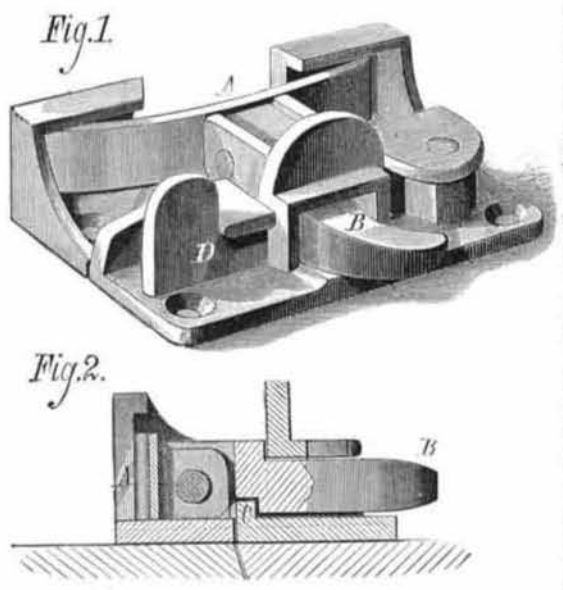
IMPROVED WINDOW FASTENER.

The annexed engraving represents a novel and simple device for fastening the sashes of windows at the meeting rails, so that said sashes cannot be raised or lowered by any one from the outside. The ordinary form of spring catch is after some use apt to work loose and to be freely movable, and it has often been opened by burglars introducing a thin steel blade between the rails and thus pushing it back. With the present invention this is impossible. The portion A, which is attached to the lower rail of the upper sash, has lugs in which is pivoted the tongue, B, which is acted upon by the leaf spring shown. This tongue may be turned up vertically, so as not to be in the way of raising or lowering either sash, and is retained in position by the action of the spring.

Pivoted in the portion of the device which is attached to



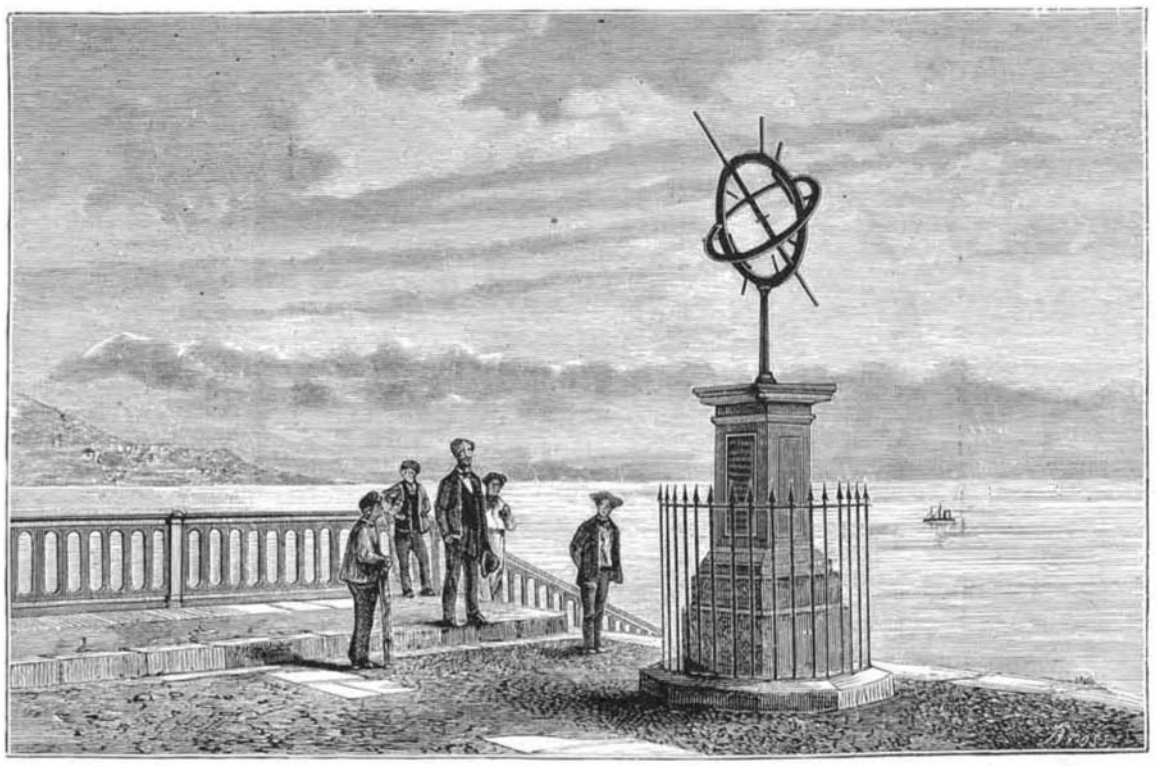
the upper rail of the lower sash is a spring clamp or catch, D. This has a recess which, when the tongue, B, is turned down, comes over said tongue, so that the same is thus prevented by the catch from rising or being moved sideways. A perspective view of the tongue thus secured is shown in Fig. 1 and a sectional view in Fig. 2. It will readily be seen that the device cannot possibly be tampered with by any one outside the window, as no tool can be introduced to reach and push back the catch, D. Patented September 4, 1877, through the Scientific American Patent Agency. For further particulars, address Clark & Smith, Chester, Orange county, N. Y.

