ASPECTS OF THE PLANETS FOR APRIL.

VENUS

is morning star, and takes the lead of the planets that sing and shine while they anticipate the rising of the great luminary that will eclipse their lesser light. She is still traveling on the eastward track that brings her nearer to the sun, as she fulfills her course from western elongation to superior conjunction. Though her fair face is becoming "fine by degrees and beautifully less," she continues to grace the breaking of the dawn, and wins the admiration of every observer who watches her progress "under the opening eyelids of the morn."

Venus varies her course with an incident on the 10th. She is in conjunction with Lambda Aquarii, a star of the fourth magnitude in Aquarius, being twenty-six minutes south of the star. The nearest approach is at eleven o'clock in the morning. But planet and star will be near enough before sunrise to form an interesting picture. Venus will be far enough above the horizon for favorable observation soon after four o'clock, and will then be seen west of the star and approaching it. On the morning of the 11th, it will be seen that planet and star have passed each other, Venus being east of the star. Observers will note the rapid progress of Venus northward. At the end of the month she will be in northern declination, nearly twelve degrees farther north than at the beginning of the month.

The right ascension of Venus is now 22 h. 10 m., her declination is 11° 37′ south, and her diameter is 16·8″.

Venus rises on the 1st eight minutes after four o'clock in the morning; on the 30th she rises at thirty-eight minutes after three o'clock.

MARS

is morning star, but is too near the sun and too insignificant in size to be of much account. A better time is coming, and, before many months have passed, he will become an object of prominent interest as he approaches opposition. Like Venus, he is moving rapidly northward. At the close of the month he will be in northern declination, having traveled nine degrees north during the month. The farther north the planets are in this latitude, the more favorably they are situated for observation, and the longer is the circuit they make above the horizon.

The right ascension of Mars is 23 h. 6 m., his declination is 6° 57′ south, and his diameter is 4·3″.

Mars rises on the 1st at ten minutes before five o'clock in the morning; on the 30th he rises a quarter before four o'clock.

MERCURY

is morning star until the 16th, and evening star for the rest of the month. On the 16th, at six o'clock in the morning, he is in superior conjunction with the sun, passing behind the great luminary, and appearing on his eastern side to play his short role of evening star.

He is an active member of the solar community. On the 27th, rushing eastward, at full tilt, with a seeming intention to get as far away from the sun as possible, he encounters Neptune, plodding westward with tortoise pace, making every effort in his power to approach the sun as near as possible, the former moving with a velocity of nearly thirty miles a second; the latter moving with a velocity of three miles and a half in a second. They have a conjunction at the respectful distance of 3° 7′, and are hidden from terrestrial gazers by their near proximity to the sun. They, however, win distinction, for the meeting of the planet that travels nearest to the sun and the one that travels on the system's remotest bounds is the sole planetary conjunction on the meager annals of the month. Mercury is speeding north faster than either Venus or Mars, for during the month his northern declination increases twenty-three degrees.

The right ascension of Mercury is 23 h. 59 m.; his declination is 2° 33′ south, and his diameter is 5·6″.

Mercury rises on the 1st at twenty-one minutes past five o'clock in the morning; on the 30th he sets at twelve minutes past eight o'clock in the evening.

NEPTUNE

is evening star, and leads the quartett of giant planets in the time of rising and setting. He is now so far from the earth, and so near the sun, that large telescopes find it difficult to pick him up, but his course among the stars is as accurately mapped out as if he were visible to the unaided eye. His conjunction with Mercury has already been referred to.

The right ascension of Neptune is 3 h., his declination is 15° 19′ north, and his place is in Taurus.

Neptune sets on the 1st at a quarter after nine o'clock in the evening; on the 30th he sets at half-past seven o'clock.

