patents. J. Elfreth Watkins as secretary of the executive committee has issued a request for the contribution of such articles from the citizens at large. Any one possessing such objects of interest should at once communicate with the secretary with a view to their exhibition.

The most permanent and lasting action has yet to be spoken of. It is proposed to hold meetings on the afternoon of April 7 and on the mornings of the succeeding days to organize the National Association of Inventors and Manufacturers. At these meetings addresses from representatives of the above branches of work are expected. This organization, if successful, may have far-reaching results, and in any case will serve to perpetuate the memory of what will, we believe, obtain recognition as one of the most important and significant conventions ever held in the national capital.

POSITION OF THE PLANETS IN APRIL.

URANUS

is morning star until the 19th, when he becomes evening star. He holds the place of honor on the April record, for his opposition to the sun takes place on the 19th, at 1 h. P. M. He is then on the meridian at midnight, at his nearest point to the earth, and in the best position for observation. He will be found about 8° east of Spica, retrograding or moving westward. He is visible to the naked eye as a faint star of the sixth magnitude. In the telescope he appears as a small disk, of a delicate sea-green color.

The moon is in conjunction with Uranus on the 23d, at 1 h. 26 m. P. M., being 2° 46′ north.

The right ascension of Uranus on the 1st is 13 h. 53 m., his declination is 10° 59′ south, his diameter is 3″.8, and he is in the constellation Virgo.

Uranus rises on the 1st at 7 h. 47 m. P. M. On the 30th he sets at 4 h. 30 m. A. M.

JUPITER

is morning star, and is joint actor with Venus in the most interesting event of the month. The regal planets are in conjunction on the 7th, at 4 h. 25 m. P. M. Jupiter is then only 13′ north of Venus, the space intervening between them being a little more than one-third of the diameter of the moon. Both planets are invisible at the time of conjunction, but will not be far apart on the morning of the 8th, rising about 4 o'clock, nearly an hour and a half before the sun. Jupiter is west of Venus, is receding from the sun, and approaching the earth, and when the month closes will rise more than two hours before the sun. Early risers who command a view of the southeast horizon will behold a charming celestial picture.

The moon is in conjunction with Jupiter on the 5th, at 5 h. 39 m. P. M., being 4° 34′ south.

The right ascension of Jupiter on the 1st is 22 h. 31 m., his declination is 10° 17′ south, his diameter is 32″.6, and he is in the constellation Aquarius.

Jupiter rises on the 1st at 4 h. 22 m. A. M. On the 30th he rises at 2 h. 42 m. A. M.

VENUS

is morning star. After her conjunction with Jupiter on the 7th there is nothing to vary the even tenor of her course as she draws nearer to the sun, rising later, lessening in size, and diminishing in luster. She is not half as brilliant as she was in January, her light number decreasing from 218 in January to 91 on the 1st. The illuminated portion of her disk increases during the month from 0·698 to 0·791.

The waning moon is in conjunction with Venus on the 5th, at 2 h. 32 m. P. M., being 4° 51′ south.

The right ascension of Venus on the 1st is 22 h. 12 m., her declination is 11° 31′ south, her diameter is 16″.4, and she is in the constellation Aquarius.

Venus rises on the 1st at 4 h. 7 m. A. M. On the 30th she rises at 3 h. 38 m. A. M.

MERCURY

is evening star. He reaches his greatest eastern elongation on the 19th, at 3 h. A.M., and is 20° 1′ east of the sun. The conditions at that time are most favorable for observation with the naked eye, and careful observers will be sure to find him, for he is in high northern declination, and sets about an hour and three-quarters after the sun. He must be looked for in the northwest, about three-quarters of an hour after sunset, a few degrees southwest of the Pleiades. If the sky be cloudless and the atmosphere pure, he will surely be found, shining with fitful brilliancy on the twilight sky.

The slender crescent moon, when one day old, is in conjunction with Mercury on the 9th, at 6 h. 14 m. P. M., being 4° 37′ south.

The right ascension of Mercury on the 1st is 1 h. 17 m., his declination is 8° 16′ north, his diameter is 5″.4, and he is in the constellation Pisces.

Mercury sets on the 1st at 7 h. 3 m. P. M. On the 30th he sets at 7 h. 59 m. P. M.