THE COSMOGRAPH.

M. Riviere, of Marseilles, France, is to be credited with a capital idea for popularizing astronomical knowledge through the medium of a simple monument which may be set up in public squares, private grounds, or any other convenient locality. Several have already been erected in French cities, and our illustration, from *La Nature*, represents the one lately constructed at Nice.

The cosmograph, as the invention is called, shows, first, by a vertical circle, the plane of the meridian. A rod, directed toward the polar star, passes diametrically through the circle and shows the position of the earth's axis. A circle placed at right angles to the first indicates the plane of the equator. Of course the inclination of the axial rod varies according to the latitude of the locality. A small rod, placed vertically above the meridian circle, shows the zenith. Four other arms, fixed 23° above and below the equator, mark the tropics, and four more, placed at the same distance from the points of intersection of the axis, mark the polar circles. The graduation comprised between the tropics allows of the sun's movement in declination being followed, the solstices and equinoxes being observed, and the succession of seasons noted. The equator, divided into degrees and receiving the shadow of the axis, becomes a sun dial, an arc of 15° counting one hour. After a little practice it is easy to refer the curves of the cosmograph to the heavens, when the principal constellations may readily be found, especially those of the zodiac, through which passes the plane of the ecliptic or annual apparent path of the sun.

Inscriptions in relief show the names of the various portions of the instrument, and several useful astronomical facts and data are engraved on the pedestal.



THE COSMOGRAPH.

The Ventilation of Passenger Cars.

If the agitation of this subject during the past few years has not been productive of the best results that could have been desired, it has at least awakened public attention to the importance of car ventilation, and stimulated inventors in their efforts to devise more effective means for securing it. It is no very difficult matter to keep passenger cars tolerably well ventilated in summer, so far as the requisite supply of fresh air is concerned. An abundance of it can be introduced through open doors and windows, and by the ordinary roof ventilators—sufficient at least to disinfect or replace that which has been contaminated by breathing.

In winter, however, the conditions are very much changed. For at least seven months in the year, in this latitude, an artificial temperature, high enough for comfort, must be maintained, and this kind of comfort the great mass of railway travelers insist upon having. If good ventilation can be had along with it so much the better, but a chilly atmosphere and direct drafts from the outside must be avoided at all hazards. These tell at once upon the physical sensibilities, while the breathing of warm and impure air produces no immediate discomfort, nor does it excite any very great alarm with most people, even when headache, lassitude, and faintness supervene.

If the owners of a car can afford to line it with costly cabinet woods and showy trimmings, they can afford to furnish the occupants with the needed supply of pure air which surrounds it in a vast volume on every side and presses for admission.

Car builders in their discussions of this subject have attached, as it seems to us, an undue importance to a scientific analysis of the vitiated air in cars, as if there was any question about its deleterious qualities. Whether carbonic acid gas and the organic poisons, exhaled with the breath or discharged from the pores of the skin, go up or down, or are diffused through the car, or whether they will kill at ten paces or fifty paces, is not very material. They are in the car, and the essential thing is to get rid of them in a quiet, automatic sort of way, so that passengers will not know that it is being done. Under the conditions of winter ventilation, this can only be accomplished by a constant process of expulsion, and the introduction of a corresponding supply of warm and uncontaminated air. A car full of bad air will not go out unless an opportunity is afforded, and some of it will not go even then unless forced; and the necessary force or motive power must be derived from the speed of the train, or an inflowing current induced by rarefaction, or both combined.—*National Car Builder.*

Strength of Steel made without Blows.

