Correspondence.

Dividing Circles.

To the Editor of the Scientific American:

As there are very uncommon and odd numbers of teeth in some of the wheels of astronomical clocks, which cannot be cut by any common engine, it may be proper to show how to divide the circumference of a circle into any given odd or even number of equal parts, so that the number may be laid down upon the dividing plate of a cutting engine.

There is no odd number but from which, if a certain number be subtracted, there will remain an even number, easy to be subdivided. Thus, supposing the given number of equal divisions on the circle to be divided to be 69, subtract 9 and there will remain 60. Every circle contains 360°; therefore, as the given number of parts in the circle, which is 69, is to 360°, so are 9 parts to the corresponding arc of the circle that will contain them; which arc, by the rule of three, will be found to be 46·95°. Therefore, by the line of chords on a common scale, or rather on a sector, set off 46·95° with your compass, in the periphery of the circle, and divide that arc or portion of the circle into 9 equal parts, and the rest of the circle into 60; and the whole will be divided into 69 equal parts as required. Again, suppose it is required to divide the circumference of a circle into 83 equal parts; subtract 3 and 80 will remain. Then as 83 parts are to 360°, so, by the rule of proportion, are 3 parts to 13·01°; the small fraction may be neglected. Therefore, by the line of chords, with compasses, set off 13° in the periphery of the circle, and divide that portion or arc into 3 equal parts, and the rest of the circle into 80. Once more: Suppose it is required to divide a given circle into 365 equal parts; subtract 5 and 360 will remain. Then, as 365 are to 360°, so are 5 parts to 4·93°. Therefore set off 4·93° in the circle, divide that space into 5 equal parts and the rest of the circle into 360, and the whole will be divided into 365 equal parts, as was required.

I have often found this rule very useful in dividing circles into an odd number of equal parts, or wheels into odd numbers of equal sized teeth with equal spaces between them; and now I find it just as easy to divide any given circle into any odd number of equal parts as to divide into any even number. And, for this purpose, I prefer a line of chords on a sector to that on a plain scale; because the sector may be opened so as to make the radius of the line of chords upon it equal to the radius of the given circle, unless the radius of the circle extends the whole length of the sector, when it is opened so as to resemble a straight ruler, or scale, and this is what very seldom happens. Any person who is used to handle the compasses and the scale or sector may very easily, by a little practice, take off degrees and fractional parts of a degree by his eye, from a line of chords, nearly enough to the truth for the abovementioned purpose. CAMBRIDGE.

The Legal Horse Power of Steam Boilers.

To the Editor of the Scientific American:

In your article on "Power of Steam Boilers," page 225 of your current volume, you seem to doubt the legality of my formula for horse power of steam boilers, and say that "it is certainly not legalized."

The unit of horse power was established by James Watt, and has since been legalized all over the civilized world, differing only slightly in different countries to accommodate different units of weight and measure; it is 33,000 minute foot pounds, which is the same as 550 second foot pounds. My formula is based upon this unit, and is therefore legalized; but being transformed into power of evaporation, you do not recognize it to be the same as Watt's rule.

The power of the same volume of steam measured in the ordinary way through a steam engine will give precisely the same result as that by my formula, which has been tested on different boilers and engines by different engineers. The legalization of Watt's rule makes my formula legal, and the same rule can be expressed by a great variety of formulas. The English custom of referring equivalent evaporation from and at 212° has caused much confusion and discordance in steam engineering; but on the continent of Europe, the evaporation is referred to the temperature 32° Fah., and my conviction is that the latter is the proper point of reference.

Philadelphia, Pa. JOHN W. NYSTROM.

[We are still of opinion that no legal status has yet been given to Mr. Nystrom's formula for translating foot pounds into evaporation of water.—EDS.]

The Wisconsin Steam Wagon Reward.

To the Editor of the Scientific American:

The Wisconsin $10,000 reward for a steam wagon is, I think, more likely to ruin many over sanguine inventors and mechanics than give them a fortune. To overcome all the obstacles mentioned is a mechanical impossibility.

I have had considerable experience with road wagons, and have tried and seen many very ingenious combinations, but they have all proved failures except as amusing toys. All builders of road wagons that I have seen say that they had no idea of the immense power it took to run them; and obstructions like loose sand or mud make them nearly helpless, to say nothing of steep hills, stones, etc. Another great drawback is the great weight of fuel and water necessary to carry. My carriage, the total weight of which was only 550 lbs., would use up 40 to 50 lbs. of water per mile. Therefore I think that a locomotive, complying with that Wisconsin law and running in ruts half way up to the hub, over stumps and stones and up steep sand hills, and averaging 5 miles per hour for 200 miles, trusting to luck in getting fuel and water, would have a sweet time of it. The idea is simply preposterous. H. S. TAYLOR.

