CALIFORNIA'S FAMOUS BIG TREES.

In some twenty irregular groups, extending through a distance of about two hundred miles on the western slope of the Sierra Nevadas, from Calaveras through Tulare County, California, are found what are known as the famous "big trees" of California, one of which forms the subject of our illustration, and, wonderful to relate, although a passageway has been cut through it through which stages regularly pass, the tree still lives. This tree is in the Mariposa grove, and is 28 feet in diameter. A still larger tree in the same grove is known as the "Grizzly Giant." It is 34 feet in diameter. The highest of these trees is in the Calaveras grove, and it is 325 feet high.

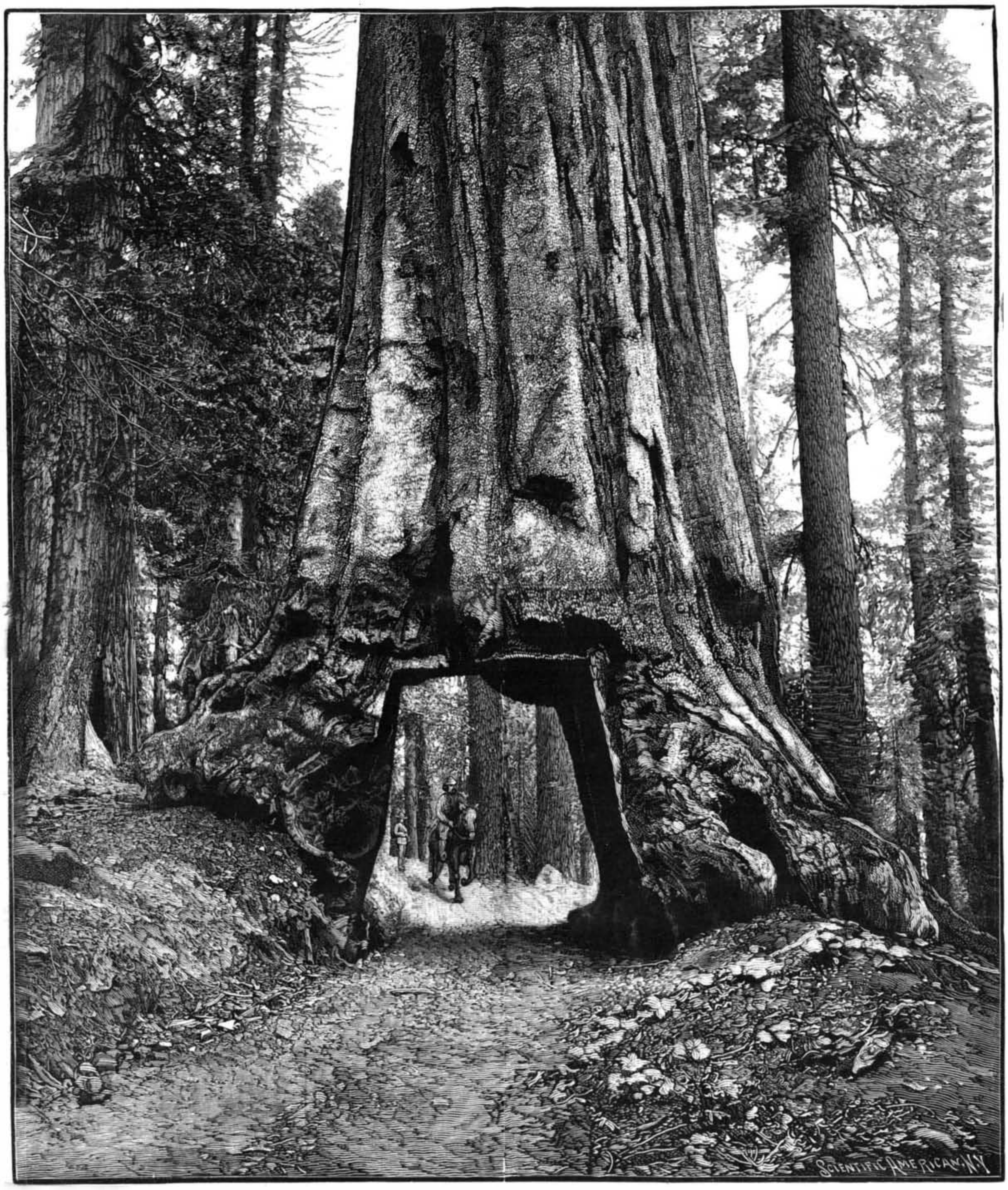
This tree, the *Sequoia gigantea*, should not be confounded with the California redwood *Sequoia sempervirens*, a tree which quite frequently reaches a diameter exceeding 15 feet and a height of 300 feet. The largest specimen of this tree is seven miles south of Santa Cruz; it is 20 feet in diameter and 366 feet high. The redwood is found from the boundary of Mexico northward, forming vast forests upon the Coast Range of mountains, never very far from the Pacific. The wood is light and close grained, much resembling red cedar in appearance; it splits with remarkable facility, is eminently durable, and is used for building purposes, cabinet work, and almost every variety of general wood work, forming the principal staple of the California lumber trade.

