HOW SUBMARINE CABLES ARE DESTROYED.

It might reasonably be supposed that after a well-protected telegraph cable once reaches its place upon the ocean bed it would not be liable to very many causes of injury beyond the natural deterioration of its protecting envelope. But that such is not the case will be seen from the following facts, for which, with the accompanying illustrations, we are indebted to *La Nature:*

In northern latitudes cables are frequently ruptured by icebergs or floes. The former often draw several hundred feet of water, and where the sea is shallow come in contact with and so break the cable. Another cause of rupture is sharp rocks on the ocean bottom, against the edges of which the cable chafes until the outer envelope and layer after layer of the protecting material are worn through. Earth contact of the interior conducting wires then usually occurs, and the cable no longer transmits signals. Other natural causes of destruction are coral banks, earthquakes, submarine currents, and the elevated temperature of tropical waters.

Numerous instances have occurred where cables have been damaged by fish, a notable example happening in the cable between Brazil and Portugal, and the coasting cables which run along the eastern shore of the South American continent. On these lines the cable is almost chronically attacked by sawfish. Pieces of the bone of the saw of this animal have repeatedly been found imbedded in the coverings so deeply that the interior conducting wires themselves are injured. Fig. 3 shows a section of the cable with the bone found inclosed therein. No less than five times have the cables above named been injured by sawfish attacks. It is supposed that the fish runs into the cable, and as its temper is none of the best, it becomes enraged and vents its anger on the obstruction by blows of its saw. An even more curious instance occurred not long ago in the cable across the Persian Gulf, which suddenly became inoperative. On examination it was found that a large whale had become entangled in the line. The animal was covered with parasites, and it is supposed that it attempted to use the cable as a rubbing post in order to rid itself of its annoying appendages. One stroke of its powerful tail probably broke the line, and then in rolling over and over the whale wrapped itself so tightly in the coil that it committed suicide by strangulation.

Among the worst enemies of submarine cables are three insects. The *teredo navalis* and its congener the *xylophaga*, which Huxley first discovered in 1860 in one of the cables of the Levant, enter the hemp covering and penetrate to the gutta percha, wherever the interstices of the wires of the exterior envelope afford them an opening. The *teredo* is a worm that constructs a tube for itself out of its calcareous secretion. The *xylophaga* is a bivalve, which does not penetrate deeply into the gutta percha, but simply attaches one of its shells thereto, chafing the material so that considerable losses of current occur. The *teredo norvegica*, Fig. 1, is quite a large worm, having two shells on its anterior part, with which it can cut through the hardest wood. It belongs to the genus of acephalous mollusks, and no less than 24 different species of it have been recognized.

The *limnoria lignorum*, Fig. 2, is a small crustacean about the size of an ant. It penetrates into the interstices of the wire envelope of the cable and makes its way to the core. The cables in the Persian Gulf and Indian Ocean and also on the Irish coast have been seriously damaged by the ravages of this creature.

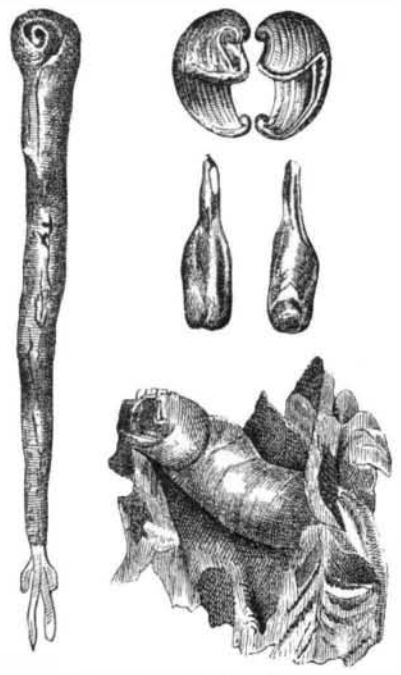


Fig. 1.—THE TEREDO.

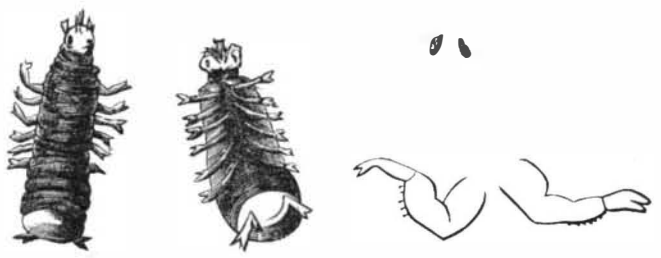


Fig. 2.—LIMNORIA LIGNORUM.

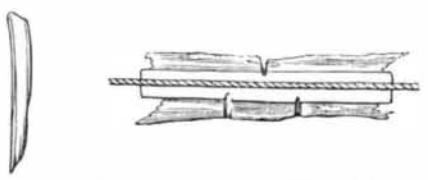
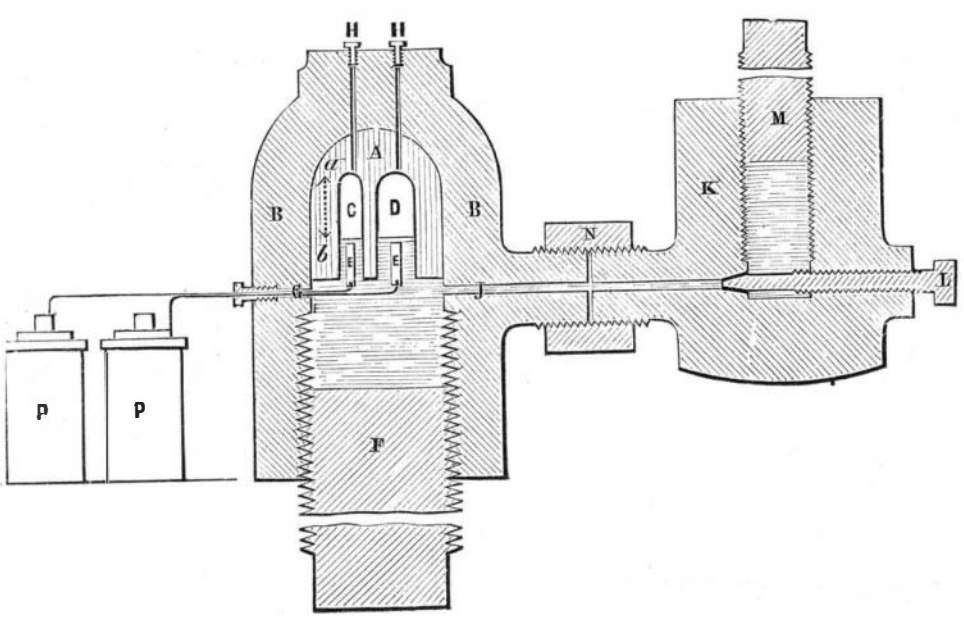


Fig. 3.—BONE IN TELEGRAPH CABLE.