SATURN

is evening star, and shines in the western sky for about three hours after sunset, when his pale disk dips below the horizon. He is now nearly south of the Pleiades, and presents no features of special interest to the ordinary observer. Even the telescopist will have to take a season of rest, for he is approaching the sun so closely that he will soon be hidden from view. Hidden, but not lost, for next autumn at opposition he will be more magnificent than he was during the past autumn and winter.

The right ascension of Saturn is 3 h. 26 m.; his declination is 16° 49′ north; his diameter is 16″, and he may be found in the constellation Taurus.

Saturn sets on the 1st about a quarter before 10 o'clock in the evening; on the 30th he sets at twelve minutes past 8 o'clock.

JUPITER

is evening star, the third in the order of rising, but he holds the palm among the planets and the myriad stars as the most brilliantly beautiful of the shining host. He distinguishes himself by no noteworthy deeds, but pursues the even tenor of his way with majestic mien, accepting with royal grace the honors due to his position as the giant member of the system, the finest exemplification of nature's fashioning hand.

The right ascension of Jupiter is 5 h. 36 m.; his declination is 23° 15′ north; his diameter is 35·2″; and his place is in Taurus.

Jupiter sets on the 1st at twenty-five minutes past 12 o'clock in the morning; he sets on the 30th a few minutes before 11 o'clock in the evening.

URANUS

is evening star, and may still be seen by the unaided eye as a faint star in clear weather on moonless nights. His position varies little from that pointed out for March, being half a degree farther north. He is in Virgo, a little northwest of Beta Virginis, and may be best observed in the east about 8 o'clock.

The right ascension of Uranus is 11 h. 26 m.; his declination is 4° 31′ north; and his diameter is 3·8″.

Uranus sets on the 1st at 5 o'clock in the morning; he sets on the 30th at five minutes past 3 o'clock.

THE MOON.

The April moon fulls on the 22d, at forty-three minutes past 6 o'clock in the morning. The old moon is in conjunction with Venus on the 4th, Mars on the 5th, and Mercury on the 6th. The new moon of the 7th is near Neptune and Saturn on the 9th. The conjunction with Saturn will be the most interesting phenomenon of the month, the two days' old crescent passing forty-one minutes north of the planet, and the time of nearest approach being about a quarter after 8 o'clock in the evening. The conjunction is much closer than that of the 13th of February, when the moon and Saturn, imprisoned in the halo surrounding her, formed a charming celestial picture. On the 13th the moon is in conjunction with Jupiter, and on the 18th completes the planetary circuit by drawing near to Uranus. On the 22d the moon is eclipsed. The eclipse is invisible in this portion of the world, but may be seen on the Pacific coast, the Pacific Ocean, and Asia. Observers here will not lose much, for less than one-tenth of the moon's diameter will be eclipsed. The moon occults Beta Capricorni, a star of the third magnitude, on the 1st at seven minutes after 6 o'clock in the morning, the star being hidden for twenty-two minutes. The occultation takes place soon after sunrise, and is invisible, but the near approach of moon and star will afford material for interesting study.

SOME ANSWERS TO CORRESPONDENTS.