With such abundant supplies, therefore, of one of the finest varieties of lumber, it seems something more than a pity, but rather a matter calling for severe criticism, that the lumbermen should be permitted to destroy, as they are doing, with a few exceptions, these groves of *Sequoia gigantea*. These trees grow nowhere else in the world, and their beauty, grandeur, and marvelous age combine to make them objects of such surpassing interest that the folly and neglect of the government in permitting their present destruction will pass the comprehension of succeeding generations. The Calaveras grove, north of Yosemite valley, is still untouched, and the Mariposa grove, thirty-five miles south of the valley, is safe, because included in the Yosemite grant, but the Fresno Flats grove, the next one in the belt, is a scene of destruction. It belongs to the California Lumber Company, of San Jose. Their policy has been to slaughter the trees without regard to age or size, beauty or grandeur. This was once one of the most beautiful of the groves, but to-day it is a pitiful wreck. Giants of the forest, fifteen, twenty, and thirty feet in diameter, lie on the ground in every direction. The largest trunks, those that are too large to be handled easily with the saw, have been shattered with blasting powder. Stumps of the trees, six, ten, or a dozen feet high, are all about, an army of witnesses to the malevolent avarice of men. Occasionally there is a mighty tree still standing, with a great gash, perhaps five feet deep, cut and sawed into one side. This grove has been almost annihilated. When the company cleans up the trunks and limbs that now cover the ground, its work of destruction will be just about completed. It has been engaged on this grove for a number of years, and has turned its attention almost entirely to the sequoias.

If the big tree lumber brought higher prices than any other sort, the zeal which is shown in the destruction of the groves could be understood. But it rates no higher in the market than the sugar pine, with which the mountain slopes are densely covered. The lumber companies could have made just as much money and been at no expense for blasting powder if they had let the big trees alone and turned to the sugar pines.

In the groves further south the same scene is repeated time after time. In that portion of the sequoia belt between the north and south boundaries of Tulare County alone there are at least ten mills, every one of which is industriously working away at the big trees. Their owners evidently fear that the national government will some day awaken to the wisdom of throwing protection around these unique groves, and they are determined to get just as much money out of them as possible before that day comes.

In the Fresno grove, which is on the line between Fresno and Tulare Counties, the General Grant National Park preserves a few of the big trees. It is only a square mile in extent, and does not include the whole of the grove. The rest of it is rapidly disappearing. A little to the southeast the Sequoia National Park includes the North Kaweah and South Kaweah groves, which were withdrawn from sale in time to save them from destruction. Through the remainder of the groves one comes upon the same scene again



THE TREE "WAWONA" (SEQUOIA GIGANTEA) IN MARIPOSA GROVE, CAL.

and again. Everywhere ax, saw, and blasting powder are doing their detestable work with speed and thoroughness.