NEW APPARATUS FOR THE COMPRESSION OF HYDROGEN AND OXYGEN.

M. Bouvet has recently addressed a note to the French Academy of Sciences, calling attention to the new apparatus illustrated herewith, by means of which he is enabled to subject oxygen and hydrogen to very high pressures. A is a voltameter formed of a block of glass in which are hollowed two cavities, C D, the cubical contents of one exactly double that of the other. The voltameter is inclosed in a strong metal case, B, and the orifice through which the former is introduced is closed by the screw, F. A special opening, G, allows of the introduction of the two wires which communicate with the electrodes in the cavities, C D. The two channels, H, closed by screws, allow the air to be driven out of the apparatus before the beginning of the experiment. At J is a tube in communication with a reservoir, K. The latter is closed by a strong screw, M, which serves as a piston to cause an augmentation of pressure in the cavities, C D, during the experiment.

Supposing that these cavities to the height *a b*, will contain, the one, one quart, the other, two quarts, and that the apparatus is filled with slightly acidulated water from which the air has been expelled. Then, the apparatus being closed, the current from a battery is sent into the voltameter, the positive electrode being in cavity C and the negative one in D. As the water decomposes, it may be supposed that its level in the cavities falls to *b*, hence all the water contained in said cavities may be considered as transformed into gas; and this, therefore, must be submitted to a considerable pressure which it is easy to calculate. The two cavities contain 8·7 cubic feet of water. Water being taken as incompressible, it is therefore here replaced by 8·7 cubic feet of gas. Knowing the weight of hydrogen and oxygen, it is not difficult to find that the volumes of gas, produced as described, are submitted to a pressure of 1,854·5 atmospheres or 27,817·5 lbs. Now if the piston screw be operated in the reservoir, K, to drive water into the cavities, if the gas in the latter be thus reduced in volume in the proportion of 1 to ½, it follows that the pressure thereon is doubled and becomes 3,709 atmospheres or 55,635 lbs. The current can again be established, the water again caused to descend to the level, *b*, and the operation as above described repeated; so that ultimately pressures can be reached only limited by the resistance of the apparatus.



NEW APPARATUS FOR THE COMPRESSION OF HYDROGEN AND OXYGEN.

JOSEPH S. LYNN, the aeronaut who on one of his ascents in England reached an altitude of 32,000 feet, recently made an ascent of 7,000 feet near Caranjah, in India. He is considering the feasibility of taking observations from a great height for the discovery of the northwest passage.

New Agricultural Inventions.

Mr. Thomas G. Bass, of Pittsburg, Texas, has devised a new Single Tree for Plows, etc., which is made wholly of wood. The construction, which is very simple, obviates vertical play and prevents the traces either from coming off or from becoming loose and falling under the horses' feet.

A new Corn Marker, patented by Mr. Michael Akerman, of Steamboat Rock, Iowa, embodies a self-dropper and marker to operate the dropping slide and to mark the ground opposite the hills. The construction embodies numerous new devices, and is ingenious and effective.

Mr. Nathan L. King, of Catskill, N. Y., is the inventor of a novel Shearing Instrument for clipping horses, removing wool from sheep, etc. The outward motion of a follower carries a plate forward toward teeth, and curved blades are caused to swing on pivots, so that their cutting edges follow those of the plate, thus making a shearing stroke. The teeth prevent the wool or hair from sliding between the edges of the instrument.

An improved Cultivator, patented by Messrs. John S. and Chas. A. Johnston, of Rockford, Ill., is so constructed that the plows may be raised from the ground by the backward movement of the driver, and that it may be easily guided and controlled. The construction is simple and ingenious.

A new Rotary Cultivator, patented by Messrs. Chas. C. Breeden and O. T. Wheeler, of Bedford, Ky., is so constructed as to stir the ground thoroughly while leaving its surface smooth. It is also of light draft, and it may be adjusted to work at any desired distance from the plants.

Messrs. Philander W. and Hiram G. Briggs, of Howell, Mich., have patented a new Grain Drill, which enables grain to be put in the ground to any depth, prevents its being covered too deeply when it may be advisable to run the drills zigzag, and stops loose stones from falling upon the seed.

A new Gate has been patented by Mr. Sanford W. Erwin, of Fayette county, Ind., which may be conveniently opened by hand or by the wheels of a passing vehicle. The construction is novel and very ingenious.

An improved Oatmeal Cutter, invented by Mr. Herbert Z. Cole, of Cortland, Ohio, consists in the combination with a cutting cylinder, formed of a series of toothed circular disks, of a stationary cutting plate provided with a series of notches corresponding in number to the circular cutters. The latter enter the said notches to effect the cutting of the oats at the point of contact with the said plate.

Mr. David E. Lupold, of Driftwood, Pa., has devised a portable fence which has panels made of rails with tapering ends and extending only to the center of the posts. Said panels alternate with other panels in which the rails are extended to half the width of the posts, so as to fit on the posts of the first panels. The posts are driven into the ground and the panels are connected by wires or ropes.

Mr. Robert Cowden, of New Richmond, Pa., has invented a new Hay and Grain Unloader which embodies several ingenious devices whereby the hay and grain may be unloaded quickly and conveniently and without being scattered or wasted.

