SCIENTIFIC AMERICAN

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CALIFORNIA RAISIN CULTURE.

The city of Fresno, California, with a normal population of 20,000, contains in the season 45,000, all working from daylight to dark, engaged in cutting, drying, packing and shipping the crop of raisins. The soil combined with certain essential climatic peculiarities makes the region particularly adapted to the growth of the native grape. For eight months of the year rain never falls. The warmth of the soil absorbed in this long period of sunshine imparts to the fruit that excess of saccharine quality which it requires, while the curing and drying of the grapes in the fields is permitted by the prolonged heat. Added to these advantages is an inexhaustible supply of water for irrigating, drawn from the high Sierras, under the perfect control of the vineyardist and rendering him independent of drought or abbreviated rainfall at all times.

The raisin industry, up to within twenty-five years, was a monopoly of Southern Europe and the chief dependence of a great population. That in so brief a

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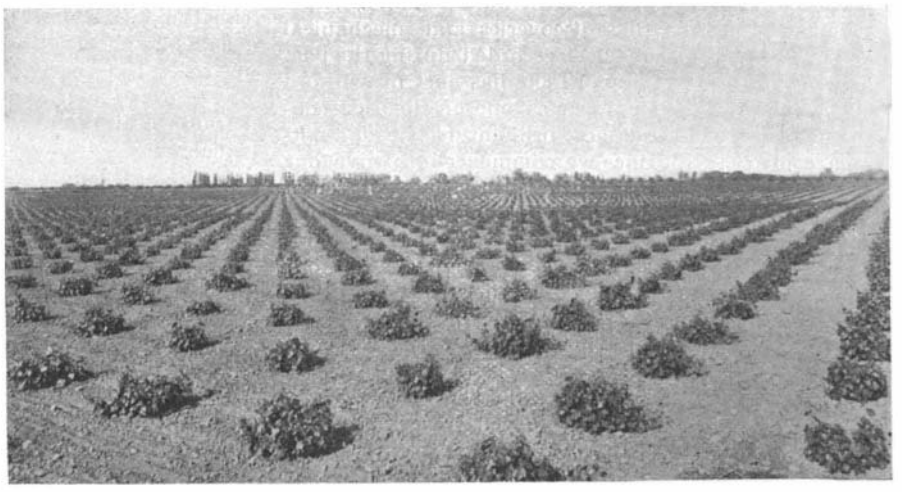
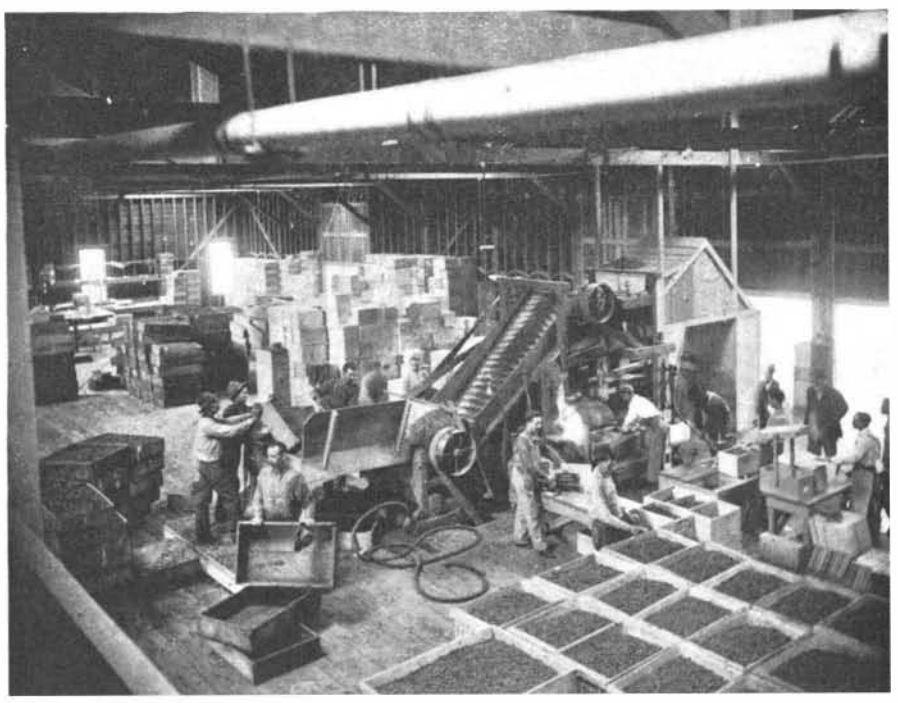
Raisin Vineyard in January, After Pruning.