It has been proposed to extend the boundaries of the Sequoia Park so that it will embrace all the sequoia groves in Tulare County and cover the mountain slope from the summit of the Sierras nearly to the lower timber line. If the proposition included the whole belt of the sequoias from the most northern grove to the most southern tree, it would be still more heartily approved by all those—excepting always the mill owners—who have visited the groves and know how hopeless is their preservation in any other way.

For an excellent photograph from which our picture is made we are indebted to Mr. I. West Taber, a Yosemite commissioner, of No. 8 Montgomery Street, San Francisco.

Allotropism in Alloys.

In his presidential address before the chemical section of the British Association, Prof. Roberts Austen spoke of the consequences of allotropic changes which result in alteration of structure as being very great. The case of the tin regimental buttons which fell into a shapeless heap when exposed to the rigorous winter of St. Petersburg is well known. The recent remarkable discovery by Hopkinson of the changes in the density of nickel steel (containing twenty-two per cent of nickel) which are produced by cooling to 30 deg. affords another instance. This variety of steel, after being frozen, is readily magnetizable, although it was not so before; its density, moreover, is permanently reduced by no less than two per cent by the exposure to cold; and it is startling to contemplate the effect which would be produced by a visit to the arctic regions of a ship of war built in a temperate climate of ordinary steel, and clad with some three thousand tons of such nickel steel armor; the shearing which would result from the expansion of the armor by exposure to cold would destroy the ship. The molecular behavior of alloys is, indeed, most interesting. Mr. W. Spring has shown, in a long series of investigations, that alloys may be formed at the ordinary temperature, provided that minute particles of the constituent elements are submitted to great pressure. Mr. W. Hallock has recently given strong evidence in favor of the view that an alloy can be produced from its constituent metals with but slight pressure, if the temperature to which the mass is submitted be above the melting point of the alloy, even though it be far below the melting point of the more easily fusible constituent. A further instance is thus afforded of the fact that a variation of either temperature or pressure will effect the union of solids.—*Popular Science Monthly.*

The First Locomotive Run in America.

It was in 1829, the same year in which Stephenson, with his Rocket, demonstrated the practicability of rapid steam traction on railways. The engine was named the Stourbridge Lion. It was made in England and imported by the Delaware and Hudson Canal Company, and designed to draw coal from their mines in Carbondale to the head of their canal in Honesdale, Penn. On its arrival, it was placed on the railway and run from Honesdale to Seeleyville, a little over a mile. It was found to be too tall to go under a highway bridge over the track at that place, and was reversed and run back to Honesdale. All parts of the railway above the surface of the ground were built on trestles, and the heavy engine racked them so much as to endanger safety. For these reasons the locomotive was set off by the side of the track, and a board shed built over it. The railway was planked, and horses employed to draw the cars. The engine stood there safe for several years.

The writer was personally acquainted with these facts. Two men who rode on that trip are living at this time.

In 1840 and 1841, while I was a student in the Honesdale Academy, I found the boards on one side of the shed torn off and the engine exposed to view. I spent many hours in trying to study out its mechanism and movement. No published description of a steam engine was then within my reach. The Stourbridge Lion had four wheels, three or three and a half feet in diameter, and the boiler rested directly on the axles. The cylinders were vertical, one on each side of the boiler near the hind wheels. There were two heavy iron walking beams a few feet above the boiler, and to one end of each a piston rod was attached by Watt's parallelogram. The other ends of the beams were joined by swinging rods to cranks at right angles to each other on the forward wheels. There was no whistle or bell, I think. The engineer stood on a small platform behind the boiler.

Soon after 1841, the engine began to be carried off piece by piece, mostly by blacksmiths and machinists; and I am told that only one small piece of the iron is now in existence in its primitive form. If the engine had been kept intact, it would be worth almost its weight in silver for exhibition in Chicago in 1893.—*M. H., Science.*

Modern Progress in Naval Engineering.