In order to protect the udder of a cow from the dirt of a stable, and to keep it warm during cold weather, so as to increase the free flow of milk, Mr. Marshall R. Dowlin, of North Adams, Mass., has invented a Protector, which consists of a pouch made of leather and provided with straps so that it may be secured to the udder.

An improved Cotton Chopper has been patented by Mr. Sampson N. Camp, of Forksville, La. In the frame between the plows is a rimless wheel, to the spokes of which are attached cups, which cover the plants that are to be left for a stand, and protect them from the soil thrown by the plows.

Mr. James Higgins, of Westfield, N. J., has also devised a new Cultivator. In this machine, by pressing a rod and operating a lever the plows may be raised from the ground or forced down to enter more deeply, as desired. The middle beam, or any desired number of the beams, may be detached as circumstances may require.

A new Reciprocating Churn, devised by Mr. Thos. J. Murphy, of Busti, Iowa, has two dashers connected to an oscillating arm on each side of its fulcrum or pivot. The churn body is divided into two compartments by a vertical partition which has slots formed through it to allow the milk to pass freely from one chamber to the other. Many other ingenious devices are added, improving the general efficiency of the machine.

A new Cultivator, devised by Mr. Reuben H. Slifer, of Holden, Mo., is so constructed that the whiffletrees cannot drop to the ground to injure or break the plants; that it may be adjusted to work to any depth; that the plow beams may have sufficient play to be properly guided, or be raised out of contact with the ground in moving the machine from place to place. It is well suited for farm use.

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Testing Tissues, etc.

We are indebted to the *Textile Manufacturer* for the following extract from the *Guide Practique pour l'essai des Matieres Industrielles, etc.*

ASCERTAINING AMOUNT OF DRESSING.

In order to ascertain the amount of dressing and other matters contained in tissues, the authorities in French naval matters and railway companies submit a sample to two prolonged macerations, one in tepid water, the other in boiling soda lessive, under the following conditions:

1. Measure the sample, and withdraw all threads which might ravel out in the maceration and other processes, and thus interfere with the weight and consequent result. Avoid testing too small samples: a piece half a yard long will suffice, and will not require large apparatus for the testing; if it be of the whole width of the stuff, of course there is no fear of lateral unraveling, but the ends must be carefully looked to.

2. Dry the sample completely in a stove heated to about 70° centigrade, or, in the absence of a stove, in a closed sand bath, or, still better, in a closed box containing chloride of calcium. Care must, however, be taken that the sample be not scorched. Then fold the piece quickly to get it into the balance, and weigh it immediately, while hot, as, being very hygroscopical, it absorbs humidity from the air, and thus soon gets an increase of weight that must not be disregarded.

3. To ascertain the amount of dressing macerate the sample for eight hours in a bath at 50° C., rain water being preferable, the water to be 18 or 20 times the weight of the piece of stuff. The bath must not be allowed to diminish, sufficient water at the same temperature being added every hour, or oftener, to keep up the same quantity.

4. After the above maceration each sample must be rinsed in ordinary or rain water in an earthen vessel, without wringing, and taking heed that no threads escape. Then dry immediately and weigh without delay, as described above; the difference between the present and the previous weighings will give the amount of the dressing, dissolved or detached. In naval and railway contracts, difference allowed is 2·5 per cent, which represents the inevitable loss due to the matters which form part of the yarn itself. If the difference be greater, there has been artificial dressing or insufficient preparation, the yarn has been soiled by matters soluble in tepid water. The following method determines the other matters separated:

5. To find then the amount of matters which the original lessivation had failed to eliminate, the samples are boiled for six hours in soda solution, marking from 3° to 5° of the alkalimeter, that is to say, about 3 to 5 grammes of soda per liter of water. The soda employed is common caustic soda, costing little more than 1s. 8d. per pound. The same precautions as mentioned above, and even greater, must be taken to keep the bath replenished, or the alkaline solution will become too strong and affect the tissue. After the maceration is completed, the rinsing, drying, and weighing must be carried out with all the precautions noted above. The difference between the third result and the second is the measure of the deficiency of the original lessivation.

TEST OF RESISTANCE OF TISSUES AND CORDAGE.

The test of resistance of tissues and cordage shows the nature of the yarn and the quantity of matters contained therein by the following triple method:

a. The weight of the tissue per square yard is taken after the samples have been well dried in the stove or in the sun.

b. The number of threads in warp and weft is ascertained by the ordinary thread counter of a quarter-inch field.

c. The resistance to traction of either tissues or cordage is measured by means of an apparatus which has two jaws, between which the tissue or cord is fixed, one jaw being stationary and the other connected with a lever, which is loaded until the sample breaks. In France the apparatus used is the dynamometer of Perreaux, which costs about £8. For tissues the trials are made with bands sixteen inches long and two inches wide, one cut lengthwise and another crosswise of the stuff.

REQUIREMENTS OF THE NAVY, ETC.

The following are the conditions required by the navy and public offices for the following principal tissues:

Kind of Tissue.	Threads per centimeter.		Weight per square meter.	Resistance of a band 5 cm. wide.	
	In the Warp.	In the Weft.		Lengthwise.	Crosswise.
			k.	k.	k.
Hand loom cloth	—	—	435	220	230
Ditto, ditto	—	—	345	130	140
Tilt cloth	32–33	10–11	540 to 560	270	330
Double yarn hammock cloth	—	18	330 to 370	200	290
Sail cloth No. 1	22	7	550	275	410
Ditto No. 6	24–25	10	350	170	255
Ditto No. 8, single yarn	16–18	13–14	270	135	200

After experimenting on samples well dried at a temperature of about 30° C., the same should be repeated with others damped with water, which, of course, generally offer greater resistance than dried samples.

TESTING FIBERS.

With respect to fibers, there is the double question of actual resistance and of durability, and there is often a difference of opinion respecting their fitness for certain purposes; some, for instance, as jute and phormium tenax, are definitely objected to in tissues of first quality; but all are agreed that tissues and cordage should always be of one kind (with exceptions), for the reason that, not being of the same elasticity and texture, the tissue will be less durable, and it is very difficult to distinguish flax, hemp, and jute by eyesight.