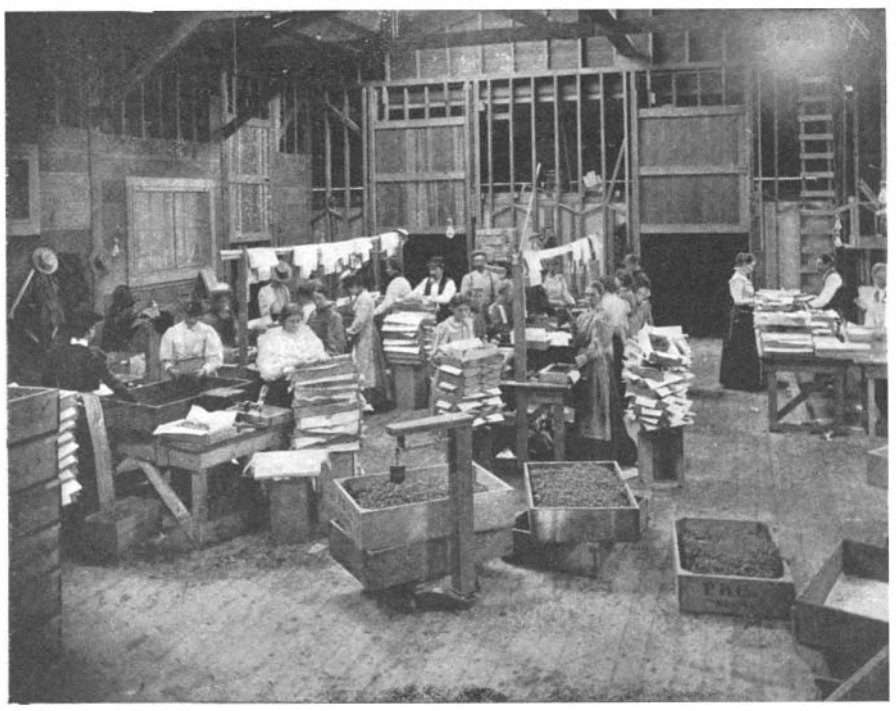


Raisin Vineyard in March.

Picking and Drying Raisins in the Field.



Stemming and Grading Raisins.



Packing High-Grade Raisins.

Packing Seeded Raisins.

THE RAISIN INDUSTRY OF CALIFORNIA.

CALIFORNIA RAISIN CULTURE.

(Continued from first page.)

period this important industry could be transplanted to distant California and the methods of Spanish cultivators improved in such a measure as to displace foreign importations altogether is another miracle of American enterprise. Spain has still the advantage of cheap labor.

The cultivation of the raisin grape differs in no essential particular from the methods employed in bringing the wine grape to its present perfection in California vineyards, which have been described in detail in previous numbers of the SCIENTIFIC AMERICAN. It is a process of ceaseless industry and never-failing vigilance, the fruit of minute observation and scientific experiment. Beginning in early winter, the vines are pruned close to the ground and each succeeding month, up to the first of June, finds the growers industriously engaged in cultivating, sulphuring and pruning again, with the object of protecting the vines from the attacks of insects or rust and of getting out of the soil and forcing into the maturing fruit the greatest nourishment without at the same time exhausting or weakening the vines. Superfluous bunches are cut off. The size and not the number of these is the aim of the most successful grower.

