and fixed by means of a bandage; catgut was used to tie any vessels requiring ligature. In those cases where the edges of the wound could not be accurately brought together, Dr. Bose put in catgut sutures, and then filled the spaces between the edges with the salicylic solution by means of a small syringe, and applied the wadding over all. The greater number of the cases thus treated healed by first intention, without the formation of a drop of pus.

Dr. Bose concludes his paper by stating that he has as yet no experience of the value of the boro-salicylic acid solution in dressing large wounds, and that he has not found it invariably successful in the case of small ones.—*Medical Times and Gazette.*

Correspondence.

Death by Strychnin.

To the Editor of the Scientific American:

On Saturday, July 24, Dr. J. O. Hill, of Ithaca, New York, in a hurry togo out, took thoughtlessly a drink of water from a graduated glass, in which he had previously dissolved some strychnin. He walked a quarter of a mile, and then felt dizzy, and this and an exhausted feeling seem to have been the first effects of the poison. These increased, and they seem to have enfeebled his mind somewhat, but not seriously. At the end of about a half mile walk, his lower extremities had become so affected that he could not move. It is not know what the exact form of this action of the poison was; but as seen by me a few moments later, it is probable that it was possibly numbness, and certainly spasm of the extremities, with quivering of the muscles on every attempt to use them; with congestion, or its opposite, anemia, of the brain, such as a ghastly pale face would show. In 5 or 8 minutes later, I saw him. His condition was that of constant spasms of the lower limbs, with occasional spasms of the arms; and in every half minute or minute, a spasmodic convulsion of the greater part of the involuntary muscles would take place. His mind was clear when no convulsions were on; but it was affected, but not suspended, during the convulsions. A death-like paleness preceded each general convulsion, with a stoppage of the pulse at the wrist, which soon took definite shape. In the brief intervals between the spasms or convulsions, he was able to speak, and to describe his case accurately. His vision was clear. He was cool and accurate in verbal expressions, but had that excitement that underlies danger. Being of a hopeful and mirthful turn of mind, he at this moment had no fear of death; for he wished still to take the railroad train, and said: "I shall be over this soon." If I am correct, and I think I am, his case shows that, beginning with a serious impression on the brain, the poison begins its fatal action on the extremities, the hands and feet, and by degrees proceeds up the extremities of the body to the trunk. When he spoke to me, this had reached the hips, pelvis, and shoulders, as was evidenced by his pointing to these parts and saying: "I am sick; it is cramps here," that is, on the circumference of bowels and ribs, and in the hips and shoulders. A few minutes later, he evidently felt that the poison was invading the involuntary muscles of the heart and lungs, as a sorrowful and alarmed expression evidently showed. A convulsion came on, and was followed by his clear statement: "What I fear is that a clonic spasm of the heart and lungs will take place, and I shall go, go soon in it." And after the next general convulsion, he said: "Doctor, you know what I fear," meaning the clonic spasm of heart and lungs.

Next the tetanic or clonic spasm was evidenced by his saying: "My jaws are becoming locked." The word "clonic," used by the dying doctor, means an irregular spasm. It is also used, probably without authority, as he used it, for violent closing or locking spasm, suddenly coming on. Very soon after, he was unable to swallow camphor and water I offered to him, and the teeth were locked as in tetanus, though not so rigidly. Then follow the fifth and sixth general spasm or violent convulsion within twelve to fifteen minutes, during the brief intervals of which he spoke: "I am gone," "it is over," "raise me up," "lift me up," and he turned purple or livid in the face; the clonic or closing tetanic spasm of the heart and lungs took place, and he who, forty-five moments before, had taken, into an empty stomach, a drink of water with the poison in it, was dead.

The action of the poison was, as I have said, first on the brain and voluntary muscles, then on the ganglia of the voluntary muscles; and it ended in death as soon as the involuntary muscles of breathing became involved, the breast being the last involuntary muscular organ that stopped. The spasms evidently were very painful, but not remarkably so. His mind was clear, so much so that he saw and spoke of what was best to do, and what was being done for and about him. Had not the celerity and the certainty of the progress of the poison been known (being absorbed by one in violent exercise, in water or solution, on an empty stomach), we might have well thought that such a self-possessed, strong, well reasoning, and conscious man was not at the gate of death.