At the recent meeting of the British Iron and Steel Institute, at Newcastle, England, a paper was read by M. Gautier relative to some remarkable experiments made with artillery produced from steel fabricated without blows, or, in other words, metal which had been simply cast, tempered, and reheated. A tube 8 inches in diameter was made with a hole 5 inches in diameter, so as to leave but 1½ inches of metal on the outside. Nothing was done besides tempering or reheating, after which the tube was grooved and a screw head adapted to carry the breech. Twenty shots were first fired with 9 lbs. of powder and a 40 lb. shell; then 10 shots with a shell weighing 47 lbs., and thereafter the charges of powder were successively increased by ¼ of a lb. every ten shots, the shell remaining identical until the 100th shot was fired. On examination, no fissure of any kind in the metal was discovered, and the deformation of the chamber was found to be less than half the average in forged steel tubes.

Previous to this test, several pieces of the metal were cut perpendicularly from the axis of the tube. The average results of four trials were as follows: Limit of elasticity in tons per square inch, 22·35: charge of rupture, 39·67; lengthening per cent, 12·47.

IMPROVED SAFETY ALARM AND DOOR BELL.

The annexed illustration represents a new safety alarm which may be used by travelers to attach to the door knobs of their rooms in hotels, so that no one can enter without the fact being indicated by the ringing of a bell. The bell is attached to a steel spring which is secured in one of the two slits, A or B, on the standard by means of suitable set screws. The foot at the lower end of the standard is cross filed so that it will not slip on the knob when attached as shown in the engraving. To secure the device in place, a

rubber strap passes around the shank of the door knob and buttons on a screw on the standard. The knob consequently cannot be turned from the outside without the bell being caused to ring. The arrangement may also be modified so as to form an efficient permanent door bell. In this case a rod passes through the door casing and is rotated by a crank handle outside. The inner end enters a square hole in the standard where it is secured in a set screw. On a suitable guard plate are provided arms which extend on each side of the vertical standard and prevent its being turned down too far. The bell is adjusted, in accordance with this arrangement in the lower slit, B.

Housekeepers and business men generally will find the alarm device a useful means of protection, as burglars seldom venture in a room when the bell rings. If arranged on the chair round, the chair may be placed at an open window, and an attempt to move it will ring the bell. Farmers can attach it to outhouses, and if they wish, extend a cord or wire from the outhouse to the bed room, so that an attempt to enter will notify them, and the burglar, not hearing it ring, can be surprised and captured.

Patent pending through the Scientific American Patent Agency. For further particulars, address W. N. Patterson, Frankfort, Ky.

Spectrum of Candle and Gas Lights.

With the aid of the spectral photometer MM. Vogel and Müller have examined the most common sources of light with regard to their intensity in different parts of the spectrum, and have reached the following, among other results: The light of a wax candle is in the blue weaker than that of the stearin and paraffin candle. Petroleum shows in blue greater intensity than oil. A petroleum lamp with the wick newly cut emits more blue and violet rays than when it has burnt some time. A gas flame is in red and blue and violet brighter than a petroleum flame. The individual parts of flames which show a considerable difference as to total intensity differ but little with regard to different parts of the spectrum. A petroleum lamp emits more refrangible rays than a Silber oil lamp, but the reverse is the case with a Silber lamp burnt with petroleum, as compared with the same ordinary petroleum lamp. A comparison of a petroleum lamp with a Drummond limelight led to the result that the Drummond lime light has a considerably greater intensity in the spectrum from green downwards, this being even doubled in the blue and violet colors.

1. Platanthera bifolia. 2. Ophrys apifera. 3. Cypripedium calceolus. 4. Orchis Morio. 5. Oncidium lentiginosum. 6. Burlingtonia decora. 7. Vanda tricolor. 8. Phalænopsis amabilis. 9. Cattleya maxima
10. Restrepia elegans. 11. Odontoglossum grande. 12. Dendrobium chrysanthum. 13. Coryanthes Albertinæ. 14. Stanhopea ornatissima. 15. Cymbidiu aloëfolium.