SATURN

is evening star. He reaches the meridian on the 1st at 10 h. 15 m. P. M., and still continues in most favorable conditions for telescopic observation. He is moving westward, and, in telescopes of low power, his rings no longer look like rings, but resemble lines of light passing through the center of the planet, and extending from each side.

The moon is in conjunction with Saturn on the 19th, at 0 h. 33 m. P. M., being 3° 16′ north.

The right ascension of Saturn on the 1st is 10 h. 56 m., his declination is 9° 11′ north, his diameter is 18.″4, and he is in the constellation Leo.

Saturn sets on the 1st at 4 h. 45 m. A. M. On the 30th he sets at 2 h. 46 m. A. M.

MARS

is evening star. He is in conjunction with Neptune on the 28th at 11 h. 26 m. A. M., Mars being 2° 17′ north.

The right ascension of Mars on the 1st is 2 h. 58 m., his declination is 17° 22′ north, his diameter is 4″.6, and he is in the constellation Aries.

Mars sets on the 1st at 9 h. 18 m. P. M. On the 30th he sets at 9 h. 7 m. P. M.

NEPTUNE

is evening star. His right ascension is 4 h. 12 m., his declination is 19° 31′ north, his diameter is 2″.5, and he is in the constellation Taurus.

Neptune sets on the 1st at 10 h. 44 m. P. M. On the 30th he sets at 8 h. 51 m. P. M.

Mercury, Neptune, Mars, Saturn, and Uranus are evening stars at the close of the month. Jupiter and Venus are morning stars.

How to Mount Maps and Drawings.

A short time since, in the "Query" column of your paper, I noticed an inquiry in regard to the best method of mounting drawings, etc., on cloth. The answer you gave, while correct, so far as it goes, is apt to mislead a novice, and will not give the most satisfactory results.

To begin with, a paste of good quality is required. When paste is made at home, trouble often arises from scorching, or from the addition of too much water. Thoroughly made paste, when spread on paper, will not strike through, but will remain on the surface, like butter on a piece of bread. To enable the paste to keep for several months in a cool place, add dissolved alum as a preservative, in the proportion of a tablespoonful of pulverized alum in two quarts of warm or hot water.

Put the water in a tin pail that will hold six or eight quarts, as the flour, of which the paste is made, expands greatly while it is boiling. *As soon as the water has cooled*, stir in good rye or wheat flour until the liquid has the consistency of cream. Beat thoroughly with a paddle-shaped stick, and see that every lump is crushed before placing the vessel over the fire. Care should be exercised to have the water cool before adding the flour, otherwise the paste will be lumpy.

To prevent scorching the paste, place on the fire a pot or kettle partly filled with water, and set the pail containing the paste materials in the water, permitting the bottom to rest on a few large pebbles to prevent excessive heat. Of course, a "farina kettle," or "double boiler," is better, and will be less troublesome to handle, but the "ruling element" of the kitchen will not always permit its use. Add a teaspoonful of powdered resin, a few cloves tied in a cloth, so that they will flavor and not discolor the paste, let it cook until it assumes the consistency of "mush," then, if any lumps appear, strain through a sieve. Keep in a tight jar, and if it becomes too thick after standing, put the quantity required in a suitable dish, and thin by adding cold water and stirring thoroughly.

So much for the paste. Now let us proceed to the mounting. Cut the cloth from one to two inches larger all around than the drawing or paper to be mounted. Lay it on a drawing board or table, dampen well with a sponge, stretch lightly, and tack down; use small tacks, and place them four or five inches apart, or closer, if necessary.

Leave it for a moment, and while its surface is evaporating and absorbing the surplus dampness, lay the drawing, map, or paper to be mounted face downward on another table, and dampen the back with a wet sponge. Returning to the cloth, with a brush (a large, round fine-haired paint brush is best) lay the paste on evenly and smoothly, and then, after the surface is well covered, take the brush and BEAT *the paste* thoroughly into the pores of the cloth. After this is done, smooth the surface nicely.

Take up the paper by the corners, and, if the thickness of the paper seems to require it, apply the sponge again. The paper should be *limp, but not wet.* If it is not well prepared, my experience has been that the surface will "blister," particularly on large drawings, for the paste adheres much better to a damp surface than to a dry one.