The climatic conditions in the raisin district are of the utmost importance to the successful prosecution of the industry. The season's rainfall in Fresno averages about 8 inches, beginning in November and terminating in May. But the growers here are entirely independent of nature's supply of moisture. The varieties of grapes chiefly planted are the Muscatel de Gordo, Blanco, Muscat of Alexandria, Sultana and Thompson's Seedless. It takes on an average three and one-half pounds of green grapes to make one of raisins. The yield per acre is about five tons of green, or one and a quarter of the dried fruit.

The average amount of sugar in the raisin grape is from 25 to 28 per cent, depending upon soil, season and amount of water supplied. Vines are planted eight and ten feet apart, and closer when the richness of the soil admits.

The season's gather of the grape begins the latter part of August. There are 42,000 acres of vines in Fresno County, and one man to the acre is the rule. The clusters are handled by the stems alone, as contact with the hands robs the product of its sightliness. As fast as picked the grapes are deposited in trays 2 by 3 feet in size holding about 20 pounds. These trays are laid between the vines, sloping toward the sun. Here they lie for six or eight days, when they are turned over by the simple process of placing one tray on top and reversing. The sun curing takes altogether from ten to twelve days, when the grapes are taken to the packing house to endure the sweating process. The sweat boxes are somewhat larger than the trays, and 8 inches deep. The sun-dried grapes are transferred to these boxes, a sheet of paper being laid upon the bottom and a layer of grapes placed on this, paper and grapes alternating until the box is full. The loaded sweat boxes are then carried to the equalizing room, a dark, air-tight apartment, well ventilated; the boxes are piled on top of each other, and remain for fifteen or twenty days until thoroughly sweated.

In this process the moisture in the raisin is evenly diffused; when the product emerges, it is about ready for market. In handling, much fruit falls from the dried stems and is marketed as "loose." These are put in a "stemmer," where they are divested of the stems and mechanically sorted into four grades. The bunch raisins are generally packed in twenty-pound boxes. This is a careful operation and is generally intrusted to women and girls.

Within the past three or four years a new product known as the California seeded or stoned raisin has been put upon the market, and has rapidly attained popularity among consumers for its many obvious merits.

In 1896, the stoned raisin was put upon the market. The raisins are prepared for seeding by first being subjected to a drying temperature of 140° for five hours, immediately after which the fruit is submitted to a chilling process, and while in this condition is passed through a cleaning and brushing machine, which removes absolutely every particle of dirt, including the cap stems. It is then taken to a room and spread out on wire trays in a temperature of 130° which brings the fruit back to its normal condition. In this process the berry is converted into pectin, that delicious jelly which gives to fruit its best flavor.

The raisins being thus submitted to alternate heating and chilling are prepared to endure all climatic influences and to keep indefinitely. They are then passed through the seeding machines, which have a capacity of from ten to twelve tons daily. In the operations, raisins are pressed between rubber-surfaced rollers, which at first flatten the berry and press the seeds to the surface, when an impaling roller catches the seed between the needles and teeth affixed to its periphery and removes them from the fruit, which passes on, minus only the seed. The product is then packed in one-pound paper boxes and afterward in packages containing thirty-six, convenient for marketing. The extraction of the seeds leaves the fruit intact, without mutilation.

It is expected that Fresno will ship this year about 2,500 carloads of raisins alone.

Engineering Notes.

While boring an artesian well in the exhibition annex at Vincennes, the engineers discovered a thick seam of coal at a depth of about 100 feet. The fuel proved of good quality, and it is thought to be very abundant.

This winter arrangements have been made by which the trip from London to Nice may be made in exactly twenty-four hours, including the passage of the Channel. The distance is 966 miles; this is an hour and 23 minutes faster traveling than the schedule of last year.