GROUP OF ORCHIDS INDIGENOUS AND EXOTIC.—[See next page.]

A Curious Experiment.

We have now at Central University a singularly beautiful experiment in operation, showing the motion of the earth. It has been contrived and successfully completed by Professor T. W. Tobin, who has charge of the department of chemistry and physics in the University. The apparatus may be briefly described as follows: Upon an iron stand, about six feet in height, an exceedingly delicate pendulum is suspended; attached to the upper portion is some mechanism and a fine index needle. The apparatus was brought to a state of perfect repose, and then the pendulum, by means of a fine silk, vibrated north and south. In the course of six minutes the index showed that the normal relation between the pendulum and the earth had altered, and a longer interval indicated an increased variation. In 1851 Foucault, a French scientist, reasoned that while all bodies are governed by gravity, independent motion is not: that in virtue of inertia, a body moved will continue in motion forever; so a pendulum once started in vibration will continue to oscillate in the same direction until gravity and the friction of the air bring it to a state of rest.

The earth's revolution being a circle, there must be a variable relation between the two motions, namely, the circle and the straight line of the pendulum's direction. The apparatus now described shows this relation. An experiment was made by Foucault in Paris with a pendulum over 200 feet long; a similar experiment at Bunker Hill and then at Yale College prove the principle: but the apparatus employed was costly and cumbersome. The instrument at Central University is simple and delicate, and is calculated to create interest in scientific circles.—*Kentucky Register, Richmond, Ky.*

Hot Water for Tire Shrinking of Wheels.

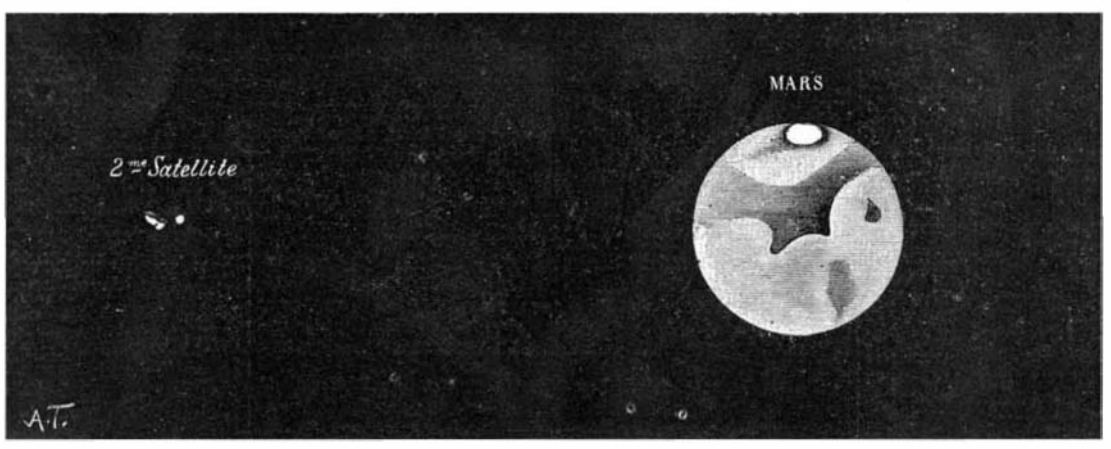
The expansion of tires by hot water, though not claimed to be new, is believed by the author to be much superior to the ordinary method of using fire. As applied on the Moscow-Nijni Railway, an iron tank, one fourth filled with water, is fixed near a stationary boiler, a steam pipe from which is led through it, capable of heating the water to 212° Fah. Into this the tire is plunged by means of a portable crane, and after an immersion from ten to fifteen minutes, is taken out and immediately placed on the wheel. Three men only are employed, who will fix from twelve to fourteen tires in a day of eleven hours. The allowance for shrinking (the difference between the diameter of the skeleton and that of the tire) is 0·75 millimeter to a meter. This is ascertained by gauges of great accuracy, and, if deviated from, the tire will be either loose after cooling or too small to get on the wheel. When fire is used, the tire can never be heated equally or cooled equally in all parts, and in consequence is sure to be more or less oval in form, which is not the case in hot water. The above railway made a comparison between the two, the results of which are given. It appears that, during a six years' trial of fire-shrunken tires, 37 per cent ran loose and 5 per cent were broken; while during a three years' trial of water-shrunken tires less than 1 per cent ran loose, and only a single tire was broken. The liability to breakage in the former (produced by the irregularity in form) is much insisted on by the author as being, of course, more dangerous and costly than the loosening of the tire.