Thinking that these facts are of interest to the medical profession, I have sent them to you.

S. J. PARKER, M.D.

Weighted Silks.

To the Editor of the Scientific American:

I noticed in your issue of July 10, an article headed "Weighted Silks." It states that the increase is by means of salts of iron and astringents, and salts of tin and cyanide; and that it cannot be too widely known that, by this adulteration, silk is rendered very inflammable, and, under certain circumstances, spontaneously so. I admit that silk in the process of dyeing, and where heavily weighted, receives all of the material named. Iron is the base; cyanide of potassium forms with the iron Prussian blue, giving the blue ground; it is then given a bath of tannin, which is precipitated with tin salts, fixing the tan insolubly on the silk. The result of all this is: Silk being, like hide, an animal gelatin, having an affinity for tan, becomes leather, and is about as inflammable.

I enclose a skein of black silk; one half of the weight is silk, the other half iron, cyanide, tin salts, and astringents, used as I have named. It is true the weighting of silks is carried to the extent of ruining the fabric. Although the goods thus weighted appear firm and solid, they will not wear. This weighing process adds bulk, so that the weighted silk will make two yards, where the unweighted would only make one. The silks will not last like those our mothers wore; to redye them is out of the question; but they have a decent appearance for a time, and I think no lady need fear spontaneous combustion.

A SILK DYER.

Pittsfield, Mass.

The Recent Wet Weather.

To the Editor of the Scientific American:

Among the many probable causes to which the exceptionable weather of this year is attributed, there is one which I have not yet seen mentioned in print, and which appears to be worthy of consideration. Advices from Europe tell us that, over a very large area of the north of that continent, quantities of ashes have fallen, having been wafted on the the winds from the Iceland volcanoes. This does not take into account the quantity which must have fallen unobserved on the intervening seas. To lift this immense mass of material to so great a hight requires an immense force, and an amount of the gaseous products of combustion terrible to think of. The question it would present to the meteorologist is: What effect would be produced on the atmosphere by this body of gas? Or if, as seems reasonable, there is an atmosphere of hydrogen above our atmosphere of combined oxygen and nitrogen, what would be the effect on it, and the resulting effect on the lower atmosphere?

Many years ago, Professor Epsy claimed that the atmospheric disturbances caused by large fires produced rains; but so far as I know, he did not assign a reason. If fire is wanted to bring rain, here is an amount of fire and heat to which the heat of the fires of Chicago and Boston combined would be nothing, and an amount of matter raised high into the air that would make many such cities.

Louisville, Ky. N. B. G.

Useful Recipes for the Shop, the Household, and the Farm.

The best remedy for currant and gooseberry worms is powdered white hellebore, obtainable at any druggist's. Put the powder in a common tin cup, tying a piece of very fine muslin over the mouth. Fasten the apparatus to the end of a short stick, and dust the powder through the muslin lightly upon the bushes. Do not work on a windy day, and stand to windward during the operation, as, if taken into the nostrils, the hellebore excites violent sneezing. The same material is a good remedy for cucumber beetles.

Sawdust can be converted into a liquid wood, and afterwards into a solid, flexible, and almost indestructible mass, which, when incorporated with animal matter, rolled, and dried, can be used for the most delicate impressions, as well as for the formation of solid and durable articles, in the following manner: Immerse the dust of any kind of wood in diluted sulphuric acid, sufficiently strong to affect the fibers, for some days; the finer parts are then passed through a sieve, well stirred, and allowed to settle. Drain the liquid from the sediment, and mix the latter with a proportionate quantity of animal offal, similar to that used for glue. Roll the mass, pack it in molds, and allow it to dry.