At this stage it is best to obtain some assistance. Have your assistant grasp two of the corners of the drawing or paper while you manage the others, holding the paper suspended horizontally a few inches above the cloth. When it is in the right position place your end on the paste-covered cloth, while your assistant still holds his end up. Place a piece of clean paper on top to prevent smearing the sheet, and with the hands brush quickly from the middle of the end toward both sides, working constantly toward your assistant as he slowly lowers the paper to the cloth. Rapid manipulation is necessary to insure perfect contact and a smooth surface.

Should any "blisters" develop, rub them briskly with the bone handle of an eraser or any similar substance. Small undulations will disappear when the cloth dries. Stand the board aside with the cloth tacked to it, and allow to dry thoroughly, then cut off as required.

Ordinary bleached cotton cloth or sheeting makes a good backing for small sheets, while large ones are best mounted on a heavy grade of unbleached material. These directions are general, and have been found to work well in practice. Individual experience can alone, however, determine many of the details.

Other paste than that described may be used if desired, though it is doubted whether a better can be obtained. Should any of your readers know of a better method, many, including the undersigned, would doubtless be glad to hear of it. CHAS. L. BAILEY.

Washington, March 9, 1891.

The Water Beetle.

Lately I kept for a few days for inspection that very beautiful insect the water beetle. The specimen was large and splendidly colored, gold banded, and displaying brilliant iris hues on its legs. I placed it in a glass jar of water. On the surface of the water some leaves were laid. On one side of the jar, at the bottom, was pasted a square of paper, and to the shelter of this the beetle often retired. It seemed to take the greatest delight in darting, swimming, and diving, rising from the bottom of the jar to the top of the water by long, vigorous strokes of its hind legs. Then joining its second pair of legs before it, like a swimmer's hands, and stretching the hind pair out nearly together, it would dive to the bottom. It slept hanging head downward under the leaves, with the tip of the body above the water to secure air.

It showed the pleasure of a child in "blowing bubbles." Rising to the surface, it would put the tip of its body above the water, part the elytra, and take in air; then, closing its case, it would dive to the bottom, stand on its head, emit the air bubble by bubble until it was exhausted, and come up for a new supply. It seemed to need the daily renewal of the water in the jar. When it was hungry, or the water was not fresh enough, it became dull and sulky, and hid behind the paper. After the beetle had fasted twenty-four hours, I laid on the top of the water a wasp, a mosquito, a blue bottle fly, and a common fly, all dead. The beetle, being at the bottom of the jar, did not seem to see or smell these insects. Rising presently, he came up against the mosquito, seized the body in his jaws, and sucked it dry with one pull. He then found the blue bottle, carried it down to the shelter of the paper, trussed it neatly, cutting off the wings, legs, and head, and letting them float to the surface. He then held the body in his hands, or short front feet, pressed to his jaws, and sucked it dry. After this he rose to the surface, found the other fly, and served it in the same fashion. Next he found the wasp, a large one. Carrying this below, as he had the flies, he clipped off the wings and legs, but took the precaution to suck the head and thorax before turning them adrift. He also grasped the body in his hands, pressed the part that had been cut from the thorax to his mouth, and holding it exactly as if drinking out of a bottle, he drained it dry.

I found that he could eat all the time, except when he was asleep or playing, and his activity was in proportion to the quantity of his food. Cooked meat he would none of. Raw beef he did not greatly like, but raw veal he prized even above wasps and blue bottles. I cut an ounce of raw veal into dice, and dropped it in the bottom of the jar in a heap. He did not seem to see or smell it, but after a while happened to dive into it. He appeared to be full of joy at the discovery. One fragment after another he took in his hands, held it closely to his jaws, and sucked it dry by strong pulls. At each pull I could mark the receding red juice of the meat. When the veal was reduced to a pale fiber, he let it go and took a fresh bit. He always retired to the shelter of the paper to eat, with the sole exception of the mouthful he made of the mosquito. Like the King of Dahomey, he would not eat in public. —*Julia McNair Wright, in Science.*

Engineers Must Study.

