Pigment Colours are so named because the tinctorial agents employed are coloured lakes, and the insoluble mineral powders used otherwise as painters' colours Only a limited number of painters' colours are so used, as, for a variety of reasons, many of them are not suitable for calico-printing. Colours containing arsenic, for example, and some others which produce brilliant effects, cannot be used on account of their highly poisonous nature. Others are excluded on account of their cost, some are too dull and muddy in colour, and some are liable to tarnish or darken on exposure to light, air, moisture, or other influences. The pigments which are most extensively useful are ultramarine blue, Guignet's or chrome green, and chrome orange, all of which are very largely used by themselves or in combination with other colours. Lamp black is also employed for the production of a solid grey, and vermilion-red with some other metallic sulphides are sometimes, though rarely, printed as pigment colours. The principal lakes used are carmine, corallin lake (a derivative of phenol or carbolic acid), black logwood lake, and several others prepared from the dye-woods with tin and alumina salts. The aniline dyes on their first introduction were also worked as pigment colours. and printed with albumen.

The first medium employed for fixing mineral pigments and lakes to calico was a solution of India rubber in coal naphtha, an agent which, so far as clearness and permanency of the printed colour is concerned, was perfectly satisfactory. The steaming dissipated the highly volatile naphtha and left the thin film of caoutchouc mixed with the colour firmly adherent to the tissue. But the inflammability of the copious naphtha fumes evolved gave rise to many serious accidents, and the method had on that account to be abandoned. No other medium has been found to give so satisfactory results as the protein compounds, of which albumen obtained from the white of eggs is the type. Besides egg albumen, blood albumen, lactarin or casein from milk, and gluten from wheaten flour are used as agents for fixing pigments. In printing with albumen advantage is taken of its well-known peculiarity of coagulating and becoming quite insoluble at a temperature under the boiling point. It is mixed with the colour and deposited on the cloth in its soluble state, when, by the operation of steaming, it coagulates and remains firmly attached to the tissue, imprisoning with it the particles of colour with which it was mixed. The cloth is not in reality dyed, but has only a coloured pattern mechanically fastened or glued to it. Egg albumen gives the most delicate and clear shades, but recent improvements in the preparation of blood albumen render it increasingly available for bright colours. Lactarin and gluten, dissolved by means of caustic alkalies, are used for printing ultramarine and other pigment colours. The length of time that pigment colours are left in the steaming apparatus varies from half-an-hour to an hour.

Ordinary Steam Colours.—The essential features of this style consist in printing direct on the cloth the dyeing material, mixed in proper proportion, with any necessary mordant, and certain acids or salts to keep the mixture in solution. On the application of moist heat after printing, the acid is evaporated or a chemical decomposition takes place in the case of the salt, and an insoluble precipitate is produced in the fibre. Steam colours possess great brilliancy, but they have not the fastness and solidity of madder-dyed goods. The dyes in the case of steam colours must be in the form of decoctions or prepared extracts of the special chemical tinctorial principles. Such preparations have of recent years come into very wide use, and with the progress of chemical science they are daily attaining greater prominence and perfection, so that the older application of crude materials is rapidly being supplanted by the use of agents of known strength and quality. Thus, as already mentioned, madder-extract and artificial alizarin, treated as steam or "topical" colours, have largely taken the place of madder root as a dye colour, and by the preparation of artificial alizarin from anthracene, printers are now rendered independent of the vegetable kingdom as a source of their hitherto most important dye-stuff.

