 340 feet long, 45 feet wide, and draws about 18 feet. Her engine has a cylinder 105 inches in diameter with 12 feet stroke. Her regular schedule time, one day with another, is 280 miles per day, and she burns 32 tuns of coal in 24 hours. I think that performance will challenge the world."

The President—"There is one branch of the subject that we have not yet considered—the effect of surface condensers on the durability of the boilers."

Mr. Sewell—"It is supposed that the copper tubes of the surface condensers cause the rapid corrosion of the boilers, but the Government had an engine in Philadelphia for pumping out the dry dock, in which no copper was used, and the boilers rusted out very rapidly indeed."

Mr. Giffin—"I am running an engine in Brooklyn which is supplied with two boilers, one having a feed pipe of iron and the other of brass. The boiler with the iron pipe is perfectly sound and good, and the other is pitted with corroded spots, extending both above and below the water line."

Several other members made remarks on this branch of the subject. "The Constitution of Iron" was selected for the next evening's discussion. and the Association adjourned.

The Danish Iron-clad "Rolf Krake" in Action.

The first trial of a "monitor" in Europe took place when, on the 18th of February, the Danish iron-clad turret battery *Rolf Krake* went to Ekensund to attempt the destruction of the Prussian bridge into Broager. The *Rolf Krake* was under a constant fire from the land batteries on three sides for nearly two hours, yet when she returned to Sonderborg, the ship, turrets, artillery, machinery, and everything was uninjured, and fit to go under fire again at any moment. There were about 100 marks about her, where the shot had hit the plating, and some of the crew had been wounded by pieces of shells bursting just over the gratings in the top of the turrets. The reason why she had to return was that the water being so shallow she could not get near enough to see the bridge, which was protected by a projecting piece of land, and consequently she had to fire at the bridge at random, without being able to judge of the result. She however succeeded in doing considerable damage to the enemy.

[If we knew the range, projectile and charge used, the above account would have more interest. A description of the *Rolf Krake* is here appended:—She is 185 feet long, 35 feet beam, and 16½ feet deep, having two cupolas or revolving turrets, 4½ feet above deck, and 21 feet in diameter. She is clad with 4½ inch solid plates, all round, increased to 7½ inches at the gun-ports. The engines are 240 horse-power. She is a sea-going vessel, and attained a speed of 10 knots per hour.—EDS.

Nativity of our Population.

The census returns of 1860 give the following totals of the birth-places of the free inhabitants of the United States:—

Born in the United States	23,301,403
Born in foreign countries	4,136,175
Birth-place not stated	51,883
Total free population	27,489,461

The different races and nations of foreigners in the United States are represented as follows:—

Ireland	1,611,304	China	35,565
Germany	1,301,136	Holland	28,281
England	431,692	Mexico	27,466
British America	249,970	Sweden	18,625
France	109,870	Italy	10,518
Scotland	108,518	Other countries	60,145
Switzerland	53,327		
Wales	45,763	Total foreign born	4,136,175
Norway	43,995		

NEW EXPERIMENTS IN WORKING STEAM EXPANSIVELY.

We made a brief announcement, some months since, that our Government was about to initiate a series of experiments for the purpose of fully and fairly testing the value of working steam expansively. So much has been said for and against this theory and the practical adaptation of it, that any thing tending to increase the common stock of knowledge in this branch of engineering, will no doubt be gladly welcomed by the intelligent and unprejudiced reader.

The engine chosen is a simple vertical cylinder working upward with a connecting rod, cross-head and slide valve; and the cylinders (for there are several of various diameters) are, respectively, one of 12 inches by 24 inches stroke, one of 14 inches adapted to the same frame, &c., one of 26 inches, and one of 30 inches. These are capable of being worked at either high or low pressure by a simple arrangement The duty done by the engine must, in order to measure the relative economy at different grades of expansion, be constant, and therefore the following plan has, after due deliberation, been determined on:—