A few years ago, says the *Stationary Engineer*, no one dreamed that in so short a time the electric light would become a regular part of the equipment of mills and factories. It was only when the dynamo found its place in the engine room and the incandescent light sparkled in the shops and workrooms that the engineer found anything of special interest to him in the study of electricity. Now he must study it whether he will or no, and though the knowledge he most requires must be of a practical nature, he must have a goodly amount of theoretical or "book" information in order to understand what he is doing.

What a Horse Would Say if He Could Speak.

Don't hitch me to an iron post or railing when the mercury is below freezing. I need the skin on my tongue.

Don't leave me hitched in my stall at night with a big cob right where I must lie down. I am tied and can't select a smooth place.

Don't compel me to eat more salt than I want by mixing it with my oats. I know better than any other animal how much I need.

Don't think because I go free under the whip I don't get tired. You would move up if under the whip.

Don't think because I am a horse that iron weeds and briars won't hurt my hay.

Don't whip me when I get frightened along the road, or I will expect it next time and may be make trouble.

Don't trot me up hill, for I have to carry you and the buggy and myself too. Try it yourself some time. Run up hill with a big load.

Don't keep my stable very dark, for when I go out into the light my eyes are injured, especially if snow be on the ground.

Don't say whoa unless you mean it. Teach me to stop at the word. It may check me if the lines break, and save a runaway and smash up.

Don't make me drink ice cold water, nor put a frosty bit in my mouth. Warm the bit by holding it a half minute against my body.

Don't forget to file my teeth when they get jagged and I cannot chew my food. When I get lean, it is a sign my teeth want filing.

Don't ask me to "back" with blinds on. I am afraid to.

Don't run me down a steep hill, for if anything should give way, I might break your neck.

Don't put on my blind bridle so that it irritates my eye, or so leave my forelock that it will be in my eyes.

Don't be so careless of my harness as to find a great sore on me before you attend to it.

Don't lend me to some blockhead that has less sense than I have.

Don't forget the old book that is a friend of all the oppressed, that says: "A merciful man is merciful to his beast."—*Farm Journal.*

The Source and Force of Electricity.

"All the energy in the world," said Dr. C. F. Chandler, in a recent lecture before the Columbia School of Mines, "comes from sunshine. Even the energy in the electric battery that rings the door bells of our homes has its origin in the light of the great solar system. The force in the copper wire that sets the bell to ringing comes from the zinc plate in the battery jar. The energy in the zinc plate comes from the anthracite coal with which it was burned when taken from the mines, and, finally, the energy in the anthracite coal was put there by the sunlight that fed and nourished it when it existed, ages ago, as trees and plants.

"An interesting misapprehension that exists in the minds of a good many persons is concerning the vital dangers that lurk in the pressure of say a thousand volts. The newspapers often tell us that a man has been killed by such a pressure, whereas, in fact, such a pressure alone couldn't kill a humming bird. I have frequently caught in my hand sparks possessing an electro-motive force of 100,000 volts without feeling anything more than a very slight burn.

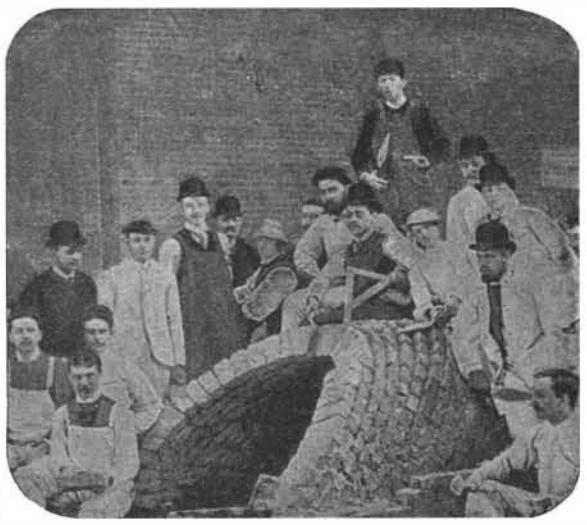
"The danger arises only when the volts are re-enforced by a good many amperes or currents, as when one takes hold of a charged wire. Then one feels a shock that is unmistakable, because the force of a great many currents in the wire suddenly decomposes all the fluids in his body. The salt in the blood at once turns to chlorine gas, and the man whose veins are charged with this deadly poison cannot in reason be expected to live long."