E. H. P.—"Luminous paint" is used to illuminate the faces of clocks and watches. It is a compound of lime and sulphur in varnish.—R. H.—There is no difference, in result, between one square foot and one foot square. One square foot may be contained in a figure of any desired shape containing 144 square inches; for example, a parallelogram 24 inches long and six inches wide; while one foot square is understood to represent a figure measuring 12 inches on each of its sides.—O. R.—The top of a locomotive wheel does not go around its axle, when running, any faster than the bottom of the wheel.—S.—Will take no more pickets to fence the hill than to carry the fence on the straight line shown in your diagram.—H. B. L.—The cannon ball fired from the rear of a train moving sixty miles an hour will pass the mile post.—J. A. M.—The profession of civil engineering offers inducements for young men to study. There are good colleges and many good books relating to engineering.—O. R.—You cannot run an electric light without considerable expense for machinery or for batteries.—W. D. T. Ordinary nut coal is the best for the purpose.—G. R. B.—Butter can be made from fresh milk by means of an ordinary churn.—J. L. B.—Railway ties made of paper pulp have been proposed.—H. S.—The best method of preserving and transporting fresh fruit is by means of the refrigerator cars. Splendid fruit is thus brought from California to the New York market.—F. E. S.—Solid iron columns are stronger than hollow iron columns of the same diameter; but the same weight of metal that is contained in the solid column, if it were put into the form of a hollow column, would be much stronger than the solid column.—J. W. P.—Better write to the Secretary of the Interior.—C. R.—There are various forms of sheep shears made with guards to prevent injury to the sheep.—C. L. F.—One way to make electrical belts is to sew a strip of copper and a strip of zinc inside of the cloth in such a manner that the zinc and copper will both be in contact with the surface of the skin. An amateur can produce good pictures with a portable photographic apparatus, such as you speak of.—There is no simple photo-engraving process, such as you call for.—F. S. M.—There is no especial place where you can go to study inventing. As for mechanical electricity, the best way will be to attend some polytechnic school.—S. R.—You can buy rubber cement at the drug stores.—C. T.—The nineteenth century closes December 31, 1899, and the twentieth century commences January 1, 1900.—E. C. B.—There is no way to prevent the lead from coming off.—F. C. K.—Powder exploded on the top of a rock under water will break up the rock; but a more economical mode is to drill the rock with the ordinary submarine drills, and then blast it in the usual way.—E. C. S.—You will find descriptions of cork machinery in the back numbers of the SCIENTIFIC AMERICAN.—J. A. R.—The cost to erect an electrical telephone for three miles, instruments, poles, wires, and all included, would be about $150 per mile.—A. C. L.—Dentiphones, or audiphones, are made in this country.—H. S.—See SUPPLEMENT, 357, electrical balance for showing presence of metals under surface of the ground. There is no other instrument for indicating the existence of precious metals.—E. L. R.—The Edson automatic steam recorder will tell you whether your fireman does his duty at night.—A. L.—For drawings of a timber drying apparatus see recent number of SCIENTIFIC AMERICAN SUPPLEMENT.—G. M.—Various forms of nut locks are in use.—T. A. M.—You can obtain the telescope glasses at almost any optical store.—W. E. M.—Common whiting and alum in equal parts makes a good filling for safes.

Steel from Phosphorized Cast Iron.

A paper by M. Delafond has recently appeared in the *Annales des Mines* on the preparation of steel from iron of this kind, and he finds that the problem is completely solved, both in the Bessemer converter as well as in the ordinary furnace, when basic linings of magnesian lime are employed. The removal of phosphorus is as satisfactory as could be desired, and the silicium is almost entirely removed, while the sulphur is also to a great degree separated. The basic steel is found to be purer and more uniform in texture than acid steel. The soundness of basic steel is more uniform than that of acid steel. Tires of both are found to be statically and dynamically alike. The formation of bubbles and blisters in the basic ingots has been avoided by raising the temperature before casting. In the furnace the basic process goes on more easily than in the converter, and the removal of phosphorus is likewise more complete. Metallurgists have then at the present time two different processes of forming steel, either in the converter or in the furnace: in the one pure kinds of cast iron are treated in the apparatus with acid lining, in the other impure products are subjected to basic linings. The question then arises, if, under otherwise equal conditions, a complete refining follows as well with a basic lining as with an acid, why should not the basic lining be simply employed, so that the steel of greater purity furnished by that method be obtained?