VETILLARD'S METHOD.

A great many methods have been proposed, but the best known is that of M. Vétillard, which is very ingenious, but delicate, and requiring an excellent microscope, enlarging 120 times. The object being a piece of the fiber, colored according to its nature by means of two solutions: one of iodine, dissolved in a solution of iodide of potassium; the other, glycerin, mixed with sulphuric acid, and the process is as follows:

a. From the tissue, perfectly washed, lessivated, and cleared of all impurities, threads are drawn from warp and weft, and are observed separately.

b. Dip the thread in the iodic liquid, and dry it with a piece of linen, or, better still, white blotting or filtering paper.

c. Lay it on a piece of glass, such as is used for microscopic observation, and divide and spread out the fibers with the aid of the point of a needle.

d. Place another glass on the fibers, set the whole in the microscope, and then introduce a single drop of the sulphuric solution between the two pieces of glass, and observe the color which the fibers assume when the acid touches them: flax turns blue, mixed more or less with yellow; hemp, green, mixed with gray; jute and phormium, yellow; China grass, gray; flat-rib, of gray-blue color. With a little practice of this method it is easy to see the difference between jute and phormium on the one hand, and flax and hemp on the other, which is of itself of great importance when there is a question of adulteration; but it is very difficult to distinguish jute from phormium and flax from hemp, as, according to the manner in which they have been prepared, they assume each other's tints, or so nearly as to deceive the eye. By means of nitric acid, in which the fibers are steeped, the distinction between flax and hemp and jute and phormium is clearly shown, the former not being affected at all, while the latter takes a fine red tint.

TESTING MIXED SILK AND WOOL.

If a piece of tissue of mixed wool and silk is plunged in hydrochloric acid, the silk is soon dissolved, while the wool remains, so that by careful weighing before and after the operation, the proportion of the two fibers is easily ascertained.

COTTON IN WOOL.

Finally, to ascertain if a woolen fabric contain cotton, treat it with sulphite of sodium, and all the wool will be dissolved, leaving the cotton untouched.

TEST FOR INDIGO.

A good test for indigo is supplied by sulphuric acid, mixed with its own weight of water. Steep a dyed specimen in the mixture for five minutes, wash well and dry in the open air; if nothing but indigo have been used, the color will be unaffected.

Vanilla.

Indigenous to Eastern Mexico, vanilla has been gradually diffused by cultivation through the adjoining countries, and is now grown also in Java and other islands of favorable climate. It is an orchidaceous plant with a trailing stem not unlike that of the common ivy, and, attaching itself to any tree standing near, it rises to the height of eighteen or twenty feet. The flowers are of a greenish-yellow color mixed with white, and the fruit or capsule, the part for which the plant is cultivated, is from three to eight inches long, of a yellow color when gathered, but gradually turning to a brownish black. The vanilla of commerce has been ascribed to a number of species of the plant, but it is now generally admitted that *Vanilla planifolia* furnishes the most of our supply.

The fruit of the vanilla, or vanilla "bean," as it is usually called, is, when fresh, of the thickness of the little finger, and is fleshy, smooth, and firm, but in drying it contracts to flattened cylinders from three tenths to four tenths of an inch wide. The surface is finely furrowed lengthwise, shining and unctuous. The pod contains a multitude of minute, black seeds, imbedded in an aromatic pulp.

Vanilla is principally gathered by the native Indians, who sell it to the whites, the latter preparing it for market. In this process it is spread out to dry in the sun for several hours, and then wrapped in woolen cloths to "sweat." Like pepper, it undergoes its principal change of color and flavor during this operation, and is finally dried by exposing it to the sun for a day or two. There are several varieties of vanilla, differing in excellence and price, the long beans being preferable to the short kinds. The best come from Mexico.

The fragrance of vanilla is not due to an otto, but to a crystalline substance found in the fruit and known as *vanillin*.

Vanilla serves the double purpose of perfume and flavor. While it lacks the quality necessary to make it acceptable for the former use in a pure state, it is largely employed in compounds, forming an excellent ingredient in sachet powders and scents for pomades, and a basis for some delightful handkerchief essences.

As a flavor, vanilla undoubtedly occupies the first rank, and here is at its best when used pure and simple. The only problem connected with its culinary use is how to secure its delicious aroma without adding the bean, woody fiber and all, to the delicacies in which its presence is coveted. The primitive mode is simply to boil a bit of the bean in some of the water or milk, as the case may be, which is to be used in making the cream, ice, or sauce to be flavored. But as this is rather wasteful, and the vanilla is always expensive, the assistance of the apothecary is usually called for, and he furnishes, in response, a liquid extract which, when properly made, contains all the aromatic virtues of the bean.

So much has been written about the preparation of this extract, and so many formulæ for it published, that one would think that its manufacture was attended with many perplexities. This is not the case, however, so far as the experience of the writer is concerned. Everybody, at least every apothecary, knows that water and alcohol are the two almost universal solvents, and that a mixture of the two serves to extract all the virtues of most roots, barks, leaves, and flowers.

Fruits are no exception to the rule, and the vanilla fruit readily yields up its aromatic constituents to diluted alcohol. Applying, then, the principles on which the apothecary prepares his tinctures in general, we may easily construct a formula for the tincture, or, as it is commonly called, vanilla extract: Take vanilla beans, one avoirdupois ounce; refined sugar, one avoirdupois ounce; alcohol, 95 per cent, eight fluid ounces; water, eight fluid ounces.

Beat the beans to a coarse powder in a mortar with the sugar, macerate them in the mixed alcohol and water for a week, shaking frequently, and finally strain the liquid through cotton cloth, using pressure, and adding enough diluted alcohol through the strainer to bring the finished product to the measure of one pint. The sugar is added merely to aid in dividing the vanilla.

If I felt myself called upon to imitate the example of certain foreign writers who give recipes for handkerchief extracts by the keg and cologne water by the barrel, it might be necessary to revise my formula to make it workable, but "small dealers" will have no difficulty with it as it is, except in regard to its costliness. With vanilla beans at the present price ($14 to $16 per lb. wholesale), the extract can be sold at, say, $2 per pint, and yield such a profit as the retail druggist must usually demand; but when the price of the beans advances, as it sometimes does, to more than double this figure, it is almost impossible to sell it to advantage.