THE SATELLITES OF MARS.

We take from *La Nature* the annexed engraving of the planet Mars and its second satellite, as the same appeared through the great telescope at the observatory of Paris, at 10:15 P.M., on August 27 last. The first satellite moves around the planet in 15 hours, at an average distance of 9,000 miles; the second completes its course in thirty hours, and is distant about 15,000 miles. Both bodies are very small, and their observation requires powerful instruments. Judging, however, by its brilliancy, the diameter of the second satellite is estimated at only some 30 miles.

Future observation of their motion will lead to the exact determination of the elements of their orbit, and will show whether the revolution is relatively direct, as in the case of the moons of Jupiter and Saturn, or relatively inverse, as in the case of the satellites of Uranus and Neptune. It will also lead to more exact data relative to the mass of Mars.

In a former article on the discovery of these bodies, we noted the fact that while most astronomers did not regard it even as probable that Mars might have satellites, others had admitted the possibility, and had predicated their admission on certain physical characteristics of the planet itself. *Les Mondes* has recently published an extract from a work by Béron, a French astronomer, entitled "Celestial Physics," and printed in 1867, wherein the author says: "Mars is distinguished from the seven other planets by its satellite, which no one has ever seen, although it exists, because Mars has thrown out jets of burning matter, to which are due, first, its rotary movement, and, second, the existence of two recesses which appear to be movable spots. It appears, incontestably, that these spots are due to light reflected in different degrees by the slopes of these recesses, which are constantly being differently exposed to the sun and to the earth."



MARS AND ITS SATELLITES.

ORCHIDS.

The orchids constitute a beautiful family plant, so called from *orchis*, their ancient name. Popularly any one of the family, of whatever genus, is called an orchis. Their number is legion, and includes a veritable host of smaller flowering kinds, whose blossoms yield in nothing but size to their larger compeers; and their beauty and conformation, when looked for, is often more extraordinary and interesting.

The large illustration on the preceding page gives a comparative idea of some of the orchids, collected from different countries. For instance, the *Restripui*, Fig. 10; the *Burlingtonia*, Fig. 6; the brown and golden twisted *oncidians lentiginosum*, Fig. 5; and the brilliant *odontogossons*, Fig. 11; are inhabitants of North America. The strangely tinted, blue, white, and brown *banda tricolor*, Fig. 7; the white *pholœnopsis*, Fig. 8; the orange and brown *dendrobium chrysanthum*, Fig. 12; belong to Asia. South America gives the beautiful *cattleya maxima*, Fig. 9, with its varying colored lips; the curiously formed purple *coryanthes*, Fig 13; and the large *stanhopea ornatissima*, Fig. 14; with its

Fig. 1.

Fig. 2.

Fig. 3.

Fig. 4.

sweet scented yellow and brown dotted blossoms. The Chinese *cymbidium aloefolium*, Fig. 15, with its yellowish brown blossoms forms, the link between the orchids of the tropics and the temperate zone.

In the lower group is given the modest flowers which are the parents of their larger and more grotesquely developed descendants. In this group are represented the lady's slipper (*cypripedium calceolus*) Fig. 3, and the shoe-shaped *orphrys apifera*, with a bee-like lip; the sweet scented meadow hyacinth, *platonthera bifolia*, Fig. 1; and the common *orchis morio*, Fig. 4, from which the class receives its name.

The distinguishing feature of the orchids is the column and it is embodied in them all, be they large or small. Figs. 1 and 2 give an enlarged representation of this column, Fig. 1 being a front view, and Fig. 2 a side view, of the same of the indigenous orchid (*latifolia*) while Figs. 3 and 4 give the same views of the exotic flower.