To this it may be replied that when the furnace is used, it would in many cases be advisable to replace the acid lining with a basic one, whereby, in fact, the work would offer no obstacle. It is quite otherwise where the converter is employed. Here the cast iron cannot be worked with a basic lining so advantageously as when the acid lining is employed. It is rich in silicium, which introduces great difficulties when the basic lining is employed. If, however, it be possible so to regulate the smelting furnace that the iron contains less silicium, the intermolecular combustion may be so regulated that no sufficient heat shall be developed to maintain the metal and slag in a liquid state. Thus it is that the preparation of pure cast iron in basic converters presents difficulties. A mixed process may, it is true, be employed; the scorification, first in an acid converter, and then a further refining in a basic converter; only this process would be costly and complicated. The future will decide what is best to be done in this respect. The white raw iron employed at Creusot in the basic process has the average composition: 3=C; 1·30=Si; 1·50–2·0=Mn; 2·50–300 P; and 0·20 S, while the basic (1) and acid (2) steel contain:

	1.	2.
Carbon	0·43	0·40
Silicium	trace.	0·30
Manganese	0·76	0·66
Phosphorus	0·06	0·075
Sulphur	0·029	0·04

The basic lining, consisting of dolomite treated with tar, has the composition: CaO=53; MgO=35·8; and SiO_2=7·7; while the slags at the end of the decarburation (1) and dephosphorization (2) have the following constitution:

	1.	2.
Silicic acid	22	12
Lime and magnesia	47	54
Iron and manganese oxides	11	11
Phosphoric acid	12	16
Alumina and chromium sulphates	5	5

A Marine Engineer's Prophecies.

Mr. James R. Thomsen, one of the builders of the steamship Servia, at the launch of the Aurania, another large first-class steamer for the Cunard Company, lately made the statement, prophetically, that the coming Atlantic steamship would be propelled by twin screws at twenty knots average speed, and would carry no cargo, her profit lying in the fact that she would make fifty per cent more trips. She would carry neither masts nor sails, her twin machinery reducing the probabilities of accidents, and, of course, increasing her safety, while obviating the necessity of the old-time auxiliary—sail power. There were fifty large steamships built on the Clyde last year, and about one-half of that number were fitted with corrugated steel furnaces, which are said to effect a saving of from ten to fourteen per cent.

NEW subscribers to the SCIENTIFIC AMERICAN and SCIENTIFIC AMERICAN SUPPLEMENT, who may desire to have complete volumes, can have the back numbers of either paper sent to them to the commencement of the year. Bound volumes of the SCIENTIFIC AMERICAN and SCIENTIFIC AMERICAN SUPPLEMENT for 1882, may be had at this office, or obtained through news agents.

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Constitution of the Sun.

In a paper presented to the French Academy (*Comptes Rendus*, xcvi., 136) Faye gives his reasons for believing that our sun and the other large self-luminous heavenly bodies have not yet arrived at either a solid or a liquid state, but are gaseous all the way to the centers. Otherwise, he says, the heat radiated from them would not be so quickly replaced by heat from within, and the surface, consequently, would soon become covered with a solid, non-luminous crust.

Cagniard-Latour has, however, proved by means of some very remarkable experiments that a gaseous mass can acquire the density of a liquid without changing its state of aggregation, provided both temperature and pressure are high enough at one time. If, then, the external strata of the solar atmosphere, where all matter is in an elementary or dissociated state, should cool sufficiently for the elements to enter into chemical combination, if the vapors of metallic calcium, magnesium, and silicium, mixed with oxygen there, on cooling should form clouds of lime, magnesia, and silica, for example, these clouds would sink to the interior, where they would again be dissociated, while at the same time they would drive the hotter particles upward, so that an approximately uniform temperature would be maintained until the whole mass had gradually cooled to such an extent as to assume the liquid and afterward the solid state.

Faye bases his hypothesis on the spectroscopic observations of many years, and on Carrington's study of sun spots, which show that the currents are all in zones parallel to the equator, while there are none from the equator toward the pole. Besides this, the flattening of the sun and the slow motion of sun spots near the poles are more easily explained on this hypothesis of Faye than on those hitherto in vogue.

Illuminating Gas in Russia.