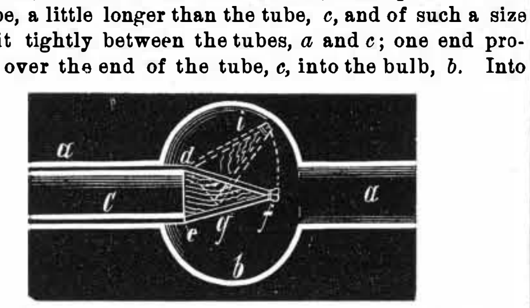
Derby Line, Vt.

Valve for Laboratory Use.

To the Editor of the Scientific American:

I herewith send you a drawing of a valve which is not, I believe, new, but is not well known, although it is very useful in the laboratory, and might be of service to some of your readers.

a is a glass tube with a bulb, *b*, blown in it; *c* is a short glass tube, smaller in diameter than *a*; *d* is a piece of rubber tube, a little longer than the tube, *c*, and of such a size as to fit tightly between the tubes, *a* and *c*; one end protrudes over the end of the tube, *c*, into the bulb, *b*. Into



this end of the rubber tube a small cone-shaped piece of wood, *g*, is slipped, with its base tight against the end of the tube, *c*; the end of the rubber tube is now drawn tightly over the piece of wood, *g*, and then tied at *f*. The rubber tube, *d*, is then cut almost off at *e*, the uncut portion serving as a hinge. The valve is shown open by the dotted lines at *i*. It will of course be understood that the rubber tube is to be drawn over the tube, *c*, the cone of wood put in the end, and the end tied and cut before it is put in the tube, *a*. When the foregoing operations are performed, the rubber tube, *d*, inclosing the tube, *c*, is run into *a*, until the end of *c* extends a short distance into the bulb, *b*.

Monticello, Pa. E. G. ACHESON.

New Rule for Calculating the Power of Steam Engines.

To the Editor of the Scientific American:

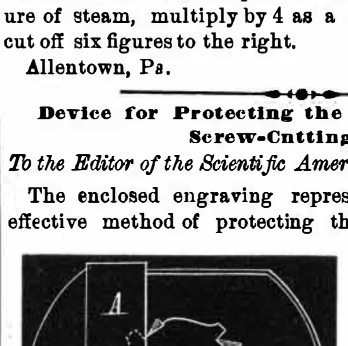
I have made a rule for calculating the horse power of steam engines, by which I get rid of nearly two thirds of the figures. It is as follows: Square the diameter of the cylinder, multiply by length of stroke in inches, multiply by the number of revolutions per minute, multiply by the pressure of steam, multiply by 4 as a permanent number, and cut off six figures to the right. DANIEL SHINE.

Allentown, Pa.

Device for Protecting the Finished Parts of Screw-Cutting Dies.

To the Editor of the Scientific American:

The enclosed engraving represents a very simple and effective method of protecting the cutting parts of a die



while the workman is finishing it after it has been tapped. A is a thin piece of soft steel, say one sixteenth inch thick, which is placed flat upon the die, B, so that the edge projects a very little beyond the points, C. When both are held firmly in the vise, the part, D, may be filed away without any danger of the file touching the points of the cutters.

I think the above might be classed among the useful wrinkles, and I send it, thinking it may be handy to some of your many readers. J. P. LEWIS.

Haydenville, Conn.

Ammonia as a Cure for Rheumatism.

To the Editor of the Scientific American:

Permit me to inform your readers that caustic ammonia is no infallible cure for rheumatism. I read your paragraph on this subject on the day on which I was treated to the novel experience of acute rheumatism in my left leg. Several drops of ammonia were taken at once without effect, and similar doses a few days later. The complaint has steadily grown more aggravating since.

This rheumatic experience of mine also demolishes a popular fallacy, to which I admit I gave credence, that perfectly abstemious habits act as a prevention of such afflictions.

New York city. R. d'H.

The Proper Time to Fell Timber.

To the Editor of the Scientific American:

Some years since, I wrote an article for your paper in which I contended that after the tree was in full leaf was the proper time to fell timber. Since then I have seen an article stating that actual experiments made by the Prussian government had shown that the winter was the best time to fell timber. Thirty-one years ago, I was engaged in clearing up a large plantation, and building houses, stables, etc., with logs cut from the woods. I soon discovered that there was a difference in the lasting of different trees of the same kind. I also noticed that, in killing the trees to clear the land, some trees would decay much earlier than others; and that trees girdled in the early spring, just before the budding of the leaf, would rot off at the place where the tree was girdled; and that trees girdled in August would soon decay in the sap wood and bark, but that the heart would remain sound for years. The conclusion I came to was that the presence of sap in wood caused it to decay, and that the sap left the body of the tree during the time it was making leaves, new sap wood, and bark; and thus, at the fall of the leaf, the sap went into the heart or body of the tree.

