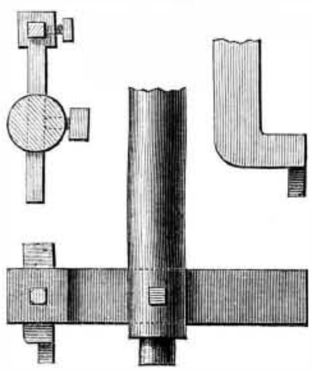
and fan or resistance shaft. The Commission are under the belief that they will be able to determine with sufficient accuracy the actual power to drive the fan shaft, without any fans on it, and the power to drive one or more fans, up to twenty, and that they will therefore be able, not only to determine 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.

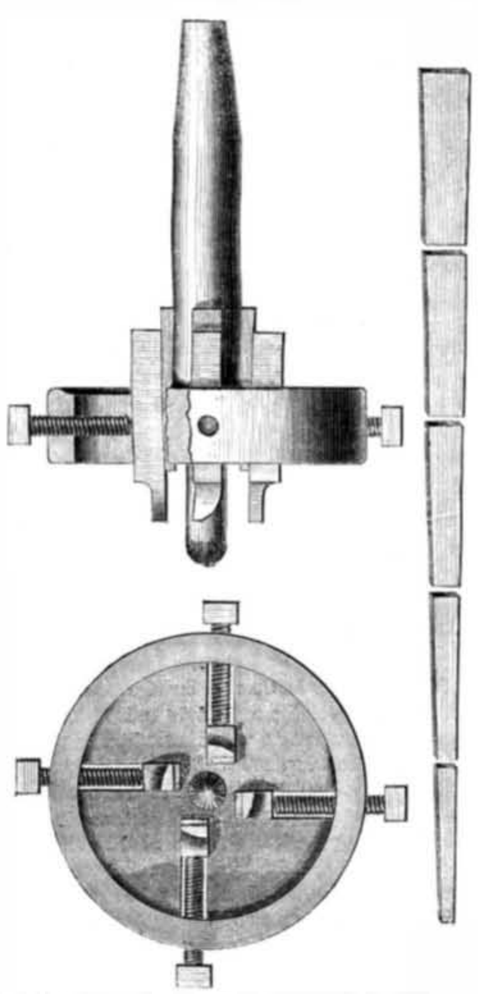
THE DRILL AND ITS OFFICE.

[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

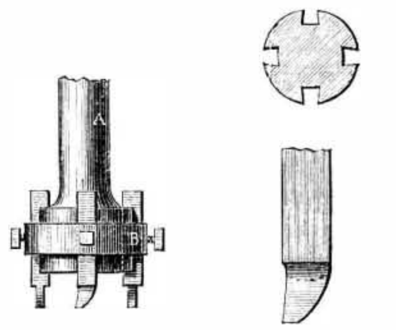


he rod or shaft that carries the arm can be made. The advantages of this appliance over an ordinary drill, such as is frequently used, are that the cutter, which breaks often even with the utmost care, can be



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 Winters, 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.

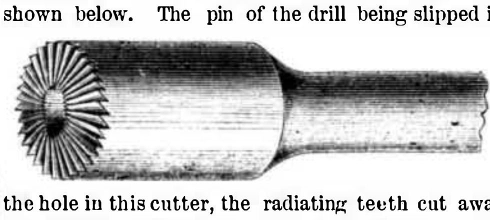
Here is another plan for a boring tool or tube sheet-



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-

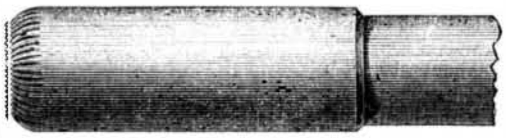
ficient tool when well made. It is costly to construct, however, and requires to be turned in the lathe by an experienced workman and afterwards filed up so as to cut properly. The spaces between the pin and the cutters are very troublesome to cut out in the lathe with an ordinary tool, as the work in 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.