IT is computed, in recently made statistics, that the glass bottle production of the world amounts to a daily output of a little over eleven million bottles. Of these, Germany, Belgium, and Austria-Hungary make more than three-fourths, England and Sweden coming next, while the production of France and the United States combined is said to be quite inconsiderable in comparison.

ORIENTAL METHOD OF VAULTING.

Layard describes some curious channels or drains found in excavating at Nimroud and Kouyundjik. At Khorsabad he found the same thing in better condition and more carefully constructed. The drains were formed of arches, pointed, semicircular, and elliptical. These are illustrated by very good engravings taken from Perrot and Chipiez's "History of Chaldea and Assyria."

In the case of the pointed arches, there are no keystones. The openings left at the summits of the courses

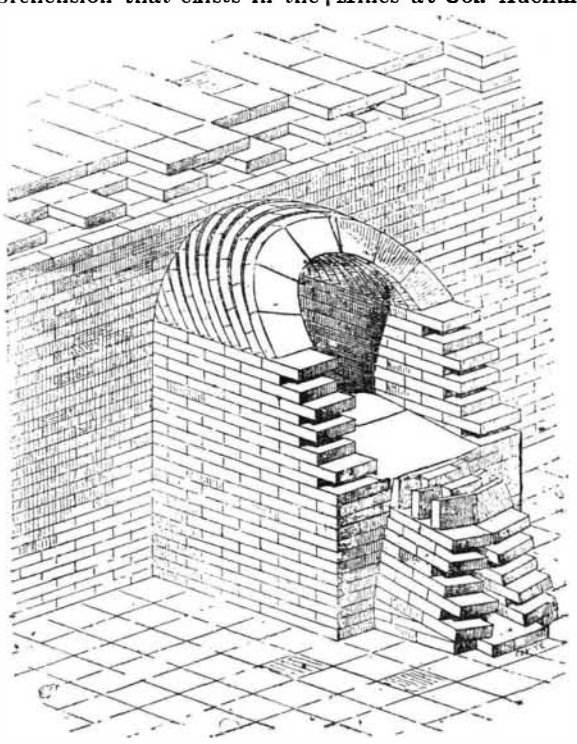


VAULT FORMED WITH SLANTING ARCHES.

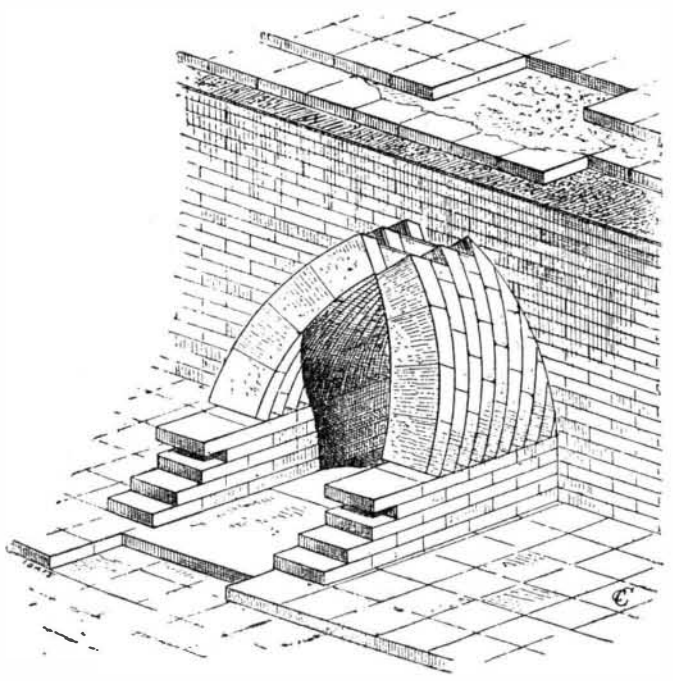
are filled in with brick earth beaten tight, and serving the purpose of keys; but the most remarkable peculiarity of these drains is the fact that the different courses of the arches have considerable inclination in the direction of the length of the drain or vault. The most plausible explanation of this peculiar construction is that it was adopted to facilitate the work of the bricklayers.