As every one in the trade knows, vanilla extract is frequently adulterated with a mixture of tonka essence. The flavor of the latter somewhat resembles that of vanilla, but is much inferior in every respect.—*J. H. S., in Boston Journal of Chemistry*

Astronomical Notes.

BY BERLIN H. WRIGHT.

PENN YAN, N. Y., Saturday, February 2, 1878.

The following calculations are adapted to the latitude of New York city, and are expressed in true or clock time, being for the date given in the caption when not otherwise stated.

PLANETS.

	H.M.		H.M.
Mercury rises	5 46 mo.	Saturn sets	8 07 eve.
Venus sets	7 50 eve.	Uranus rises	6 24 eve.
Mars in meridian	5 06 eve.	Uranus in meridian	1 13 mo.
Mars sets	11 52 eve.	Neptune in meridian	5 21 eve.
Jupiter rises	6 04 mo.	Neptune sets	0 5 mo.

FIRST MAGNITUDE STARS.

	H.M.		H.M.
Antares rises	3 12 mo.	Altair sets	5 23 eve.
Regulus rises	6 26 eve.	Fomalhaut sets	5 58 eve.
Spica rises	11 3 eve.	Algol in meridian	6 08 eve.
Arcturus rises	10 05 eve.	Capella in meridian	8 15 eve.
Sirius in meridian	9 47 eve.	7 stars (cluster) in meridian	6 48 eve.
Procyon in meridian	10 40 eve.	Betelgeuse in meridian	8 56 eve.
Aldebaran in meridian	7 37 eve.	Rigel in meridian	8 16 eve.
Vega sets	6 35 eve.		

REMARKS.

The sun is moving northward rapidly, changing in declination 44″ per hour. Day's length, 10 h. 9 m., 53 m. longer than the shortest. Duration of twilight, 1 h. 33 m., which is slowly shortening, reaching the *winter* minimum March 4. Mercury attains his greatest western elongation February 2. He can only be seen at or near the time of greatest elongation, as he then is at his greatest angular distance from the sun. Taking mean values, we find Mercury is brightest three days after greatest elongation west, and three days before greatest elongation east, or between greatest elongation and superior conjunction. But cases may and do arise when the time of greatest brilliancy falls before greatest elongation west and after greatest elongation east, or between greatest elongation and inferior conjunction, which fact, so far as I know, is not mentioned in any treatise on astronomy. To cause the point of greatest brilliancy to occur, as last mentioned, the earth must be at or near perihelion, and Mercury at greatest elongation, and at or near aphelion. This will be the case when Mercury is at aphelion and greatest elongation, about January 1. The elongation of Mercury, which occurs this day, happens to fall within the limits of this case. The earth being only 33 days from perihelion, and Mercury 16 days from aphelion, the time of greatest brilliancy occurs a few hours before greatest elongation west. Jupiter rises 1 h. 6 m. before the Sun, and 7° 9′ south of the sunrise point. Saturn's rings disappear February 6; the sun passing below their plane, and the earth remaining above. The earth will not reach their plane until March 1, when we shall see the southern surface, the rings reappearing as slowly as they disappeared. Algol is at minimum brilliancy February 3, 5 h. 25 m. morning; February 6, 2 h. 14 m. morning; and February 8, 11 h. 3 m. evening. θ Ceti (*Mira*) is fast disappearing, becoming invisible during the latter part of February. *Mira* in meridian February 2, 5 h. 21 m. 17 sec. evening.

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New Mechanical Inventions.

An ingenious Sounding Machine, by which the depth of water is quickly and accurately shown, has been invented by Mr. F. E. Schrom, of Whitewater, Wis. There is an endless graduated indicating belt, combined with the reel that carries the sounding line, to which a relatively low velocity is imparted in such a manner that equal lengths of the line, when winding upon or unwinding from the reel, are represented by much shorter distances moved by any point on the belt. The graduations on the latter are numbered to indicate fathoms and quarter fathoms on the line.

Mr. Daniel H. Merritt, of Marquette, Mich., has patented a new Friction Gearing, the improvement in which consists in making a triangular or V-shaped groove between the bases of the teeth, at a more acute angle than the latter. The teeth or ribs travel faster at the periphery than at the bases, and are consequently liable to the greatest wear at the outer portion of their surface. By the present arrangement, it is claimed that as the ribs wear away they will maintain their original form.

Mr. Lorenzo Meeker, of Oswego, N. Y., has invented a new Lifting Jack by which a heavy weight may be lifted either from the ground or from the top of the device. There is a combination of a vertically sliding bar, a peculiarly constructed clutching device, and a lever fulcrumed on the tubular standard, by which the vertically sliding bar is guided.

In a new Car Wheel patented by Messrs. H. Scheibel, Jr., George M. Seeley, and John Schneider, of Bridgeport, Conn., annular elastic packing is interposed between the cylindrical faces of the tire and the web, the object being to absorb the jar, deaden the sound, and diminish the force of concussion, thus affording a better riding wheel and reducing the wear on the tire.

Mr. L. Morgenthau, of New York city, has devised a new Paper-feeding Machine, which consists of a vertically reciprocating and oscillating casing or receptacle, that is arranged with a narrow longitudinal slot at the curved bottom, and filled with some adhesive substance for the purpose of taking up and lifting a sheet of material at the down stroke of the receptacle and carrying it by the up stroke and by contact with a top stop screw to the feed rolls, so as to be taken up by the same.

Mr. T. A. Blake, of New Haven, Conn., has recently devised a new Ore Crusher, the object being to secure a regular feed and the avoidance of sudden strains upon the frame or the rods of the machine. The materials to be crushed are broken to uniform size and placed in a hopper. A sliding cover is then adjusted to supply the required material to the rolls. The rotation of a roll beneath the hopper causes an even supply of material to fall from the latter to the crushing rolls, where it is reduced to a uniform powder, either coarse or fine, as may be desired. New devices are provided, so that under sudden strain the rolls are permitted to yield without the necessity of overcoming increased resistance.