Sir Edward J. Reed, in a recent address to the Junior Engineering Society, said:

Prior to 1863, the consumption of fuel in H. M. ships was 4 pounds per I. H. P. per hour. In the case of the Sultan it was 1½ pounds when developing the full power with forced draught. Now, a vessel with the old type of engine, weighing 920 tons, would develop about 4,900 I. H. P., and burn in four days of her fullest steaming 840 tons of coal. The total weight which her designer had to provide for was 1,760 tons, to enable her to develop say 5,000 horse power for four days continuously. But in the case of the modern vessel, just before referred to, if her indicated horse power were to be the same, viz., 5,000, the weight of her machinery would only need to be one-twelfth of this, say 420 tons, and this with the same aggregate weight of machinery and fuel (viz., 1,760 tons) would leave 1,340 tons available for fuel. But her consumption would be only 80 tons per day, so that she would carry fuel enough to steam for no less than 16 days at the fullest speed, or more than four times the time, and therefore more than four times the distance over which the earlier vessel could have steamed. During the period over which my own responsibility for large steamships extends, I have, therefore, seen the steaming power multiplied more than fourfold.

This single illustration furnishes, I think, so striking an example of recent progress that it will not be necessary for me to trouble you with references to the many other examples of like nature with which marine experience abounds, otherwise I might adduce, as one of the most interesting among them, that elfish creation (due to the genius and perseverance of Mr. Thornycroft) the swift torpedo boat, which animates the military harbors of the world by its lightning-like movements. In this case we have developed to a degree never dreamed of until quite recent years the principle of securing a very large development of power with a very small weight of machinery, by means of an immense number of revolutions.

These are some of the things which were before me, although but dimly seen, if seen at all, when I commenced my public work. What may not be before you who are now of the age that I was then? I remember that many years ago, when presenting prizes to the Science School at Liverpool, I pointed, as to a dream that might be realized, to the possible reduction of weight of material in a vessel and her machinery so great in amount as to provide for the complete lifting of the vessel to be propelled above the surface of the water, by means of a set of propellers with inclined axes, which should simultaneously elevate her and force her head through the air only. I admit that, notwithstanding the great advances in this direction to which we have just been attending, we are still far from this result; but I for one am satisfied that we are advancing rapidly toward a time when the transformation which steam and steel and electricity have already effected will be looked back upon as but the initial stages of the transformations that are to come, and are to come soon.

Roads in France.

The excellence of French roads is well known. The United States consul at Bordeaux describes how they are made. The materials are brought from the nearest quarries and placed at either side of the route surveyed. In order that the full amount contracted for may be delivered, the stone must be heaped in angular piles of prismatic shape and fixed dimensions. These heaps, placed at a given distance from one another, are afterward visited by an official inspector, and must in all instances fit exactly beneath a skeleton frame carried by him. The material is usually marble, flint, stone, or gravel, and whatever is used must be of the best quality and cleansed from all foreign substances. The stone must be broken so that each piece may pass through a ring 2½ inches in diameter. It is then spread evenly over the road, the interstices being carefully filled in with smaller pieces, so that the whole is smooth and free from abrupt eminences and depressions. A steam roller then crushes and further evens the whole, after which a superficial layer of clay and earth completes the work. Roads are classed as national roads, which are the main arteries of the system connecting most distant parts of the country, and are constructed and maintained by the government; department roads, which connect different points of the same department or of two adjoining departments, and are constructed and maintained by the department; highways and public roads, which are the property of the commune through which they run, but are in practice made and repaired by the department from taxes levied on the commune, supplemented by a department subsidy; cross roads, which are maintained by sums derived from the ordinary revenues of the commune, occasionally supplemented by additional taxation; and country roads, which are kept in order by the commune, except they are injured by unusual traffic, when an indemnity may be claimed by the communal administration. For the purpose of maintaining the common roads the inhabitants living in the district are obliged to work three days in each year or pay an amount equivalent to the compensation of a laborer for three days. The consul at Havre says that French pavements increase in excellence with age. In France, he says, all roads have perpetual attention. If from weight, rain or other causes a hollow, rut or sink is formed, it is repaired at once. Where the space to be repaired is of limited area, the rolling of the new coating is left to the wide tires of the heavy carts, but in the case of extended areas a steam roller is brought into use. Every carrying and market cart in France is a road maker instead of a rut maker, for it has tires usually from 4 inches to 6 inches in width.