If any one will cut a green tree after the fall of the leaf, and put one end in a hot fire, he will soon see sap ooze out of the whole stick, even in the middle; but cut a stick after full leaf, and the sap will run out near the bark. All timber that lasts well has but little sap at any time; all timber that decays easily has a great deal of sap, such, for instance, as the sugar maple, elder, and sycamore. All carpenters have seen large timbers that were perfectly rotten in the middle while the outside was apparently sound. This decay must have been caused by the presence of something besides heat and moisture. As the outside was sound while the inside was decayed, this must have been sap, and nothing else.

Oakley, Ark. J. H. MOORE.

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

Laboratory flasks which have contained oil or fatty matter may be easily cleansed by a solution of permanganate of potassa. To remove turpentine, petroleum, photogene, etc., wash with an ounce or so of sulphuric acid and rinse with water.

The comparative value of horse feed is found by experiment to be as follows: 100 lbs. of good hay is equal in value to 59 lbs. of oats, 57 lbs. of corn, 275 lbs. of carrots, 54 lbs. of rye or barley, and 105 lbs. of wheat bran.

A recent English patent, for the production of a glazed or vitrified surface on cast metal, sets forth the coating of molds with powdered glass, furnace cinder, or enamel, which is vitrified by the heat of the molten metal when the same is poured into the molds.

A new process for making tinned iron wire consists in first immersing it in a bath of muriatic acid in which a piece of zinc is suspended. After the acid has produced a new surface on the wire, it is placed in communication with a sheet of zinc in a bath of 2 parts acetic acid in 100 parts water, to which 3 parts chloride of tin and 3 parts soda are added. The wire is allowed to remain 2 hours in this mixture, after which it may be polished.

In the following will be found valuable details relative to the coloring of brass. An orange tint inclining to gold is produced by first polishing the brass and then plunging it for a few seconds in a warm neutral solution of crystallized acetate of copper. Dipping into a bath of copper, the resulting tint is a grayish green; while a beautiful violet is obtained by immersing the metal for an instant in a solution of chloride of antimony and rubbing it with a stick covered with cotton. During this operation the brass should be heated to a degree just tolerable to the touch. A *moiré* appearance, vastly superior to that usually seen, is produced by boiling the object in a solution of sulphate of copper. There are two methods of procuring a black lacquer on the surface of brass. The first, which is usually employed by instrument makers, consists in polishing the object with tripoli and washing it with a mixture composed of nitrate of tin 1 part, chloride of gold 2 parts. Allow this wash to remain for fifteen minutes, then wipe it off with a linen cloth. An excess of acid increases the intensity of the tint. In the second method, copper turnings are dissolved in nitric acid until the latter is saturated; the objects are immersed in the solution, cleaned, and subsequently heated moderately over a charcoal fire. This process must be repeated in order to produce a black color, as the first trial only gives a dark green. Finally, polish with olive oil. Much pains are taken to give objects "an English look." For this purpose, they are first heated to redness and then dipped in a weak solution of sulphuric acid. Afterward they are immersed in dilute nitric acid, thoroughly washed in water, and dried in sawdust. To effect a uniformity in the color, they are plunged in a bath consisting of 2 parts nitric acid and 1 part rain water, where they are suffered to remain for several minutes. Should the color not be free from spots and patches, the operations must be repeated until the desired effect is produced.

Paper may be prepared for bank cheques and other documents so that any writing in ink, once made thereon, cannot be altered, without leaving plainly visible marks, by passing the sheets through a solution composed of 0·015 grain gallic acid to 1 gill distilled water.

To silver cast iron, 15 grains of nitrate of silver are dissolved in 250 grains of water, and 30 grains cyanide of potassium are added; when the solution is complete, the liquid is poured into 700 grains of water wherein 15 grains of common salt have been previously dissolved. The cast iron intended to be silvered by this solution should, after having been well cleaned, be placed for a few minutes in a bath of nitric acid of 1·2 specific gravity just before being placed in the silvering fluid.

The base used in making artificial gems is strass, obtained by melting together 6 drachms carbonate of soda, 2 drachms burnt borax, 1 drachm saltpeter, 3 drachms minium, and 1½ oz. purest white sand. To imitate in color the following minerals, add to the strass the ingredients named in connection with each gem: Sapphire, 10 grains carbonate of cobalt; opal, 10 grains oxide of cobalt, 15 grains oxide of manganese, and from 20 to 30 grains protoxide of iron; amethyst, 4 to 5 grains carbonate of peroxide of manganese; gold topaz, 30 grains oxide of uranium; emerald, 20 grains protoxide of iron and 10 grains carbonate of copper.