The production of zinc constitutes one of the oldest and staple industries of Poland, having been followed since 1816 In that year only 410 tons were produced, which had increased to 5,500 tons in 1898. It is computed that over 250,000 tons of zinc have been produced in Poland since the industry first commenced.

An attempt is being made, under the auspices of the German government, to cultivate the American cotton plant in Togoland, German West Africa. An agreement has been concluded between some planters and experts in Alabama and the German authorities by which 150 carriers and laborers will be taken to the West African colony. The government has encouraged the enterprise to the extent of $15,750, and the Berlin "Colonial Economic Committee" will also render aid to the scheme.

An interesting advertising scheme has been adopted by the Atchison, Topeka & Santa Fé Railway Company. One of their traveling men, an expert stenographer, was sent to visit individual farmers in their homes, to find out what success they were having, and then write letters at their dictation addressed to Eastern friends, telling about the crops, etc. He goes about with a team, and carries a typewriter and stationery. This personal letter is followed up in due time by advertising literature sent to the friends to whom the letters are written.

The Strand district of London disposes of 21,000 tons of refuse per annum from that neighborhood alone. Hitherto this garbage has been conveyed away from the city in barges at a cost of $15,000. With a view to economizing on this expense, a refuse destructor of the Horsfall type has been erected on the south side of the river, at a cost of $50,000. It is calculated that by this development a saving will be effected of over $2,500 per annum after writing off the annual charge for the repayment of capital with interest in ten years. The cost of removing the clinkers by barge will be about $6,000 a year, but it is anticipated that a saving may be made also in this direction, by the preparation of the clinker for building purposes.

Barrow in Furness is rapidly rising in importance as a private naval dockyard, owing to the numerous developments that have been carried out by Messrs. Vickers, Sons & Maxim, Ltd. During the past two years, this firm has expended $6.250.000 for the building of new yards, workshops, and the installation of new machinery. All the gun mountings required for the vessels constructed by this firm at Barrow are now produced upon the spot, as well as projectiles, from 50 up to 850 pounds. The whole of the machinery in the engine section is driven by electricity. At the present time this firm have five ironclads in course of construction for the British navy, of the very latest type, and which when completed will be the largest and fastest armored cruisers in the world. Their displacement will be 14,000 tons, with a speed of 23 knots.

The Bell Telephone Company Wins a Suit.

Judge Colt, of the United States Circuit Court, gave a decision on December 21, in favor of the American Bell Telephone Company, in the suit brought by the Western Union Company to recover a sum said to be due on a division of rentals and royalties, according to the terms of the contract between the two companies dated November 10, 1879. The case has been in the courts for seventeen years, and the amount asked for is said to have been $12,000,000.

Under the contract, the defendant, then known as the National Bell Telephone Company, agreed to pay the Western Union 20 per cent of all rentals or royalties received from licenses for telephones in the United States. The Bell Company issued licenses to various corporations, and received, in addition to the annual rental for telephones, 35 per cent of the capital stock of these corporations. The Western Union held that this stock was "rentals or royalties," within the meaning of the contract, and that it was entitled to 20 per cent of the stock and the dividends declared thereon.

The Bell Company said that the "rentals or royalties" mentioned in the contract were the standard annual rentals (less commissions) and nothing more. A master found in favor of the Bell Company, and the Western Union's exceptions are overruled by Judge Colt.

Science Notes.

During the month of September the slaughter house at Villette, which supplies Paris, dispatched daily an average of 3,044 oxen, 1,041 cows, 23,384 sheep, 2,725 pigs and 2,999 calves. In ordinary times only 1,210 oxen, 450 cows, 13,929 sheep, 4,828 pigs and 1,425 calves are required.

In an account of Manchuria given in Petermann's Mittheilungen, the statement is made that the Manchus are disappearing under the influx of the Chinese, and the time is probably not far distant when their language will cease to be spoken, as their children are taught Chinese.