As a preparatory to printing, the cloth is mordanted or prepared by passing it through a solution of stannate of soda, and treating with a very weak solution of sulphuric acid which decomposes the stannate, combining with the soda, and leaves the stannic acid (peroxide of tin) precipitated in the fibres. Cloth thus prepared has much purer and brighter shades than simple bleached calico. The common steam colours include black and chocolate from logwood liquor, orange from annatto, yellow from Persian berry liquor and from bark liquor, green from Persian berries and yellow prussiate of potash, purple from logwood and red prussiate of potash, dark red from sapanwood and bark liquor, reds, purples, and chocolate from madder extract and alizarin, and blues from Prussian blue. Iron, alumina, and other mordants are used with these colours according to their character and the nature of the shades desired. The solvent principally employed is acetic acid, which readily volatilizes in the steaming process, but oxalic acid is also employed to keep certain special oxides in solution during the printing. Oxidizing agents, as the chlorate or bichromate of potash, are also required for the development of some colours. Steam blue is printed, not by using the Prussian blue colours ready formed, but by effecting the chemical reaction on the cloth itself, which results in the blue colour. In some cases yellow prussiate of potash is used, which yields Prussian blue; again, when the red prussiate is employed, Turnbull blue is the result; but a mixture of both, to which a proportion of ferro-prussiate of tin, called tin pulp, is added, is the source of the best steam blue. The reaction by which the colour is developed will be understood by instancing the development of Prussian blue from the yellow prussiate. It is mixed with an acid—tartaric, oxalic, or sulphuric—or the whole three combined, and printed on the cloth. In the steaming the added acid combines with the potassium of the prussiate and liberates ferrocyanic acid, which is further decomposed into cyanide of iron, abundant fumes of hydrocyanic acid (prussic acid) being meantime evolved. On withdrawing the goods from the steaming chest after this decomposition is complete the pieces are quite colourless, but exposure to the atmosphere in an ageing chamber, or passing them through an oxidizing solution, such as the bichromate of potash, develops the characteristic blue of Prussian blue.

Aniline Colours.—These colours now constitute the largest and most important section of steam-fixed dyeing materials, and in their behaviour and method of printing they form a class by themselves. The range of aniline colours now embraces almost every possible shade; and in no other department of scientific and technical research has equal activity been displayed within the few years which have passed since these colours were introduced; and the rewards of investigation have been commensurate. The number of colours introduced, and the methods of preparing them which have been suggested are beyond computation, and the list of those which are now in current use is exceedingly extensive. In addition to the dyes procured from aniline many more of an allied nature are prepared from other derivatives of coal-tar, phenol, naphthalin, and anthracene, some of which have also come into extensive use, and the applicability of others has been demonstrated. The topical use of these colours in connection with extract of madder, Guignet's green, ultramarine, &c., has exercised a powerful influence in improving the art of design in connection with calico-printing, placing as they do at the disposal of the designer an unlimited range of the most striking, brilliant, and pure colours.

Aniline colours have a powerful affinity for animal substances, dyeing silk and woollen tissues readily without the intervention of any mordant. Taking advantage of this property aniline colours were, on their introduction, printed as dye colours, albumen being used as a mordant. An albuminous solution was printed and fixed on the cotton, and on its introduction, so prepared, into the dye-vat the albumen readily took up the colour, while the unmordanted portions merely imbibed an easily discharged stain. Aniline colours were also printed with albumen in the manner already described as applied to pigments and coloured lakes; and the patents secured by Mr Walter Crum, in 1859, for the application of gluten and lactarin in printing, had reference chiefly to the use of aniline colours. The process of fixing these colours now generally adopted is known as the arsenite of alumina process. In this process the dye is dissolved in water or acetic acid, carefully filtered through a fine cloth and mixed with acetate of alumina, a thickener, and arsenious acid dissolved in glycerine. This mixture is printed on the cloth, which is then introduced into the steaming chest. In the steaming, acetic acid is liberated and arsenite of alumina formed, which with the aniline colour is precipitated in the fibres as a brilliant insoluble lake.

Spirit Colours.

This style of printing consists simply of a modification of the process for ordinary steam colours, but excluding the steaming. All the decoctions and extracts used for regular steam colours may be employed in this method, but they are mixed with such large proportions of the mordants and acids that were they submitted to the action of steam the fibre would be quite destroyed. When printed, spirit colours are therefore simply dried and aged for several hours, after which they are rinsed in water, washed, and dried. The style yields very brilliant but very loose and fugitive colours, and is now falling into disrepute.

Finishing Processes.