The Chemical Society in St. Petersburg recently appointed a committee to determine what was to be understood by "illuminating gas of best quality." From their report we abstract the following points:

1. A good illuminating gas must give, when burning about 100 liters per hour in a bat wing burner, an illumination equivalent to 10 normal spermaceti candles, that burn 7·78 grammes per hour.

[One hundred liters equals 3·53 cubic feet, while 7·78 grammes = 120 grains. This requirement corresponds very nearly with our 14 candle gas.—ED.]

2. Since the material used in making gas, as well as the way in which it is made, has an effect on the value of the gas, it will be necessary, after a standard has been fixed on for the quality of the gas, for the city to establish an inspector to constantly watch the quality of the gas sent out.

3. Not only the illuminating power of the gas, but its composition, is of importance to consumers who use it indoors, hence the comptroller or inspector must also test it with regard to its chemical purification, and for this purpose also a standard must be fixed upon.

4. After estimating the quality of the gas, attention must also be given to the methods of illumination, since a good illumination depends, not on the quality of the gas alone, but on other causes, as, for example, on the pressure, the state of the pipes, the condition of the burners, etc.

5. The society advises sending a competent scientific person to Paris and other cities where such inspection is carried on, to study the methods and means employed.

Nottingham Worms.

In all angling localities, the merits of Nottingham worms for angling purposes are fully recognized; but only a comparatively few people are aware of the trouble that is expended upon them. This industry affords employment to a large number of persons throughout a considerable part of the year, who, every favorable night, collect the worms from their happy hunting grounds in the meadows. Naturally, the supply in wet weather is more abundant than when the atmosphere is dry, although some sort of a harvest can even then be obtained by watering the ground. The wormers are provided with lanterns, and have to exercise some considerable agility in catching their prey, as, if disturbed by any noise, they pop back into their holes. As soon as the worms are brought in from the country, they are taken to the 'farmer,' who places them in common field moss, and there they remain until they are as tough as a piece of India-rubber, which is a proof of their being in good order to use as bait, as a freshly caught worm is extremely tender, and breaks up readily when put on a hook. The worms are generally kept in moss from three or four days to a week, which is the longest period they can be preserved in good order. The worms are frequently picked over, in order to exclude all those that are broken and mashy; and when fit for use, they are usually sold for three and sixpence or four shillings per thousand, packed up in canvas bags filled with moss. For this purpose, only the plump and healthy worms are selected.

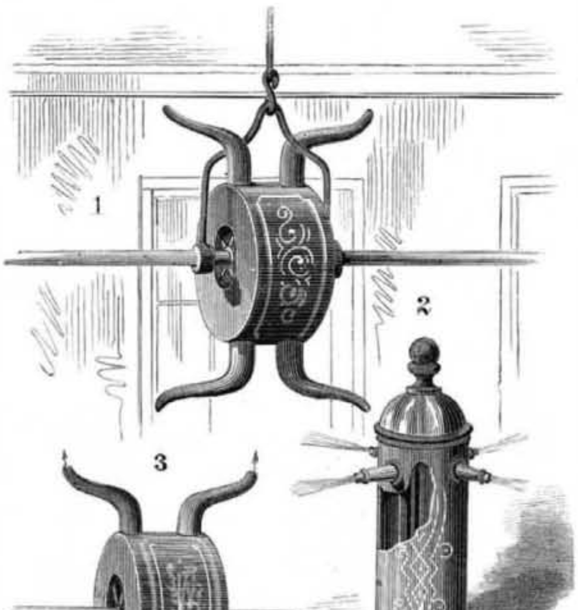
[The above from *Chambers's Journal* suggests a new industry not yet introduced into this country, and a useful hint to our fishermen respecting the toughening of their bait.—ED.]

IN Japan, one of the staple articles of food, fresh and pickled, is the daikon, a great radish, that grows 2½ feet long and 4 inches in diameter.

NEW FANNING APPARATUS.