The medical faculty of the University of Heidelberg has made an interesting report on the effect of the incandescent light, whether gas or electric, upon the eyes. After mature deliberation they have decided that the incandescent light is not harmful, and they specially recommend electricity for lighting halls and places of entertainment.

A scientific expedition is to start from St. Petersburg to examine the immense number of manuscripts discovered at Mukden by Russian troops. In the collection are a large number of Greek and Roman documents, which are supposed to have been taken by the Mongolians on the retreat from the Occident. It is believed that the manuscripts are of great value.

The Alexandra Palace, London, in which the exhibition of 1861 was held, and which was in danger of being sold to the speculative builder, has been secured for the nation, at a cost of $750,000. The palace itself covers seven acres of land, while the whole of the estate comprises 147 acres. The palace is to be opened to the public every day throughout the year. The large banqueting hall will be utilized for Volunteer headquarters, and it is proposed to found a technical institute.

An outbreak of typhoid fever has occurred in Lambeth, England, owing to infected mangles. Forty-one cases occurred in twenty-four houses, all within a restricted area. There was much inter-communication between places and families living in different houses. Many of the inhabitants after washing their clothes in their own homes took them to some neighbor to be mangled. Owing to this custom, bedding and clothing of those ill with typhoid fever were mangled in the same machine, thus spreading the disease. Four different infected mangles were traced.

Prof. Koch, in describing his experiences with the government expedition in Java and New Guinea, stated that he had reached the conclusion that gnat bites introduced and developed parasites into the human body. The germs are passed by a gnat from one human body to another, but they develop in the body of the gnat during the passage. Children are specially liable to impregnation. In a village in New Guinea, 137 inhabitants out of 700 were infected by the disease. All inoculations have hitherto proved to be failures, but the success of quinine is very gratifying.

It has been decided to prolong the period for the competition for the Deutsch prize of $30,000 for a navigable airship for an extra six months, from May 1 to October 31, 1901. It has also been decided by the Aero Club of Paris to carry out a series of monthly balloon ascents under the auspices of the International Aeronautical Committee for Scientific Purposes. The aerostats will ascend from Paris, Trappes, Strasburg, Berlin, Vienna, and Bath, between the hours of 6 and 8 A. M., in order to study the atmosphere and to carry out other meteorological observations. The airships will be provided with automatic registering instruments.

During the recent restoration of St. Martin's Church at Vevey, Switzerland, a primitive edifice has been discovered a few feet beneath the floor of the building. In shape it somewhat resembles a church, but the style of architecture is quite foreign to Europe, but bears traces of Oriental source, somewhat similar to that of the Taj Mahal, Agra, India. The walls and foundations of the relic are in a remarkable state of preservation, and the whole structure is to be carefully excavated, and attempts will be made to determine the epoch to which it belongs. It is believed by experts who have examined the materials of which it is constructed that it is one of the earliest buildings in which stone was employed.

A few weeks ago an old Viking ship was discovered at Tottenham Marshes on the outskirts of London, during some excavations in connection with the new waterworks for the East London Company. Recently another equally interesting discovery was made by the unearthing of a dug-out boat in a remarkable state of preservation. Canoes shaped out of a single tree of the Stone Age have been frequently found in Ireland, and the estuaries of England and Scotland, while some specimens were also discovered during the excavation of the Manchester ship canal. This dug-out boat was found in its natural floating position, not far distant from the spot were the Viking ship was unearthed, about eight feet below the surface. The relic will probably be forwarded to the British Museum.

The Heavens in January, 1901.

BY HENRY NORRIS RUSSELL, PH.D.

The most important astronomical event of the present month, from a scientific standpoint, is one which is observable only by telescopic aid. It is the close approach to our earth of the small planet Eros, and its importance consists in the fact that it enables us to determine more accurately the distance of the sun and the dimensions of our solar system.