of the places struck. The plates were of undoubted excellence both in the quality of the metal and in their manufacture. Messrs. Brown's plate was then selected for firing against, with improved cast iron spherical (crucible) shot from the Elswick 100-pounder smooth-bore gun, (diameter of bore 9in. and weight 120 cwt. 2qrs.,) with a charge of 25lbs. of powder. Three shots were fired. No. 1 struck the lower edge and touched a bolt. It produced an indent of 4in. at its greatest depth, with a diameter of 9½in., and with only a surface crack round the indent. No. 2 struck just over the lower edge, producing an indent of 10in. in diameter and a greatest depth of 3 8-10in. with a slight surface crack in the indent. Both these shots were destroyed in the ordinary manner of casting projectiles. No. 3 shot struck fairly on the plate, and part of it remained fastened in the plate's outer surface. It will be seen that the damage inflicted by these improved cast-iron shot was hardly commensurate with their increased weight and the extra 9lbs. of powder charge as compared with the 68-pounder gun. The Millwall plate had next three steel shot sent against it from the same Elswick gun, with a similar charge of 25lbs. of powder, the result being—No. 1 shot struck about 4in. below the upper edge of the plate, a distance away from any damaged part, and breaking right through, buried itself, and the broken parts of the plate in the ship's side 12in. beyond the plates inner surface. No. 2 shot struck the plate in a central and undamaged part, went clear through and buried itself with the broken fragments in the side of the ship, the outer surface of the shot being 3in. below the plate's outer surface. No. 3, the last shot, also struck the plate in a central and undamaged part, and about 2ft. aside of the last shot. It cuts its way in with 9½in. diameter, about one-third of the plate thickness, and then carried everything before it on the lower deck of the target ship. The shot in passing through the broken pieces of plate increased the diameter of the hole it made on entering the plate from 9½in. to 3ft. at the other end. It passed entirely through one side of the ship, and struck against the opposite side. The shot entering the plate by a hole 9½in. diameter passed into the ship by a hole 3ft. in diameter, tearing five planks away from the inside, and covering both sides of the deck for some distance round with broken pieces of wood and iron. One piece of plate, measuring 17in. by 14in. was picked up on the ship's deck, 15ft. from the side of the ship where it had entered with the shot. The shot itself was found on the opposite side of the ship's deck, and was but very little changed in form.

Estimating the Weight of Cattle by Measurement.

The *Canada Farmer* in reply to a correspondent, says :—

Many experiments have been made by graziers and salesmen to ascertain the net weight of cattle by measurement, and a number of rules and tables have been formed from the results obtained. None, however, can be regarded as absolutely correct. With the most accurate measuring is required a practical acquaintance with the points and forms of animals, and allowance must be made according to age, size, breed, mode and length of time of fattening, &c. ; conditions which require a practical eye and lengthened experience to correctly appreciate. We have found the following method to lead generally to trustworthy results :—

Measure carefully with a tape line from the top of the shoulder to where the tail is attached to the back; this will give the length. For the girth, measure immediately behind the shoulder and fore legs. Multiply half the girth by itself in feet, and the sum by the length in feet, and the product will give the nett weight in stones of 8 lbs. each. For example, with an ox or cow 5 feet in length and 7 feet in girth, the calculation will be as follows:—

Multiply half the girth by itself in feet	3.5
	3.5
	12.25
Multiply by the length in feet	5
Weight in stones	61.25

THE DRILL AND ITS OFFICE.

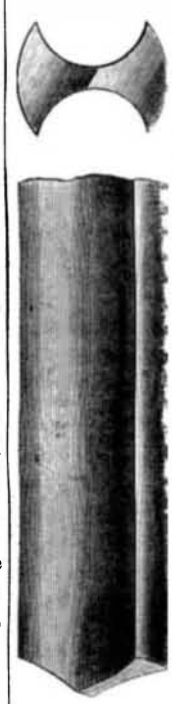
[Continued from page 213.]

In our last article on this subject we considered counter-borers or composite drills, and we will now allude to the same class on different plans.

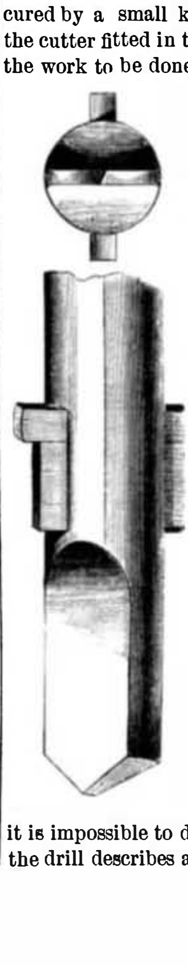
There is still another kind of drill for peculiar work which is employed by some machinists, though for our own part we see no special virtue in it, for it is troublesome to use and to make, and very liable to break. It is called the tit or center drill and here is an engraving of it.

The center marked out by the punch is of course the point where the tit is inserted on the work. This tit is the cause of all the trouble with the tool; it must be filed up in the vice, it tries the tool-dresser's patience to harden it, for the small quantity of metal in it compared to the heavier parts in proximity causes it to get hot in the fire more speedily and also to cool quicker, so that while the cutting edges are of the right temper the tit is soft or hard as the case may be; for all ordinary purposes the common flat drill is far superior.

Another kind of drill is illustrated below; it is a turned drill and will go, if it runs true in the machine, as straight as a die in the work. These two figures are side and end views; the tool is simply forged and then turned up in the lathe afterward, and it is much used for drilling holes in the tube sheets of surface condensers.