Mr. Carl A. Schumacher, of Walla Walla, Washington Territory, has devised a new Sewing Machine Shuttle, one advantage of which is that the tension spring and its fastening are permanently attached to the shuttle case, and consequently none of the parts are likely to become mislaid or lost.

A new Cross Tie for railways devised by Mr. David Horrie, of Keokuk, Iowa, consists of a cast or wrought iron tie made of a broad bearing surface, center bottom rib, and with lateral top flanges, that bind on the base of the rails and firmly secure the same. With this are combined straight screw bolts, having spiked heads that pass in grooves of the tie across the bottom of the rails.

Mr. Clark P. Hayes, of Brooklyn, N. Y., has invented a Machine for Cutting and Grinding Logwood, which is intended to take the place of the separate machines now used for that purpose. It works rapidly and separates the fine particles from the coarse chips, which last are conducted away and reground.

Mr. Elson Towns, of Cisne, Ill., has devised a new Governor for Steam Engines, which is so contrived that the relation of the centrifugal force of the rotating balls to the resistance changes as the balls rise or fall; and the relation of the motion of the balls to that of the moving sleeve is also variable, so that the governor is most sensitive when sensitiveness is required.

Business and Personal.

The Charge for Insertion under this head is One Dollar a line for each insertion.

A Rare Opportunity.—A new Factory, with Engine, Boiler, Shafting, etc.; in a splendid location; suitable for manufacturing; will be sold for less than ⅓ of its original cost, or will be leased on easy terms. For particulars, address L. A. Lawton, Herkimer, N. Y.

Alcott, Mt. Holly, N. J., pledges power to equal any Turbine.

I want some patented article in Wood or Iron to manufacture. De Valois St. John, Leonardsville, N. Y.

Manufacturers of Water Motors address Wm. Morehouse, 1,023 Delaware Ave., Buffalo, N. Y.

Everybody their own Nickel Plater; no battery. Send 3c. stamp for particulars to Wm. Munch & Co., Groton, Tompkins Co., N. Y.

For Sale.—Machinery and Compositions of all kinds of Matches. Apply to J. H., P. O. Box 942, N. Y. city.

Machine Cut Brass Gear Wheels for Models, etc. (New List.) D. Gilbert & Son., 212 Chester St., Phila., Pa.

Canadian Patent For Sale.—Mey's Dryer for Grain, Malt, etc., has been in practical use for several years in Buffalo, N. Y. Address F. H. C. Mey, Buffalo, N. Y.

Galvanized Iron Cornice Machines.—The most Improved, Straight and Circular. Prices reduced. Calvin Carr, Cleveland, O., and Hewes Machine Works, Newark, N. J.

For a 15 in. Swing Lathe having 1⅝ in. hole through Head Spindle, something new, address Star Tool Company, Providence, R. I.

For New Illustrated Catalogue of Foot Lathes, Scroll Saws, Small Steam Engines and Amateur's Tools, send stamp to Chase & Woodman, Newark, N. J.

Mechanics, Builders, Architects, and Plumbers, send for specimens of Manufr. and Builder, 37 Park Row, N. Y.

Carpenters.—Your Saws will cut straight by using my Jointer; the teeth will all be of an equal length. Sample by mail, 25 cts.; $2 per doz. E. Roth, New Oxford, Pa. I want agents.

For the best and most practicable Brick Making Machine, address Chambers Bros. & Co., Philadelphia, Pa.

For power and durability, Alcott's Water Wheel, Mt. Holly, N. J.

2d Hand Iron Planer built by Smith of Salem. Plane 13 ft. x 30 in.; price $375. A. C. Stebbins, Worcester, Mass.

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Noise-Quieting Nozzles for Locomotives, Steamboats, etc. T. Shaw, 915 Ridge Ave., Philadelphia, Pa.

Bolt Forging Mach. & Power Hammers a specialty. Send for circulars. Forsaith & Co., Manchester, N. H.

For Town & Village use, Comb'd Hand Fire Engine & Hose Carriage, $350. Forsaith & Co., Manchester, N. H.

John T. Noye & Son, Buffalo, N. Y., are Manufacturers of Burr Mill Stones and Flour Mill Machinery of all kinds, and dealers in Dufour & Co.'s Bolting Cloth. Send for large illustrated catalogue.

Power & Foot Presses, Ferracute Co., Bridgeton, N. J.

Solid Emery Vulcanite Wheels—The Solid Original Emery Wheel—other kinds imitations and inferior. Caution.—Our name is stamped in full on all our best Standard Belting, Packing, and Hose. Buy that only. The best is the cheapest. New York Belting and Packing Company, 37 and 38 Park Row, N. Y.

Steel Castings from one lb. to five thousand lbs. Invaluable for strength and durability. Circulars free. Pittsburgh Steel Casting Co., Pittsburgh, Pa.

For Best Presses, Dies, and Fruit Can Tools, Bliss & Williams, cor. of Plymouth and Jay Sts., Brooklyn, N. Y.

Hydraulic Presses and Jacks, new and second hand. Lathes and Machinery for Polishing and Buffing metals. E. Lyon & Co., 470 Grand St., N. Y.

Shaw's Mercury Gauges, U. S. Standard of Pressure. 915 Ridge Ave., Philadelphia, Pa.

New Machinery at Second-hand Prices.—Two Brown & Sharp's No. 3 Screw Machines; Five Prentice Hand and Foot Lathes; Six Boiler Feed Pumps; detailed list free. E. I. N. Howell, 720 Filbert St., Philadelphia, Pa.

Friction Clutches warranted to save Rolling Mill Machinery from breaking. Also Hoisting Machines and Safety Elevators. D. Frisbie & Co., New Haven, Conn.

For Sale.—An Elevator, with Carriage, suitable for a Hotel. Apply to Morgan & Co., 154 South 4th St., Philadelphia, Pa.

Polishing Supplies of all kinds. Walrus Leather Wheels, all sizes and shapes. Greene, Tweed & Co., N. Y.