In this rather dull season, speaking from the standpoint of the amateur stargazer, it may then, perhaps, be worth our while to devote part of our time to the subject which is now employing the resources of some of the greatest observatories.

The asteroid Eros, which was discovered early in August, 1898, is, in many respects, the most remarkable of all the small planets. It is much nearer to the sun than any other of the asteroids, and its period is correspondingly short. Its mean distance from the sun is about 135,000,000 miles, and it completes a revolution about that luminary in very nearly one and three-quarter years, while the next nearest of the asteroids is 180,000,000 miles distant, and takes a year longer to complete its circuit.

Eros is, of course, nearest to our earth when it is in opposition, that is, when we come directly between it and the sun. If its orbit were circular, this distance would always be the same, no matter what part of its orbit Eros was in, but as a matter of fact the orbit is strongly elliptical, so that the planet is much nearer the sun (and consequently the earth's orbit) at some times than at others. In the most favorable case, when an opposition occurs about January 21, Eros is but some 14,000,000 miles away. No other heavenly body but the moon and an occasional comet can come so near.

At the present time things are not quite so favorable. Eros reaches the point of its orbit which is nearest that of the earth on February 6, while the earth, which passed the corresponding point on January 22, is about 24,000,000 miles further on, and about 28,000,000 miles from Eros. In this part of its orbit Eros moves almost as fast as the earth, so that the two planets keep along for some time at about the same distance, like two trains running at the same speed on parallel tracks, the earth being always ahead, till the curving of Eros' orbit separates the two more widely.

But what has all this to do with the sun's distance? Simply this: we can from a study of the motion of any planet among the stars determine very accurately what ratio its distance bears to that of the sun, without any knowledge of how many miles there are in either distance. For example, it is known that in the middle of the present month the distance of Eros from the earth is almost exactly $\frac{3}{10}$ that of the sun, so if we can find the first, it is a simple piece of arithmetic to get the second. Now the only way to determine the distance in miles of a heavenly body is by a sort of triangulation, where two of our stations are on the earth, and the other on the body whose distance we wish to measure. We know the distance of our two terrestrial stations in miles, and require only to know the angles of the triangle to determine the other sides. But since the body is at a great distance, the angle formed, at the body, by the lines joining it to the two stations on the earth, must be very small; and the greater the distance of the body, the smaller will this angle be. Now if this angle is very small, the unavoidable errors which are present in even the best observations will amount to a large proportion of its value, and the deduced value of the distance of the body will be correspondingly uncertain. So it is evident that the distance of the nearest planets may be determined with the greatest proportional accuracy.

Eros, during the present month, is nearer to the earth than any other planet ever comes, excepting Venus, and when Venus is at her nearest she is between us and the sun, and visible only in daylight, when her position among the stars cannot be accurately measured. Moreover, Eros is too faint to be seen with the naked eye, and appears in the telescope merely as a starlike point of light. It is in consequence much easier to observe accurately than a planet presenting a large disk, like Mars or Venus.

The advantages of observation of Eros are thus twofold: the errors of observation are less than in the case of one of the larger planets; and, since Eros is nearer, equally large errors will produce a smaller percentage of error in the calculated distance of the planet, and in that of the sun, which is deduced therefrom. Indeed, so favorable is the present opportunity that so eminent an authority as Prof. Newcomb has expressed the opinion that the observation of Eros at the present opposition will give us a more accurate value of the sun's distance than all previous similar observations put together.

This then is why a systematic "campaign" of observation is planned by the astronomers of Europe and America, and why a little speck of light, hardly visible in a field glass, has concentrated upon it so large a part of the attention of the astronomical world.

There is little need to spend much time in the description of the heavens this month. Sirius and Procyon are well above the eastern horizon. Above the former are Orion and Taurus, above the latter Gemini and Auriga. Eridanus and Cetus form an uninteresting southern sky. Perseus is near the zenith, and Andromeda and Pegasus below on the west. Of the summer constellations, only Cygnus remains low in the northwest. Cassiopeia is above and to the left of the pole, and Ursa Major opposite and near the northern horizon.