"This plan depends on the use of fans, having vanes of same area, run at same velocity and under the same circumstances, to furnish the required resistance. A single line of shafting, of adequate length and suitably supported, is to carry all the fans, to be run together, if need be twenty in number. This shaft is to pass through an inclosure twelve by forty-eight, formed by sides and ends fifteen feet high, and this inclosure is divided by partitions fifteen feet high, into compartments three feet wide. In each of these compartments, thus 3x12x15, open at the top, the shaft is prepared to receive four arms on each of which is a vane, the centers of the vanes being two to three feet from center of fan shaft. The structure and dimensions of the arms and vanes of the fans to be in every particular the same in all the fans. The inclosure of the fans (12x48) is to be within a building 30x90, so that all outside currents of air are shut out. At each end of each compartment a door gives access to the fan in that compartment. The shaft carrying the fans will receive its motion by a pinion on it, from a mortise wheel on engine shaft, of such proportions that 50 revolutions of engine produce two hundred revolutions of fan shaft. For the resistance required for a full stroke cylinder, it is proposed to use ten fans, placed in alternate compartments. The vanes on these ten fans to be, at the commencement, of larger area than necessary, and then cut down on trial until that area of vane (all the vanes being reduced to precisely the same area) is obtained, which at two hundred revolutions will furnish the resistance, which will require all the power developed by the full stroke cylinder at fifty revolutions, and full pressure of steam throughout the stroke. As each of these fans will be of precisely same dimensions, will of necessity be run at same velocity, and will in every respect be under the same circumstances, any one of the ten will require one-tenth of the power required to revolve the ten. On removing the full stroke cylinder, and substituting an expansion cylinder, having a capacity of one cubic foot at the point of cut-off, such additional number of fans of exactly the same dimentions and structure will be attached to the shaft, in compartments adjacent to those already occupied by the ten, as the power furnished by the expansion cylinder may prove able to drive. The dimensious, revolutions, and circumstances of the additional fans being the same in every particular with those of the standard ten, the total number driven by the full stroke cylinder will embrace the facts by which to compare the two developments of power. In both cases the power required to drive the shafting, without the fans, will be common to both performances. It will therefore be necessary to determine what that power is. An additional fan driven, with the allowance referred to for friction of apparatus, will show ten per cent. more power developed; two additional fans twenty per cent. and so on.

"For cases where the increase of development of power is more than one more fan will measure and less than two more fans can measure, resort must be had to vanes of less area on one fan, and to deduction, based on the area for the relative power. The use of fans for the source of resistance presents the advantage of the easy and favorable introduction of some form of dynamometer between the engine shaft

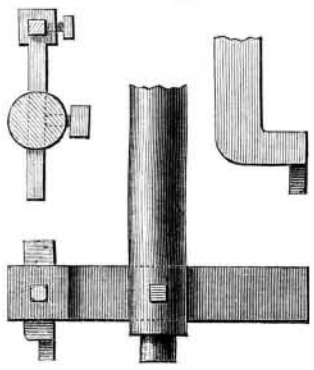
and fan or resistance shaft. The Commission are under the belief that they will be able to determine with sufficient accuracy the actual power to drive the fan shaft, without any fans on it, and the power to drive one or more fans, up to twenty, and that they will therefore be able, not only to determine the relative economy of using steam with different measures of expansion, but the actual power developed, expressed in pounds, raised at an ascertained velocity, and therefore expressible in horse-power—the conventional unit of po wer."

The commissioners are Horatio Allen and B. F. Isherwood. The engine is now well under way at the Novelty Works, in this city. The experiments will be conducted in a building on Fourteenth street, New York. When they take place we hope to be present.