Orchids are among the most valued of cultivated flowers, some for their beauty, others for their fragrance, while others are admired for their grotesque forms. The forms are sometimes wonderfully simulative. The flowers of one species resembling the mouth of a cuttle fish, others resemble a large spider, while in other species the flowers bear a great resemblance to various insects, for instance the butterfly orchid (*oncidium papillo*) which in form, size, and color resembles somewhat a gaudy butterfly.

The cultivation of orchids is a passion with many horticulturists, who spare neither time nor expense in their favorite pursuit.

A New Military Arm.—The Torpedo Hunters.

A correspondent of a German journal, writing from Erzeroum, gives the following account of the new corps of divers which has been organized by the Turkish government for the purpose of removing the torpedoes laid down by the Russians in the Danube and on the shores of the Black Sea:

The divers are Mohammedans from Lazistan, and a certain number of them are attached to each of the Turkish squadrons cruising in the Black Sea. When the ships arrive near a spot where the existence of torpedoes is suspected two of the divers row to the place in a very light boat, drawing so little water that there is scarcely any danger of its striking against the torpedoes. On arriving at their destination one of the rowers dives into the sea; if he finds a wire or rope by which the torpedo is attached he cuts it with a sharp instrument and returns quickly into the boat. The liberated torpedo floats to the surface of the water, the men pass a short lasso around it, take it in tow, and then row back to the ship as quickly as possible. For each torpedo thus captured the divers are paid $45, and also a sum of money equal to one half of its value. Although the men have been often employed on this dangerous service, not a single accident has occurred to any of them.

Effects of Timber Waste.

Colonel Playfair, British Consul General for Algiers, has sent to his government a report which offers some striking instances of the injury done to a country by the reckless destruction of forests. He states that the principal cause of the decadence of the entire region of Tunis and Algiers and the exhaustion of the soil is directly owing to tree felling. Meteorological observations have been carried on in Algiers since 1838. During the first twelve years of the intervening period the rainfall averaged 32 inches annually, during the second twelve years it had decreased to 30·8 inches, and during the last fourteen years it has been but 25·5 inches. The decrease became apparent after the first serious clearings of wood in 1845, and during 1876 so exhausted had become the soil that a famine seemed imminent in Western Algeria.

Magnetization of Sheffield Steel Bars.

M. Gaugain, who for some time has been conducting investigations with the influence of heat on magnetization, has recently announced some very curious results obtained with Sheffield steel bars. He found that, when certain bars were magnetized at a high temperature and cooled, their magnetism entirely disappeared, and then changed sign; so that if a bar had been magnetized when hot in a certain direction, it was found to be magnetized in the opposite direction after returning to the ordinary temperature. When heated afresh, the inverse magnetism, which is always very feeble, vanished, and the primitive magnetism reappeared. The same change of sign is reproduced when the bar is again cooled.

Experiments with the Dynagraph.

The Springfield (Mass.) *Republican* of recent date says: A very interesting series of experiments have been in progress on the Boston and Albany road the past few days by means of the dynagraph car of the Eastern Railway Association, in charge of P. H. Dudley, which has been run between Springfield and Worcester on both freight and passenger trains, to test the relative amount of power required at different points along the road, especial reference being had to the Springfield and Charlton grades. The experiment on the Modoc train, leaving Springfield at 6.30 A.M., which, on the day in question, consisted of two sleepers, four passenger and baggage cars, and the dynagraph car, showed power required as follows: For the first 2,920 feet out of the depot the tension on the draw-bar was 6,526 lbs.: for the next mile 6,469 lbs., the rate of speed being 32 miles per hour; for the next, 6,200 lbs., the speed being 36 miles and for the last 1,100 feet, to the top of the grade, 6,250 lbs. The last mile required the engine to produce 19,625,800 foot pounds of power per minute.

In going up the grade from East Brookfield to Charlton, beginning at the station, the tension on the draw-bar for the first 3,880 feet was 5,722 lbs.; for the first full mile, the velocity being 37·5 miles, 4,280 lbs.; for the second mile, with 37 miles velocity, 5,232 lbs.; third, with 36 miles velocity, 5,450 lbs.; fourth, which contains a sharp curve, with 37 miles velocity, 5,612 lbs.; fifth, with 41 miles velocity, 5,230 lbs.; and sixth, which ran a little past the summit at Charlton, 4,356 lbs.

The engine had an 18 inch by 24 inch cylinder, and the track was in excellent condition. The maximum of the