For Solid Wrought Iron Beams, etc., see advertisement. Address Union Iron Mills, Pittsburgh, Pa., for lithograph, etc.

Felt of every description for Manufacturers' purposes, especially adapted for Polishing, can be furnished in any thickness, size, or shape. Tingue, House & Co., Manufacturers. Salesroom, 69 Duane St., N. Y. Factory at Glenville, Conn.

Ice Machines. Clayton & Cook, Daretown, N. J.

Improved Wood-working Machinery made by Walker Bros., 73 and 75 Laurel St., Philadelphia, Pa.

Skinner Portable Engine Improved, 2 1-2 to 10 H. P. Skinner & Wood, Erie, Pa.

Vertical Scientific Grain Mills. A. W. Straub & Co., Phila.

Fine Taps and Dies for Jeweler's, Dentist's, and Machinist's use, in cases. Pratt & Whitney, Hartford, Ct.

Weldless Cold-drawn Steel Boiler and Hydraulic Tubes. Leng & Ogden, 212 Pearl St., N. Y.

Safety Linen Hose for factories, hotels, and stores, at lowest rates. Greene, Tweed & Co., 18 Park Place, N. Y.

Diamond Tools. J. Dickinson, 64 Nassau St., N. Y.

The best Turbine Water Wheel in use. Alcott, Mt. Holly, N. J.

Manufacturers should try the pure natural Lubricating oil. Produced and prepared by Geo. Allen, 13th street, Franklin, Pa. It does not gum or chill in cold weather, and wears as well as lard oil. Price by the barrel 30 cents per gallon. Packages of 10 gallons sent on receipt of $3.75.

More than twelve thousand crank shafts made by Chester Steel Castings Co. now running; 8 years' constant use proves them stronger and more durable than wrought iron. See advertisement, page 78.

NEW BOOKS AND PUBLICATIONS.

UPLAND GAME BIRDS AND WATER FOWL OF THE UNITED STATES. By A. Pope, Jr. Published by Scribner, Armstrong & Co., 743 and 745 Broadway, New York city.

We have received the first part of one of the most elegant ornithological works that has been published since Audubon produced his colossal volumes. The idea is to present a series of exact illustrations of many of the principal game birds and water fowl of the United States, drawn from and colored to the life by an artist sportsman who has studied them for years, and whose ability as a painter in water colors is of high order. The sketches, which are reproduced in fac-simile in the highest style of chromo-lithographic art, represent the male and female of each variety of birds, and the descriptive text is taken from Wilson's, Audubon's, Baird's, Cone's, and other standard ornithological books. The entire work is being published in the most sumptuous manner, and when complete will form one of the handsomest productions of a publishing house already renowned for the artistic excellence of what it puts forth. The part before us relates to the American Snipe and the Green Winged Teal. The four following parts—there are to be five in all—describe the woodcock, mallard duck, quail, black duck, ruffled grouse, blue billed duck, prairie chicken, and red headed duck. The work is sold by subscription only, at $2.50 per part.

AMES' COMPENDIUM OF PRACTICAL AND ORNAMENTAL PENMANSHIP. By Daniel T. Ames. Published by A. J. Bicknell & Co., 27 Warren St., New York. Price, cloth, $5.

This is a large quarto volume containing 48 plates, finely executed by photo-lithography, and placing before the penman a great variety of models for imitation, ranging from simple elements of letter formation to the most elaborate engrossing. Twenty ornamental alphabets (many entirely new) are embodied, besides numerous designs for borders, monograms, and the various formal documents, such as resolutions, testimonials, etc., in preparing which the penman's skill finds its crucial test. The author states that it is the most complete handbook of ornamental penmanship extant. It is very handsomely published.

PALLISER'S AMERICAN COTTAGE HOMES. Published by A. J. Bicknell & Co., 27 Warren St., New York. Price $5.

The above-named publishing house is doing valuable service in its frequent publication of copiously illustrated works containing designs for dwellings which are not only moderate in price but in accordance with a constantly improving popular artistic taste. American village architecture has long been remarkable for lack of beauty, chiefly perhaps on account of the rapidity with which new towns spring up in this country, and the necessity of building at low cost. Now that the best architects do not think the planning of a workman's cottage unworthy of their skill, we may look for the application of better principles both in construction and exterior appearance. The present work is a notable instance of what may be done toward adapting really tasteful and new designs to the exigencies of moderate outlay. Here are 50 designs, each giving the necessary plans, elevations, and perspectives of cottages, none costing more than $3,500 to erect complete, and ranging from that figure down to as low as $325 for a very neat 2 room 1½ story dwelling. All are tasteful, many picturesque and elegant. They are intended for the country and look rural, which is much more than can be said of the ineffectual attempts to imitate French city architecture on a reduced scale, which of late years many architects have made, in planning country homes. Full forms of specifications and agreements are given, so that the reader has only to select his design and make a contract with a builder to have it constructed.

PRACTICAL STUDIES IN LINEAL DRAWING. Designed and engraved by E. Becker. Price 75 cents. For sale by the author, Box 140, Stapleton, Staten Island, N. Y.

This is a portfolio of six finely engraved plates, exhibiting mouldings, volutes, and pedestals, and the Tuscan, Ionic, Doric, Corinthian, and Composite orders of architecture. Problems and solutions and various explanations are engraved upon the plates.

Notes & Queries

(1) C. L. asks: Is there any way to prevent a lignum vitæ block from checking? I have a piece that I use for cutting stencil plates on, and it has begun to check quite badly. I should like to prevent it without injuring the wood. A. Oil would have a tendency to stop it if frequently applied. A coat of paraffin would close the pores and prevent the action of the air upon the fibers. It might be bound with an iron ferule.

(2) F. B. asks what papier mache is composed of for making ornaments, also how to mix it for casting. A. It is a mixture of paper pulp and hot melted glue; the mixture is poured or cast while hot in moulds which may be made of plaster of Paris, and as soon as it sets by cooling is removed from the mould, and allowed to dry by exposure to the air; and when dry it is varnished or polished, according to the degree of finish that is required.