Mercury is morning star until the 21st, when he is in superior conjunction, passing behind the sun and becoming an evening star. He can only be seen, if at all, during the first few days of the month, when he rises about an hour earlier than the sun. Venus is also morning star in Scorpio and Sagittarius. She is moving rapidly eastward among the stars, and is steadily overtaking the sun. She rises about two hours before sunrise on the 1st and one and a half hours on the 31st. Mars is in Leo, and moves slowly eastward until the 13th, when he begins to retrace his path as he approaches opposition. He is rapidly approaching the earth and increasing in brightness. On the 1st he is about 87,000,000 miles from the earth, while on the 31st his distance has decreased to 68,000,000 miles, and he is nearly twice as bright as at the month's beginning. Jupiter is in Sagittarius and is a morning star, rising about an hour before sunrise on the 1st and over two hours on the 31st. Saturn is also in Sagittarius, and, like Jupiter, is moving eastward among the stars, though more slowly. He rises only a few minutes before the sun, at the beginning of the month, but by its close he is far enough from him to be easily seen, rising nearly two hours before sunrise. Uranus is morning star in Scorpio, rising three hours before the sun in the middle of the month. Neptune is in Taurus, well placed for telescopic observation.

The present month is remarkable for the large number of planetary conjunctions that take place. Venus plays the principal part in these. On the 3d she is in conjunction with Uranus, passing north of him at a distance equal to about twice the moon's diameter. But much more conspicuous are her conjunctions with Jupiter on the 15th and with Saturn on the 24th. On the first of these dates she passes north of Jupiter at a distance of about three-fourths of the moon's diameter and on the 2d she approaches a little nearer to Saturn, but on the southern side. These last two conjunctions can be easily seen in the early morning. Mercury also comes into conjunction with Saturn on the 7th, but both planets are too near the sun to be seen.

Full moon occurs on the afternoon of the 4th, last quarter on that of the 12th, new moon on the morning of the 20th, and first quarter on that of the 27th. The moon is farthest from the earth on the 12th, and nearest on the 24th. She passes Neptune on the afternoon of the 3d, Mars on that of the 9th, Uranus on the night of the 16th, Jupiter on that of the 17th, Venus on the forenoon of the 18th, Saturn the evening of the same day, Mercury on the morning of the 20th, and Neptune again on the evening of the 30th.

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Retrospective Views of the Century.

In the last issue of the SCIENTIFIC AMERICAN, we took occasion to publish an interesting review of the century from the pen of Mr. Edward W. Byrn, the author of "Progress of Invention in the Nineteenth Century." The contemporary press have made somewhat elaborate plans for publishing reviews of the century, many of them on a somewhat extensive scale. One series which is in process of publication will extend over a period of many weeks. It is only fair to mention that for nearly two years Mr. Byrn, of the SCIENTIFIC AMERICAN, has been engaged upon the preparation of the work which we mention above. His facilities for reaching the data from which he has obtained the information treated of in "Progress of Invention in the Nineteenth Century" are unsurpassed, owing to his residence in Washington, and his intimate relationship with the Patent Office. Many of the valuable papers which are now being published on the progress of the last century will be scattered and lost, but the work above referred to, which has been extensively and favorably reviewed by the contemporary press, preserves in condensed form a most complete and accurate record of the industrial progress of a hundred years.

Automobile News.

The French Automobile Club, the Belgian Automobile Club, and a union of the automobile clubs of the various centers of Italy have arranged extensive tours for 1901. The French Club will have a three weeks' trip through Tunis; the Italian Clubs will make a tour of the Italian lakes, a distance of 1,000 miles to be completed within 14 days; and the Belgian Club are organizing a jaunt through Namur, Spa, Liege, Antwerp, Bruges, and Ostend.