The following table for boiling fruit in cans will doubtless prove useful, as the present is the time for putting up such preserves for winter. The first figure after the name of the fruit refers to time of boiling in minutes, the second to ounces of sugar to the quart: Cherries, 5, 6; raspberries, 6, 4; blackberries, 6, 6; gooseberries, 8, 8; currants, 6, 8; grapes, 10, 8; plums, 10, 8; peaches (whole), 15, 4; peaches (halves), 8, 4; pears (whole), 30, 8; crab apples, 25, 8; quinces (sliced), 15, 10; tomatoes, 30, none; beans and peas, three to four hours.

The following soluble glass is best adapted for coating brick and stone: Dry carbonate of potassium, 10 parts; powdered quartz, 15 parts; charcoal, 1 part. Sand, free from alumina and iron, may replace the quartz. Fuse together and dissolve in boiling water of 5 or 6 times the weight. Filter.

Handsome ornaments can be made by mounting fern leaves on glass. The leaves must first be dyed or colored. They are then arranged on the mirror according to fancy. A butterfly or two may be added. Then a sheet of clear glass of the same size is placed on top, and the two sheets secured together at the edges and placed in a frame.

Photography of Children.

W. A. Nicholas, Australia, says; As nearly all children are photographed in white dresses, and the faces are a great deal tanned through exposure to the sun, I have found a useful help in a simple wax match. If I have been unable to get full exposure through the restlessness of the little sitter in dull weather, by lighting a match and holding it just under the face only, so as to make that part of the plate hot during development, it is astonishing the increase of detail I get. There is no danger of the plate cracking through uneven expansion.

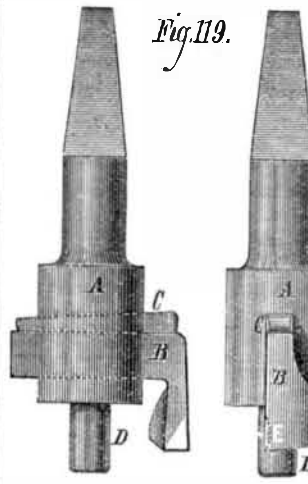
PRACTICAL MECHANISM.

BY JOSHUA ROSE.

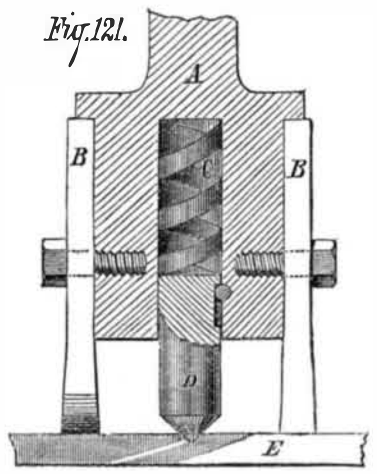
NUMBER XXX.

CUTTERS.

Cutters are steel bits, usually held in either a stock or bar, being fitted and keyed to the same; by this means, cutters of various shapes and sizes may be made to fit one stock or bar, thus obviating the necessity of having a multiplicity of these tools. Of cutter stocks, which are usually employed to cut out holes of comparatively large diameter, as in the case of tube plates for boilers, there are two kinds, the simplest and easiest to be made being that shown in Fig. 119.



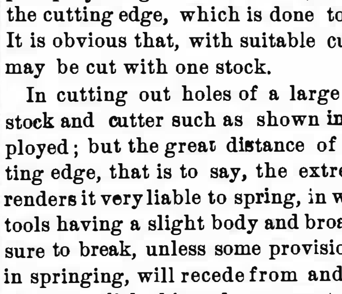
A is the stock, through which runs a slot or keyway into which the cutter, B, fits, being locked by the key, C. D is a pin to steady the tool while it is in operation. Holes of the size of the pin, D, are first drilled in the work, into which the pin fits. To obviate the necessity of drilling these holes, some modern drill stocks have, in place of the pin, D, a conical-ended pin which acts as a center, and which fits into a center punch mark made in the center of the hole to be cut in the work. Most of these devices are patented, and the principle upon which