(3) S. A. H. writes: Please inform me how screw taps are hardened; those we have with the dies are a reddish color, and stand quite well, but we cannot make any that will stand at that color. A. It may be that you harden at too high a heat. Sprinkle pulverized yellow prussiate of potash over your taps. When they are heated to a dull red, again place them in the fire and increase the heat for a few moments until the prussiate is thoroughly fused or fluxed over the surface, and then immediately plunge and shake them (so that they will chill quickly) into and under clear cold water. When thoroughly cool, the tap or taps are to be removed from the water, then cleaned, polished, oiled, and tempered.

How are those collapsible tubes made used to put artists' oil colors up in? A. On very much the same principle as lead pipes are made—the metal is heated and drawn (in dies) to the required shape by pressure.

1. I have a Daniell battery (zinc was cast from chain pump buttons). It will not work sometimes for a long time, and then very weak. I would like to know the reason? A. It is likely that your battery zinc contains lead. 2. Can the sulphate of copper solution be made so strong as to impair the action of the battery? A. Not in Daniell's form of battery.

(4) J. L. P. says: In the SCIENTIFIC AMERICAN of December 15, 1877, under "Notes and Queries," is the following by H. R. H. (16): "What is the correct answer to the following example? 714—·714÷(·34—·034 ×·25 of 6)." There were two answers given, 1554 and 711·52942+. In your answer you say the second solution is the correct one. I claim the first (1554) to be the correct answer, and give my reasons below. A. The statement is ambiguous; it may be rendered in four different ways, thus: 1. (714—·714)÷[(·34—·034)×·25×6] =1554. 2. (714—·714)÷[·34—(·034×·25×6)]=2468·117. 3. 714—[·714÷[(·34—·034)×·25×6]]=712·444. 4. 714—[·714÷[·34—(·034×·25×6)]]=711·529. In the quotients, the decimals are carried out to only the third place.

(5) M. H. R. says: It is desired to deaden the floor in a schoolroom. The room is about 45 x 30, the ceiling underneath is of ⅛ inch boards. What would be the best and cheapest mode of doing it? A. Lay down two or three thicknesses of building paper under the floor plank.

(6) A. S. asks: How are blue photographic pictures made? A. First solution: Potassium ferrocyanide, 120 grains; water, 2 ozs. Second solution: Ammon-ferric citrate, 2 ozs.; water, 140 grains. Mix the separately made solutions, filter into a flat dish and float plain photographic paper on it for 3 or 4 minutes. Dry the paper in the dark and expose it to strong sunlight under the negative for 8 or 10 minutes. Wash the print in running water, dry, and mount. A little gum arabic in the bath is said to greatly improve the picture.

(7) J. M. S. asks: What are the coloring matters used by confectioners—red, blue, yellow, and green? A. Blue: Indigo powder, soluble indigo (sulphindigotic acid), Prussian blue. Yellow: Saffron, Turkey and Persian yellow berries, quercitron, fustic, and aluminous lakes of these. Mixtures of blue and yellow make green. Red: Cochineal, carmine or lake, Brazil wood lake, madder lake. Carmine is often adulterated with vermillion (mercury sulphide); it should, if pure, dissolve without residue in strong aqua-ammonia.

(8) A. H. J. writes: Can you inform me how I can obviate the following difficulty with my cook stove? A thick, black, tarry substance almost continually oozes through the joints of the pipe and drips onto the stove and carpet, and has a strong, disagreeable odor. The draft is good; the wood used is beech and maple, thoroughly seasoned. The pipe is nearly new and perfect, about 16 feet in length from stove to chimney, with only one elbow. The stove, with this exception, is an excellent one. A. The tarry substance you mention is a product resulting from the destructive distillation of wood, and consists principally of pyroligneous acid. Your stovepipe acts as a condensing worm to a still or retort, such as is used in chemical manipulations; in fact, you are making pyroligneous acid; but as you seem to take no interest or pleasure in this manufacture, we suggest as a means of preventing it that you connect your stove directly with a brick chimney, so as to use as little metal stovepipe as possible.

(9) F. H. S. asks for a good indelible ink to use with stamps? A. Mix equal parts black oxide of manganese and hydrate of potash, heat to redness, and rub with an equal quantity of smooth white clay into a paste, water being added for that purpose; or, sulphate of manganese, 2 drachms; lampblack, 1 drachm; powdered loaf sugar, 4 drachms; rubbed into a paste with water. After stamping, dry the linen and wash well in water. Mix aniline red or rubine extra, 2 to 4 drachms; alcohol and water, each 7 ozs.; glycerin, 15 ozs.; heat and rub together with a little tannic acid or sumac extract and alum water. For blue, use soluble water blue (aniline) dissolved in a sufficient quantity (about 150 parts) of hot dilute glycerin. Soluble nigrosine may in a similar manner be used for black ink.

(10) F. W. M. asks how to hold India ink in solution like that prepared by Winser & Newton? A. The ingredients are digested for two hours at a high temperature in a Papin's digester. A drop of clove oil should be added and a little ox-gall.

(11) J. V. asks: What is the feeding principle of the German students' lamp? A. The equilibrium of a liquid in communicating vessels. Consult some text-book on Natural Philosophy.

Will ordinary rubber bands answer for making a coating or cement by dissolving in bisulphide of carbon? A. No; use gum rubber or caoutchouc.

1. What is the cheapest manufacture of ammonia? A. By decomposing the solution of the sulphate or carbonate obtained from the liquor of gas works, by slaked lime aided by heat. 2. About what is the cost of manufacture per lb.? A. If you refer to aqua or liquor of ammonia, crude, 10 cents; chemically pure, 75 cents.

(12) D. S. asks: Is there any method of keeping the worm out of white hickory? A. The application of a dilute solution of tannin mixed with about 10 percent of zinc chloride is said to preserve the wood to some extent.

(13) J. S. asks: Is it practicable to manufacture ice by utilizing the cold given out by the expansion of compressed air (say to five atmospheres)? A. Yes, but the processes involving ether, anhydrous sulphurous oxide and other chemicals are more economical.

(14) S. S. asks: What can be added to common black writing ink to make it a copying ink? A. A little loaf sugar dissolved by heat.

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