We give an engraving of an improved fanning apparatus designed for cooling purposes, and to be used in hotels, restaurants, private residences, offices, and in all other places where it is desirable to keep the air in circulation. It may be made in various sizes, and driven by any available motive power; the smaller sizes being propelled by a spring or weight, and the larger ones by steam or water power, gas or caloric engines, according to locality, extent of use, etc.

The apparatus consists of a fan formed of a series of wings or blades mounted on a shaft and inclosed in a casing, the casing having discharge pipes opening in various directions, according to the requirements. The apparatus may be suspended, as in Fig. 1, placed beneath a table or floor, as in Fig. 2, or supported by a standard, as in Fig. 3.



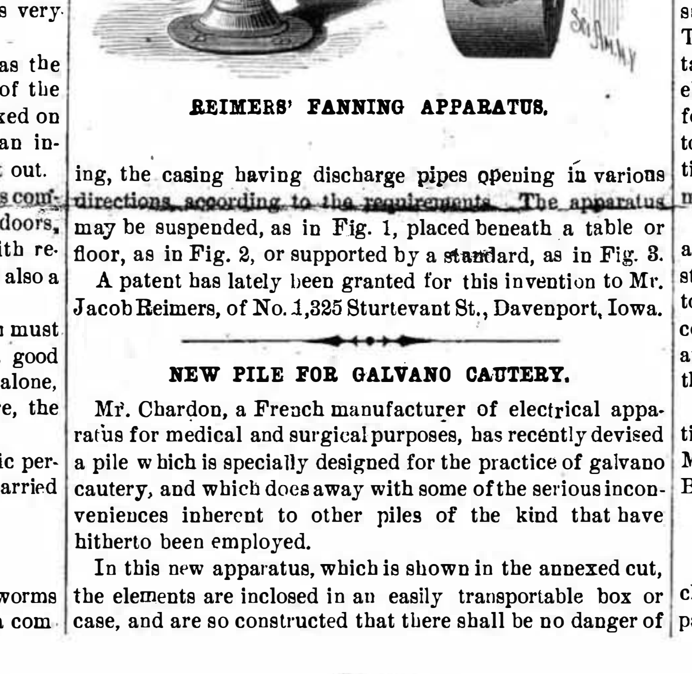
REIMERS' FANNING APPARATUS.

A patent has lately been granted for this invention to Mr. Jacob Reimers, of No. 1,325 Sturtevant St., Davenport, Iowa.

NEW PILE FOR GALVANO CAUTERY.

Mr. Chardon, a French manufacturer of electrical apparatus for medical and surgical purposes, has recently devised a pile which is specially designed for the practice of galvano cautery, and which does away with some of the serious inconveniences inherent to other piles of the kind that have hitherto been employed.

In this new apparatus, which is shown in the annexed cut, the elements are inclosed in an easily transportable box or case, and are so constructed that there shall be no danger of the fluid's spilling. It takes but a few minutes to mount and use the cautery, and but a few minutes also to close up the apparatus again to make it transportable.



NEW BATTERY FOR GALVANO CAUTERY.

The apparatus consists of a box, whose cover, S, and one side, R, are hinged, and within which is fixed a metallic support formed of three vertical columns united at their upper extremity by a horizontal crosspiece. Into the middle column, which carries a thread, enters a screw, while into the other two, which are smooth, enter two cylinders, H, that act as slides. This screw and these slides support, by means of a properly arranged device, a wooden tablet on which are fixed all the pieces that are necessary for the working of the apparatus. The head of the screw traverses this tablet and terminates in a wheel, C. It follows, from the well known properties of the screw, that the tablet, which cannot revolve because of the two slides, H, may be made to rise or descend by turning the wheel, C, in one direction or the other. Beneath the tablet and toward the extremities, at F, are situated the zincs and carbons. There are three of the former on each side, with four alternating carbons. These seven plates together do not take up much space in the box, but leave room for two quite thick sheets of rubber, I I, and four ebonite troughs. These latter are of different heights, those (L) containing the exciting liquid (solution of bichromate of potash and sulphuric acid) being nearly as high as the external case, and the others, M, being about half the height.