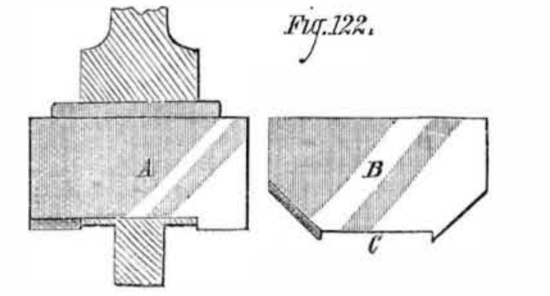
they act will be understood from Fig. 121, A being the stock to which the cutters, B B, are bolted with one or more screws. C is a spiral spring working in a hole in the stock to receive it. Into the outer end of this hole fits, at a working fit, the center, D, which is prevented from being forced out (from the pressure of the spring, C) by the pin working in the recess, as shown. E is the plate to be cut out, from which it will be observed that the center, D, is forced into the center punch mark in the plate by the spring, C, and thus serves as a guide to steady the cutters and cause them to revolve in a true circle, so that the necessity of first drilling a hole, as requirred in the employment of the form of stock shown in Fig. 119, is obviated. The cutters are broadest at the cutting end, which is necessary to give the point clearance in the groove. They are also, at the taper part (that is to say, the part projecting below the stock), made thinner behind than at the cutting edge, which is done to give the sides clearance. It is obvious that, with suitable cutters, various sized holes may be cut with one stock.

In cutting out holes of a large diameter in sheet iron, a stock and cutter such as shown in Fig. 120 is generally employed; but the great distance of the cutting from the cutting edge, that is to say, the extreme length of the cutter, renders it very liable to spring, in which case these, and other tools having a slight body and broad cutting edge, are almost sure to break, unless some provision is made so that the tool, in springing, will recede from and not advance into the cut. To accomplish this end, we must shape the cutter as shown in Fig. 120, which will, at the very least, double the efficiency of the tool.

In Fig. 120 the cutting edge, B, stands in the rear of the line, A, or fulcrum from which the springing takes place; hence, when the tool springs, it will recede from the work, C. To avoid springing and for very large holes, the cutter may be a short tool, held by a stout crossbar carried by the stock; but in any event the cutter should be made as shown above.



Cutters of a standard size, and intended to fit the pin stock, shown in Fig. 119, should be recessed as shown in Fig., 122; A being a facing or recessing cutter, shown in the stock, and B a countersink cutter out of the stock, the recess being shown at C. In making these cutters they should be first fitted to the stock, and then turned up in the lathe, using the stock as a mandrel, the ends being then backed off to form the cutting edges. Those slight in substance should be tempered to a light straw at the cutting edge, and left softer at the back part. Those above five



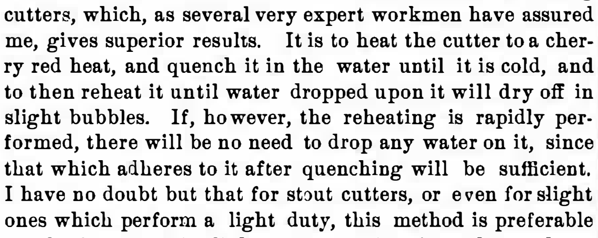
sixteenths of an inch in thickness may be hardened right out, and not tempered at all.

Here it may be as well to describe a process for tempering cutters, which, as several very expert workmen have assured me, gives superior results. It is to heat the cutter to a cherry red heat, and quench it in the water until it is cold, and to then reheat it until water dropped upon it will dry off in slight bubbles. If, however, the reheating is rapidly performed, there will be no need to drop any water on it, since that which adheres to it after quenching will be sufficient. I have no doubt but that for stout cutters, or even for slight ones which perform a light duty, this method is preferable to all others: but for light cutters performing a heavy duty, I should judge that it would leave them too hard for their strength, and therefore liable to break.