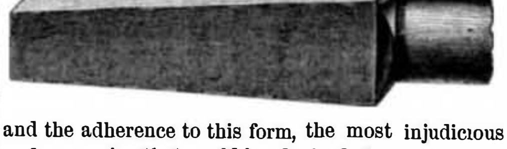


Composite drills are those made by combining cutters with drills in such a manner that while the hole is being drilled or just after the operation, it is also countersunk on top, or counterbored to a certain depth; and this without removing the drill from the hole, thus saving a great deal of time. When the tube sheets of surface condensers are drilled, such tools do good service, for the vast number of holes requires some such method to render it economical as well as to expedite the job. The plans for a drill capable of being used for such work are given below. The drill is simply a turned steel bar flattened on the end for but a short distance; as the plate to be drilled is not thick it does not require to be long but should be made as short as possible. There is a key-way or slot, in the shank in which the cutters are set, and secured by a small key at the back. The shape of the cutter fitted in the key-way, of course varies with the work to be done, and the corners may be rounded off to make a round-bottomed hole, or made to conform to any pattern desired, and the key may be made short so that the cutter can go clear through.

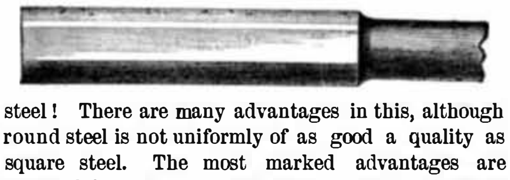


Drills of this kind are also extremely useful for counter-boring in lathes; a dog may be slipped over the round shank and screwed up while the center in the drill shank is received by the dead center of the lathe. It is much more economical to use a tool of this kind where the circumstances admit of it, than to bother with boring tools of the usual pattern. It is in the minor details of this kind that workshop economy may be practiced to advantage, and there is nothing that calls more for the exercise of ingenuity than the simple matter of drilling holes speedily and accurately. In every instance it must be borne in mind that it is of the utmost consequence that the drill should run *true* on its end. Without this the finest temper and the best shape are of no value, and it is impossible to do good work where the point of the drill describes a circle of greater or less diameter.

From specific designs of drills let us depart at present and turn our attention to the other end of the same tool, where we shall find something worthy of attention. We might fill page after page with drills of peculiar shapes; those with and without lips, those with lips or cutting edges curved so that a section would be like this, ∞ ; others with round corners, &c., but as the main principles of drills have already been given it is not necessary that we should follow out every design, as it would interfere with more important matters. Let us look at the drill shank. It is a common and a favorite expression with many that the minor trials of life cause more sharp annoyance and vexation than severe visitations. Be this as it may, it is very certain that the simple matter of the formation of the drill shank has caused more profanity, delay, and actual pecuniary loss than any similar part of any other tool. The shank is in general made square and taper as in this engraving,



and the adherence to this form, the most injudicious and expensive that could be devised, is remarkable. Drilling machines upon new plans are made every day, and are fitted with some ingenious device for expediting the work, but for some inexplicable reason the spindle is squared out, duly tapered, and with—the hight of absurdity—a set screw in addition. It is among the impossibilities of mechanical practice that a square-shanked drill should ever run true by any possibility except one involving great expenditure of time and consequently money. It must be acknowledged by every unprejudiced person that the true shape for a drill shank is round and parallel, not tapered like a lathe center. With this form the drill in all cases will run much truer than with any other shape; not only is this assertion correct, but the labor or cost of making the drill shank in this form is not to be mentioned with a square or taper one. The round hole in the spindle of the machine is capable of being wholly finished in the lathe, so that when it leaves that tool it is completed and does not require to be chipped out or even filed. Squaring the hole makes it untrue with the center of the spindle, even when great care is used, and the drills themselves have to be forged exactly alike or else they will not fit. In a shop where there are thirty or forty drilling machines and a thousand drills there are scarcely any two alike, and when a square-shanked drill is put into a squared spindle, the point describes a circle of no small magnitude. Then comes the corrector of this evil—bang goes the hammer—the drill falls out, and a piece of emery cloth is wrapped about it because it is rough and holds better; the tool is replaced and the same process goes on again and again, sometimes varied by breaking the drill short off at the shank, at others only succeeding after much time and trouble in making the drill run true. Each time it is dressed the drill is altered so that it is no exaggeration to say that it never runs twice alike. The set screw is a nuisance, it is of no use at all; when set up to its place it strikes one-sided, and instead of securing the drill actually pushes it out. How easy it would be to avoid all this complexity by making the shank in this form, or forging the drill of round



steel! There are many advantages in this, although round steel is not uniformly of as good a quality as square steel. The most marked advantages are lessened first cost of construction, greater efficiency of the tool itself and less time expended in straightening and setting the drill; a standard size for all drills so that each one will fit every machine in the shop, and less work in making the drill machine itself. The taper round shank drill is not so good for these reasons: It costs more than either of the others, it is troublesome to get out of the machine, for a key has to be driven in at the end, which often gets lost. The hammer is used to loosen the drill by men too lazy to take the key when it is not lost; the taper gets bruised by the blacksmith in dressing the drill; when the drill has to be upset, as it does at times, the