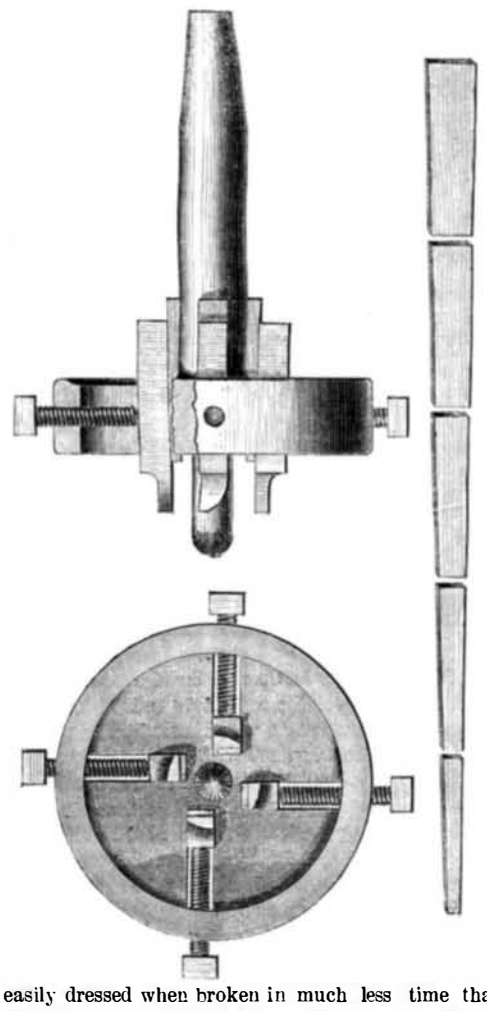
THE DRILL AND ITS OFFICE.

[Continued from page 181.]

Here is a plan for an expanding or an adjustable tool by which holes in flue sheets can be made of any size, varying only with the plan of the cutters. The apparatus is very simple and by altering the shape of the cutters, a hole but little larger in diameter than

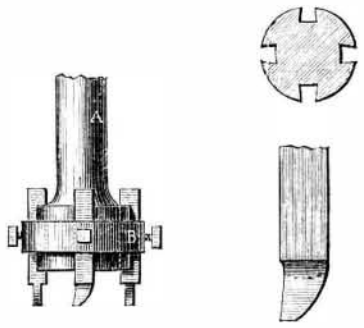


he rod or shaft that carries the arm can be made. The advantages of this appliance over an ordinary drill, such as is frequently used, are that the cutter, which breaks often even with the utmost care, can be



easily dressed when broken in much less time than the counter-borer could, thus making it cheaper to use both in point of execution and cost of repair when injured. We are indebted to Mr. Herman Winders, an accomplished engineer, now with Donald McKay, Esq., of Boston, Mass., for the plan of the tool presented above. It is, as may be seen, adjustable, and will cut holes of varying diameters, according to the sizes it is constructed for. The arrangement is simple and consists of a central head forged solid on the shank. This head is planed out for the reception of the tools or cutters and has further a wrought iron ring shrunk over it. This ring is tapped out to receive the set screws which hold the tools fast. Behind the tools are wedges which, when driven or slacked off, advance or retract the cutters with great nicety, the taper is planed in the shank for the wedges, so that the cutters always stand vertically. The wedges should all be planed at once so that there will be no variation in them, and several sizes should be provided so that holes of any diameter can be made. The cutters need not all travel in the same track, but each may set a little inside of the one that forms the size; in this way they cut freer and are less liable to break. This tool is useful not only in the boiler-shop but also in the finishing department, for by changing the character of the cutters, work of almost any kind can be done.

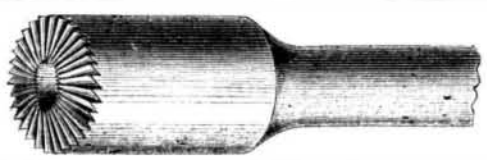
Here is another plan for a boring tool or tube sheet-



borer more properly, for this is the object it was designed for. It is not so good a tool as the first one for some purposes, but as all persons may not have the same opinion we give it place. It is not adjustable except limitedly, it costs more to make at first but it will work faster and do equally as good, if not better work than the ordinary adjustable cutter. The bar, A, is merely forged with a larger portion on the end, and is grooved on four sides to admit the cutters; these are simply square nosed, offset on one side and the cutting part, of course, curved to suit the circle it works in; a wrought-iron ring, B, is then slipped over the cutters to hold them firmly in place and adjust them so that all the points may work at once; this ring has set screws for each cutter and one of the cutters may be made to countersink the sheet at the same time if it is preferred to do it on the side drilled from. The burrs or ragged edges left on the under side of the sheet by this tool will be very slight indeed if it is properly made, and can be rubbed off with an old file.