The latest pattern of the De Dion motor tricycle possesses many important improvements. The engine, which is of 2¾ horse power, is so attached as to be free from the machine, so that it remains stationary until the clutch is inserted, by the movement of the lever fitted to the handle-bar. The brakes, which are of great power, are supplied inside the side wheels instead of being fitted to the front wheel as heretofore. The brakes are controlled by a lever fitted to the left-hand side of the handle-bar. The coil is placed at the end of the tank, and not upon the axle bridge, so that short circuit is averted.

One of the interesting automobile events in Paris has been the hill-climbing race lately held at Chanteloup, near Paris, under the auspices of the Moto Club. It was a contest for large machines, and moto-cycles were excluded. Carriages carrying from four to six passengers were entered, besides voiturettes with two and four persons. The slope up which the race was made has a grade of 11 per cent and is about 5,600 feet long. There were more than 40 entries, and many of the well-known "chauffeurs" took part, such as R. de Knyff, Serpollet, Michelin, Jeorges Richard, Delahaye, etc. Baron Henri de Rothschild entered with his new German-built carriage for four persons, with motor of 20 horse power. There were five sections: carriages of four or six seats, voiturettes (two sections), and light voiturettes. It was an all-around contest, and the points taken into account were not only speed, but horse power of the motor and general performance. All types of machines, petroleum, alcohol, and steam, were represented, but comparison was not made between them, and all were placed on the same footing. The following is a list of the winners in each of the five classes, with the time of each: 1. Carriages of 4 places, H. de Rothschild, time 3 min. 45 4-5 sec., or 17·5 miles an hour. 2. Carriages of 6 places, Lefebvre, 5 min. 10 sec., 12·5 miles an hour. 3. Voiturettes of 2 places, Mercier, 4 min. 8 4-5 sec., 16 miles an hour. 4. Voiturettes of 4 places, Darracq, 5 min. 57 3-5 sec., 11 miles an hour. 5. Small voiturettes of 2 places, Gladiator, 5 min. 56 1-5 sec., 11 miles an hour. After the race Marcellin made a trial of the course on his racing machine and covered the distance in 3 min. 4 4-5 sec., but as his machine belonged to the moto-cycle type, it was not entered officially in the race.

The Bulletin of the Societe des Ingenieurs Civils gives an account of the progress of the automobile industry in Germany. This country, in which were developed the first two motors for automobiles, the Daimler and the Benz, has been much slower than France in the development of the industry, and a large part of the German vehicles are of French importation for the petroleum types and of American for the electric. Nevertheless, the construction of automobiles has made a great stride forward within the last year or more. Nearly all the bicycle works have, as in France, undertaken the construction of moto cycles, and in most of the large cities may be seen a considerable number of moto-cycles for package delivery with De Dion or Astor motors. The two leading German constructors are the Daimler Company, which constructs machines having figured well in many of the races and whose works at Cannstadt are in full activity, and the Benz Company, which produces motors of a horizontal type with one cylinder, which it exports to France and England. At Hamburg have been noted a certain number of Daimler vehicles, and those of Moritz-Hille, of Dresden, of a similar construction. A number of electric cabs have been recently put in service as well as an electric omnibus system. At Berlin is to be seen the large omnibus of Siemens & Halske with an accumulator system, and also a wire-loop trolley, by which it travels upon the electric tramway lines or independently; it contains eighteen places. The General Omnibus Company has recently established a line of these vehicles between the Stettin and Anhalt depots, about three miles distant; the trip is of half an hour, and the price is ten pfennigs. The same company constructs also a hotel omnibus for nine persons, besides delivery wagons and electric cabs. At Cologne may be mentioned the Henry Scheele Company, which constructs electric hauling wagons of five tons capacity; they are provided with electric motors of six horse power each, and give a speed of over four miles an hour, being able to cover a distance of eighteen to twenty miles without recharging.