According to this explanation, the first course of voussoirs would be sloped, and would rest upon a mass of crude brick at the center of the building; the bricks of the second course would lean against those of the first, and so on throughout the entire structure. This method of building could be easily carried out without an internal support, and as a consequence this kind of work could be rapidly carried forward with but few laborers.

In a lecture recently delivered before the Brooklyn Institute, by Prof. W. R. Ware, of the Department of Architecture, Columbia College, a very interesting description of this mode of vaulting without timber centers was given, and applications of the principle to the formation of large arches and vaults were illustrated. Among the noteworthy illustrations was one which we here present of a vault built upon this principle by some of the students of Columbia College School of Mines at Col. Auchmuty's Industrial School in this city. This experiment clearly proves that a vault can readily be built according to this system without timber centers.



SEWER AT KHORSABAD—SEMICIRCULAR VAULT.



DRAIN AT KHORSABAD—POINTED ARCH.

In view of the simplicity and practicability of this method, it would seem to be worthy of the attention of modern mechanics, as long stretches of vault suitable for many uses can be quickly made in this manner, and the time and material required for the erection of timber work can be wholly saved.

It will be seen that only enough inclination is required in the successive courses to cause the bricks to retain their position by their own friction until the course is complete.

Life of Incandescent Lamps.

In the manufacture of incandescent lamps, success may be said to depend on several small points. The exhaustion, we know, must be as complete as possible to insure long life and reasonable efficiency. During the exhausting process it is the usual practice to heat the carbon filament to incandescence, in order that all air contained in the substance may be expelled. It has been found that if the filament is heated at too early a point during the exhausting process, it produces a more or less porous condition of the carbon and that a lamp made in this manner has neither a very long life nor a high degree of efficiency after having been in use for a short time. As an improvement on this, the globes are exhausted to as great a degree as may be and in as short a time as possible; then the current is passed through the carbon, and it is brought to incandescence for a few moments while the vacuum pump is still working. The vacuum pump used in this process is wholly mechanical and very quick acting and is reported to be much quicker in its action than the mercury pumps commonly in use for this purpose. From two sets of lamps made from similar filaments, a writer in the *Stationary Engineer* has discovered that one set exhausted in the usual way by mercury pumps, while the filaments were heated by the current, the other set treated with the mechanical pump and the current sent through the filament just previous to sealing the lamps, showed in the latter case the highest efficiency and longest life. The reasons for this may be inferred to have been that in the former case the filaments were partially disintegrated in the rarefied atmosphere.

The Chinese Can Sing.

An impressive scene recently was presented at the Congregational church in Stockton, California. The occasion was the celebration of the anniversary of the Chinese Mission in that city. A part of the exercises consisted of singing in chorus and solos and addresses by the Chinese. The singing, especially of solos and hymns, was a surprise, as it was generally supposed that the Chinese were destitute of capacity in that direction and incapable of appreciating harmony, judging by what travelers in China tell us and of the barbarous exhibitions given in this country by untaught immigrants. One soloist particularly carried the audience by storm and elicited applause that was with difficulty checked.

Filing Commutators.

Whenever it becomes necessary to file the commutator of a dynamo or motor, the persistency with which the copper will stick in the creases of the file causes considerable annoyance, and not only this, but the particles will scratch the copper segments. Filing a commutator is not the best way of dressing one up, but it is infinitely superior to allowing it to run while in a rough condition.

If the filing is done steadily while the machine is running at a fair speed only, no difficulty need result from such practice. The greatest trouble will be found in the particles of copper sticking in the grooves of the file. This can be practically avoided, says the *Stationary Engineer*, by first wetting the file in a bucket of water, which will prevent the copper particles from sticking, although it allows them to accumulate, but that is no detriment, as they can be easily washed out simply by the application of water while rubbing with the fingers. To keep the file wet, a bucket of water should be kept close at hand, into which the file is to be dipped before commencing work and as often afterward as occasion may require. The small amount of moisture that will adhere to the file will not in any way injure the commutator or its insulation. The greatest difficulty to be met with will be in keeping the commutator round. If filed out of round to such an extent as to cause any trouble, the commutator should then be chalked and the high places filed down, which will bring it sufficiently true to work without trouble of any kind. From a number of experiments in drilling and filing copper we have found, says the writer, that the use of water assists materially in the work when the tools are kept wet with it.