Cutters for boring bars should be, if intended to be of standard size, recessed to fit the bar, as shown in Fig. 122, the bar having a flat place filed around and beyond the edges of the hole, to form a broader bearing for the cutter to fit upon. But if the cutter is intended to vary the size of hole, it must be left plain, so that it may be moved inwards or outwards to accommodate the size of bore required. All cutters and bits should be used at a cutting speed of about 15 feet per minute, and with oil or soapy water for work in wrought iron or steel; and for use on those metals, the cutters, etc., may be given a little front rake by grinding away the metal of the front face, as shown by the dotted line in Fig. 119, at E.

REAMERS.

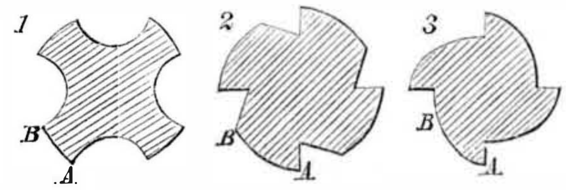
Reamers are cutting tools usually employed to finish holes requiring to be very true and smooth, and may be employed in a machine or lathe, or by hand. As reamers are generally of a standard size, but little metal should be left to be cut out by the reamer, so that they will not, from excessive duty, become rapidly worn and hence reduced in size. Fig. 123 represents reamers for hand use, No. 1 being a taper reamer to be introduced first, and No. 2 a finishing one to make the hole parallel. It is obvious that the taper one, by



entering the hole a part of its length before its diameter becomes large enough to perform any cutting duty, is steadied during the operation. To steady the finishing reamer, it is usually made slightly taper at its cutting end for a length about equal to its diameter. To illustrate the indispensability of this tool, we will take the case of fitting an eccentric rod double eye to a link or quadrant. The faces of the latter are planed, and the hole is bored as true and parallel as possible. The double eye may be planed, milled, or slotted, and the holes in the eyes are bored as true as it is practicable to get them; nevertheless, when the double eye is fitted to the quadrant, it will be found that the holes in the eye and that through the quadrant are not true one with the other. Theory would say that they must come true, but practice proves that they never do; hence they are fitted together, and the reamer is applied to true them out and make them parallel. The reason for this want of truth is this: If the holes in the double eye are bored before the inside faces are cut out, the latter operation varies the form of the whole double eye, in consequence of freeing the tension which always exists on the outer surface of either forgings or castings, as has already been explained in former remarks. If, on the other hand the faces of the double eye are turned out first, then boring the hole will have the same effect; hence the use of the reamer cannot be dispensed with for holes requiring to be practically true.

Reamers should be made as follows: Forge them of the very best steel, and to within one sixteenth inch of the finished size; then turn them up, taking care to properly centerdrill and square the ends, and to rough them out all over before finishing any one part, bearing in mind that the diameter is sure to be a trifle increased by the process of hardening. Then cut out the flutes in a milling machine; the number of flutes should increase with the diameter of the reamer, but a good proportion is five flutes to a reamer of an inch diameter. Let the flutes be deep and roomy, so as to allow the cuttings free egress and the oil freeingress. An odd number of flutes is better than an even one, since they render the reamer less likely to follow any variation from roundness in the hole. Nor need the flutes be the same distance apart, a slight variation tending to steady the reamer when in operation. The form of flute is not arbitrary; Fig. 124*a* shows, however, the forms usually employed, either of

Fig. 124*a*.



which will answer excellently for hand reamers, the only difference being that No. 2 is rather more difficult to sharpen (without softening it) on an emery wheel, while No. 1 is the most difficult to sharpen when it is softened, in consequence of the file being liable to slip out of the grooveand take off the cutting edge.

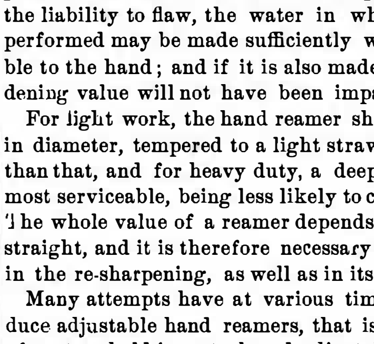
After the flutes are cut, the rake is given to the cutting edges by easing off or filing away the metal behind the cutting edges, A, towards the point, B; but this should be done by drawfiling to a very slight degree near the cutting edges, otherwise the reamer will be liable to wabble when cutting. In forms 1 and 2, the amount of the rake at the point, B, need not be more than the thickness of a piece of thin writing paper; but in No. 3, while near the cutting edge it may be very slight indeed, it must at the point, B, be considerable; hence (save for rough work requiring an excess of cutting duty) form No. 3 is not so desirable as the others.