The Meeting of Jupiter and Venus.

Everybody must have noticed during the past few weeks the gradual drawing together of the brilliant planets Jupiter and Venus. Outshining all the other stars, they have added greatly to the beauty of the evening sky. During the present week they will continue to approach one another, until on Saturday morning, February 6, they will be so close that to the naked eye they will actually seem blended into one. Unfortunately the hemisphere of the earth which we inhabit will be turned away from the place they occupy in the sky at that time, so that we shall be unable to witness this interesting conjunction. But on Friday evening the two planets will already have drawn so near together that their aspect will be that of a most splendid double star.

The observer will notice at once the unquestionable superiority of Venus to her giant brother in brilliancy. This, of course, is an effect of distance, for although apparently so near together that they almost touch, the two planets are really more than four hundred millions of miles apart, their conjunction in the sky arising simply from the fact that Venus, in swinging around its orbit, happens to come almost exactly into the line of sight from the earth to Jupiter. Jupiter is more than 1,400 times as large as Venus, and if it were really placed side by side with Venus, would be at least 130 times as bright as the latter is. In short, it would resemble a small but dazzling moon.

But it is only when one considers what these two planets are that the true interest of this week's celestial spectacle is developed. They represent respectively the two great types or groups into which the sun's family of worlds may be divided—the terrestrial group, whose members, like the earth, are of comparatively moderate dimensions, while th [illegible] rfaces have become cool and encrusted with a [illegible] d, on which a great variety of life flourishes, [illegible] y flourish, and the Jovian group, to adopt a name from their greatest representative, Jupiter, in which a much earlier stage of planetary development evidently exists, so that their surfaces have not yet cooled down or assumed a permanent form. These half-developed globes are all of gigantic dimensions and low specific gravity.

During the past year Jupiter has shown signs of tremendous disturbance in the dense cloudy atmosphere by which it is surrounded, and the fact has been noted that such disturbances upon Jupiter show a tendency to coincidence with the return of the maximum sun-spot period. Just now the sun is becoming from month to month the scene of more violent activity than it has displayed since 1883 or 1884, and at the same time the great belts and spots upon Jupiter brighten and glow with color, and exhibit changes of wonderful rapidity and variety. We cannot yet precisely interpret the processes of world making which are going on there, but they are intensely interesting to watch.

Venus, too, attracts particular attention just now, because observations to be made during its present visit to our side of the sun may settle the question that has been raised as to the correctness of Schiaparelli's conclusion, announced less than two years ago, that Venus always keeps one side turned sunward, or makes but one rotation on its axis in the course of a revolution around the sun. If this strange state of things really exists upon a planet whose size entitles it to be called the twin of the earth, so many consequences follow bearing upon the question of its habitability, that there is hardly any direction in which investigation and discovery could prove more fruitful and interesting.

They are in every way a wonderful pair of planets which now attract all eyes to the sunset sky.—*N. Y. Sun.*

Coloring for Glass.

A substance apparently used for imparting a yellow color to glass had the following composition:

Moisture	1·71
Carbon	29·96
Silica	10·65
Ferric oxide and alumina	4·38
Manganese dioxide	37·92
Sodium chloride	13·55
Sulphuric acid	0·22
Magnesia	0·23
Lime, traces of baryta, and loss	1·38

It is probably compounded of 45 parts of graphite, 41 parts of pyrolusite, and 14 parts of common salt.—*G. Hattensaur, Chem. Zeit.*