When it is desired to use the pile, the tablet is raised by revolving the screw, and the troughs, L, half full of liquid, are placed against the extremities of the box and secured in position by means of the troughs, M. Then, by revolving the screw in the opposite direction, the tablet is made to descend, and the zincs and carbons are caused to enter the liquid gently without splashing. If the circuit is closed, the current then begins to pass. The intensity of the latter is regulated by plunging the zincs to various depths into the liquid.

When the operation is terminated, and it is desired to carry the pile to another place, the tablet is raised high enough to free the extremities of the carbons and zincs, and the respective positions of the troughs, L and M, are changed. Then, by reversing the motion of the screw so as to cause the tablet to descend, the sheets of rubber, I, are pressed against the edges of the troughs containing the liquid with sufficient firmness to form hermetical covers to them. The case may then be closed preparatory to removal. It may be easily seen that no liquid can flow out, owing to the fact that the troughs that contain it are tightly closed, and that the small portion that drips from the zincs and carbons cannot injure the rest of the apparatus, inasmuch as it is caught in the troughs, M.

The zincs and carbons employed are about fourteen centimeters in width in each direction. The three zincs on each side, as well as the four carbons, are united for quantity, in such a way that two elements of wide surface are obtained. The terminals that are observed on the upper side of the tablet permit of employing at will one or the other of the elements only. On the contrary, the two elements mounted for tension may be used by attaching the conducting wires to one of the terminals of each of the elements, communication being established on another band by a wide band of metal.

The carbons are platinized, and, toward their upper part, are invested with a layer of copper to which is soldered the strip of metal that unites the four carbons of each element to form a single one. This arrangement, which secures a continuity of the contacts, is of a nature to keep the resistance of the pile constant, and consequently to contribute to the constancy of the currents.

Although this apparatus has been introduced but a short time, it is being used in some of the hospitals at Lyons, Montpellier, and Brussels, and, if we mistake not, at the Bichat Hospital in Paris.—*L'Electricien.*

An Old Church in Arizona.

The most interesting of all sights is the grand old mission church of San Xavier, nine miles from Tucson, on the Papago reservation. This mission was founded in 1654, when the Papago (or Pima) Indians were supposed to have accepted the Christian religion. The Church of San Xavier was begun about the year 1700 and finished in 1798, excepting one of the towers, which is yet unfinished. The style of architecture is Moorish. The lines are wonderfully perfect. It is in the form of a cross, 70 x 115 feet, and has a well formed dome. A balustrade surmounts all the walls. The front is covered with scroll work, intricate, interesting, and partly decayed. Over the front is a life-size bust of St. Xavier. The interior is literally covered with frescoes. The altar is adorned with gilded scroll work.

The statues are as numerous as the paintings. The tiling on the floor is much defaced and but little is left. That of the roof is nearly all as perfect as when laid. Its manufacture is one of the lost arts. There is a chime of four good sized bells in the tower that have a soft, sweet sound. Ascending to the roof, you walk up long, narrow stairs in solid walls. But one can go at a time. The same is true in going to the gallery of the church.

It is marvelous that so long ago, and in such a place, such architecture, ornaments, painting, and sculpture were so well executed. You are admitted by two of the Papago signiors, who have it in charge. The admittance fee is 50 cents for each person.—*Denver Tribune.*

ACCORDING to the new act passed by the Maine Legislature, salmon, land-locked salmon, and trout, except in tide water, cannot be taken with nets, seines, weirs, or traps. The taking of land-locked salmon less than nine inches in length and of trout less than five inches is unlawful; also the transportation of more than fifty pounds of land-locked salmon or trout by any one person at a time.

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