The best method of hardening such reamers, and in fact all others, is to heat them in molten lead, and to quench them endwise in water; because, when heated in lead, the outside will become sufficiently heated before the inside metal is red hot; and so, when the tool is quenched, the inside or central metal will remain sufficiently soft to permit of the tool being straightened should it warp in the hardening. The straightening should be performed by slightly warming the reamer and laying it upon a block of lead with the rounded side upwards; then place a rod of copper or brass in the uppermost flute, and strike the copper with a hammer. The use of the copper is to prevent damage to the tool by the hammer. The object of dipping the tool endwise is to prevent the reamer from warping in hardening. If great care is not taken in the hardening process, reamers and all tools having grooves or flutes in them are very apt to crack along the bottom of the flutes, which cracking is due to the unequal contraction of the metal in being rapidly cooled by quenching. Those having deep flutes, or sharp corners at the bottoms of the flutes, are the most liable to flaw in hardening, so that, in this respect, the flute shown in No. 1 is far preferable. To obviate the liability to flaw, the water in which the quenching is performed may be made sufficiently warm to be just bearable to the hand; and if it is also made a little saline, its hardening value will not have been impaired by the warming.

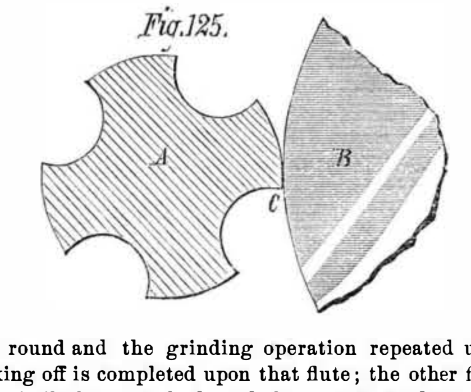
For light work, the hand reamer should be, if above ¾ inch in diameter, tempered to a light straw color. For sizes less than that, and for heavy duty, a deep brown will prove the most serviceable, being less likely to cause the tool to break. The whole value of a reamer depends upon its being true or straight, and it is therefore necessary to exercise great care in the re-sharpening, as well as in its manufacture.

Many attempts have at various times been made to produce adjustable hand reamers, that is to say, those formed of cutters held in a stock and adjustable as to diameter, the object being to make one reamer serve for several sizes of holes, and to render the manufacture less expensive by having to simply remove the cutters to grind them when dull, and to renew them when worn out. The difficulties in the way of producing such a tool are that, in the smaller sizes, there is not sufficient strength to permit of their being made in pieces, and that, in requiring to set the diameter of the tool, a slight deviation as to size is very apt to occur. They are also liable to wear out of truth.

The best and truest method of making long fluted reamers is the one instituted in the Grant Locomotive Works, of Paterson, N. J. It consists in turning the reamer from one sixty-fourth to one thirty-second inch too large in diameter; then, after cutting out the flutes and hardening, the straightening and backing off is performed as follows: Upon the top of the slide rest, in the position usually occupied by the tool post or clamp, there is fastened a small head carrying an emery wheel of say eight inches diameter, upon a spindle having a small pulley attached, speeded to run about 2,000 revolutions per minute. An overhead countershaft is provided to drive the same, the appearance of the device being as in Fig. 124. The belt is arranged to drive the emery wheel in a direction opposite to that in which the lathe runs.