Still another drill for boring tube sheets is given herewith. It is one commonly used and is a very ef-

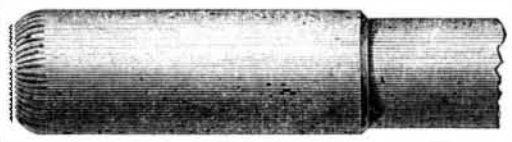
ficient tool when well made. It is costly to construct, however, and requires to be turned in the lathe by an experienced workman and afterwards filed up so as to cut properly. The spaces between the pin and the cutters are very troublesome to cut out in the lathe with an ordinary tool, as the work in revolving strikes square and suddenly on the lathe tool and soon dulls it or else breaks off the end and throws the drill out of the centers. A useful cutter for making these drills is shown below. It is simply a steel bar turned up and bored out the size of the tit or pin on the drill, and has teeth cut all round the circumference as shown below. The pin of the drill being slipped in



the hole in this cutter, the radiating teeth cut away the central portions so difficult to remove in the lathe. The drill may revolve in the steady rest, or the barrel cutter may be so used and the work screwed up to it by inserting the center in the dead center of the lathe; by employing this tool much time may be saved and better work done.

A work might be specially devoted to this detail or part of the mechanic's tool-chest; the drill is one of the most indispensable of the minor instruments employed by mechanics and it is only reasonable to add that the tool most in use, simple though it be, deserves all the attention that can profitably be given to it.

Although the rose bit is not in any sense a drill, it is of the same class, and is indispensable to good work in the drilling machine, for if a man does not know how to grind a drill or make one, and the holes he makes are neither round, square, nor oval, then he has only to use the rose bit and he will have a perfectly round straight hole. This is the bit. It may



be made wholly of steel or the shank may be iron, and the cutting end only of steel. The end is composed of a series of fine cutters arranged regularly all around, and the body is a shade smaller at its upper end than at the lower. When the hole is drilled in the work to nearly the right size, the drill is taken out and replaced with this bit, which cuts regularly and steadily all around and corrects any untruth in the first hole. There should be but very little metal left for it to work on, and the job must be well oiled during the process. If these conditions are observed the hole will be a true cylinder.

Antidotes for Strychnia.

The *British Medical Journal* says "Professor R. Bellini, after conducting a long series of experiments on poisoning by strychnia and its salts, arrives at the opinion, that the best antidotes are tannic acid and tannin, chlorine and the tinctures of iodine and bromine. Chlorine, he maintains, attacks the strychnia even when it is diffused through the system, for he found that in rabbits poisoned with the sulphate of the alkaloid, on being made to inhale chlorine gas in quantity, such as was not sufficient in itself to kill, the convulsions were retarded, and were milder when they occurred; death, also, was less rapid. The author further observed, that when strychnia was exhibited with pyrogallic acid, the convulsion was retarded for the space of half an hour, by comparison with other experiments in which the alkaloid was given by itself. Professor Bellini believes that this arrest in symptoms is not dependant on the acid acting chemically on the strychnia, but only through the astringent effects produced by the acid on the mucous membrane of the stomach, whereby the absorption of the poison is rendered difficult. The same author, dwelling on the frog-test for strychnia, asserts that this test is not be trusted, inasmuch as other poisons produce the tetanic symptoms, although in a lesser degree."

SPECIAL NOTICE.

Lewis Moore, of Ypsilanti, Mich., has petitioned for the extension of a patent granted to him on July 2, 1850, for improvements in seeding apparatus of seed planters.

It is ordered that the said petition be heard at the Patent Office, Washington, on Monday, June 13, 1864.

All persons interested are required to appear and show cause why said petition should not be granted. Persons opposing the extension are required to file their testimony in writing, at least twenty days before the day of hearing.

Business done in the Patent Office.—From a report communicated by the Commissioner of Patents to Congress, it appears more business has been transacted than during any year in the history of the Government, excepting 1859 and 1860; 6,014 applicants have been received; 4,170 patents have been granted; 787 caveats have been filed; 40 applications made for extensions have been granted. Of the issues, 48 were to English inventors, 37 to French, and 27 to persons of other nations. The funds on hand January, 1863, were $38,400; the amount received during the year, $195,600; expenses, $189,400, of which $143,000 were for clerk hire. Balance on hand January last, $44,600.