A is the emery wheel, B the head carrying the spindle, and C the pulley, D being a lug to bolt the appliance to the top of the slide rest of the lathe. The reamer is, after being hardened, driven in the lathe at a fast speed; the revolving emery wheel is then brought into contact with it and traversed along the length, thus serving as a cutting tool to true the reamer to a dead true and, by proper adjustment, to the requisite diameter. The backing off is performed thus: The lathe is stopped in such a position that the emery wheel will make contact with the reamer just behind the cutting edge, as shown in Fig. 125, A being a section of the reamer, and B a section of the emery wheel, C being a cutting edge of the reamer. The position being adjusted, the lathe is locked, so that it cannot move, by locking the back gear or in any other convenient manner. The revolving emery wheel is then brought into contact with the reamer, and traversed from end to end of its length of flute, thus performing the backing off, the reamer being turned a little further round and the grinding operation repeated until the backing off is completed upon that flute; the other flutes are then similarly treated, the whole process producing a true and sharp reamer, unequaled by any other method of manufacture. It is obvious that, by adjustment of the back head of the lathe, any desired degree of taper may be given to the reamer. The journals of the hardened spindles for lathes may be, and in fact are, in many cases, made true and round by the application of the same device.



Professor Winlock.

Joseph Winlock was born February 6, 1826, in Shelby county, Kentucky. Graduating in 1845, at Shelby College, he afterwards held the professorship of mathematics and astronomy in that institution until 1852. The remainder of his life was passed chiefly at Cambridge, Mass.; but he spent some months at the United States Naval Observatory at Washington, and for more than a year was at the head of the mathematical department of the United States Naval Academy at Annapolis. He was twice made superintendent of the *American Ephemeris*, finally quitting this office in 1866 to take the post of Phillips Professor of Astronomy at Harvard University, and in that capacity to serve as Director of the Observatory. He held this office at the time of his death, June 11, 1875. His last illness was short, and did not appear dangerous until a few hours before its termination.

Professor Winlock was an excellent mathematician and astronomer, and had a remarkably retentive memory, not only for facts relating to his branch of science, but for the sources of information concerning those facts. The originality of of his mind, however, was chiefly shown in his suggestions for the improvement of astronomical instruments. These inventions were singularly simple and effective. Four among them deserve special notice in this place.

(1) The mounting of large meridian circles in such a manner as to allow the piers to be shortened, so that the graduated circles are wholly above the piers, and the steadiness of the whole instrument is increased. The theoretical advantage of this arrangement cannot here be discussed; it has been tested by five years' experience at Harvard College Observatory with very gratifying results; it has been adopted in other observatories, and will probably come into general use.

(2) The application of a diagonal eyepiece, moved by a rack and pinion, to any large telescope, in such a manner as to dispense with the customary finder, and to enable the principal object glass to be used in finding faint objects which are to be examined with the spectroscope or otherwise. This invention has also been for some years in use in Harvard College Observatory.

(3) A method of registering spectroscopic observations by marking lines upon a silver plate without requiring the removal of the eye from the spectroscope, or the use of artificial light. Professor Winlock registered in this manner his observations of the solar eclipse of December, 1870, which he observed in Spain.

(4) The use of a lens of long focus and of a plane mirror in making photographs of the sun. Apparatus of this kind was brought into daily use in July, 1870, at Harvard College Observatory. Priority in this invention is claimed by some other astronomers; but it does not appear that any one actually used the combination of the mirror with the lens of long focus until some years after Professor Winlock. It should also be noticed that in 1869 Professor Winlock first photographed the solar corona without enlarging the image by an eyepiece.

During his connection with the Observatory, Professor Winlock greatly increased its instrumental equipment, and also its pecuniary resources, by the aid of contributions from neighboring friends of Science. In particular, the system adopted for furnishing electric signals from one of the clocks at the Observatory, to various points in Boston and elsewhere, has been profitable alike to the Observatory and to the public. It illustrates Professor Winlock's practical good sense, that, instead of introducing new clocks, controlled by that at the Observatory, at the places where the signals are received, he provided simple telegraphic apparatus for the reception of the signals every two seconds: a method much cheaper than the other, and in practice equally satisfactory.

In private life, Professor Winlock's amiable though reserved character greatly endeared him to his friends.—*A. S., in the American Journal of Science and Arts.*