After the prints have undergone the various operations described above, they are submitted to a series of processes, whose object is to give to the fabrics such an appearance as will please the eye of the buyer. All the finishing processes have one common end, namely, to fill up the interstices which exist in the fabrics, and thus give to the calico a more substantial and glossy appearance; and this is effected by filling the cloth with boiled starch, farina, or sour flour, which is obtained from wheat flour which has been allowed to ferment. To these are often added large quantities of sulphate of lime or baryta, and other similar substances, with the object of imparting to the cloth a weight and appearance of solidity which it does not really possess. The finishing processes are varied according to the nature of the print, muslins requiring a quite distinct method of treatment from ordinary calicoes, and furniture chintzes also receive a finish peculiar to glazed goods. Some of the apparatus employed in finishing will be found figured under the heading Bleaching, where also the subject is entered into in some detail. As the general features of finishing, including water-mangling, drying, damping, starching, and calendering are the same both for white cottons and prints, it is unnecessary here to detail these operations. The machines and operations in a finishing-room may be briefly noticed as follows. The goods are opened by passing over a winch at a considerable elevation, and if necessary stretched in breadth on a machine which evens the texture and draws it out laterally. They are then passed into the chloring machine, which has two rollers, one of brass and one covered with india-rubber. The lower one is made to revolve in an aqueous solution of chlorine, and as the cloth passes between the rollers it is saturated with this solution. It passes immediately through a box containing a vapour of steam, which at once arrests the action of the chlorine, the momentary contact being considered sufficient to brighten the white ground without giving time for the colours to be affected. From the steaming box the piece passes through a water mangle, where pure water is spurted on the cloth, and after passing through the trough it receives a hard squeeze to extract as much moisture as possible before the drying is reached. The machine is a range of steam cans, generally made of copper. The next operation is that of starching, the machinery of which is almost identical with that used for chloring, starch paste, however, occupying the place of the chlorine liquor. The lower roller revolves in and carries up the starch to the cloth, which passes round the upper rollers and becomes saturated by the squeezing action produced and regulated by the screws and levers of the machine. After starching, the goods pass direct to another drying machine, whence they are taken to be damped by a slight sprinkling of water, which they receive in passing over a simple machine for the purpose, consisting of a rapidly revolving brush throwing up a fine spray. Calendering is the next and final operation, after which each piece is separated and folded up by a plaiting machine, or hooked by hand. It is then made up in the ordinary book form, and after being pressed in a screw or hydraulic press is ready for the market. (J. PA.)

CALICUT, or Kolikod, a seaport town of India on the western coast, in the British district of Malabar and the presidency of Madras, situated about 560 miles S. of Bombay, in 11° 15′ N. lat. and 75° 52′ E. long. The town stands on the sea-shore in a low and unsheltered position; and as there is neither river nor harbour, ships are compelled to anchor in five or six fathoms water, about two or three miles from land The houses are for the most part built either of sun-dried brick or laterite, and have a tidy appearance. In the quarter of the Moplahs or Mapillas there are several mosques, and the Portuguese quarter possesses a Roman Catholic church One of the largest buildings is the jail, which can accommodate 600 prisoners. The port is frequented by vessels from the Red Sea and the Persian Gulf, which return with freights of rice, cocoa-nuts, ginger, cardamoms, sandal-wood, and teak. The weaving of cotton, for which the place was at one time so famous that its name became identified with its *calico*, is no longer of any importance. Calicut is of considerable antiquity; and about the 7th century it had its population largely increased by the immigration of the Moplahs, a fanatical race of Mahometans from Arabia, who entered enthusiastically into commercial life. It was the first place in India visited by any European navigator, for it was there that Vasco de Gama arrived in May 1498, ten months and two days after his departure from Lisbon. At that time it was a very flourishing city, and contained several stately buildings, among which was especially mentioned a Brahminical temple, not inferior to the largest monastery in Portugal. In 1509 the Marshal Don Fernando Continho made an unsuccessful attack on the city; and in the following year it was again assailed by Albuquerque with 3000 troops. On this occasion the palace was plundered and the town burnt; but the Portuguese were finally repulsed, and fled

to their ships after heavy loss Not long after they concluded a peace with Prince Zamorin or Tamuri, and were allowed to build a fortified factory in the town. An English factory was founded in 1616. The town was taken in 1765 by Hyder Ali, who expelled all the merchants and factors, and destroyed the cocoa-nut trees, sandal-wood, and pepper vines, that the country, reduced to ruin, might present no temptation to the cupidity of Europeans. In 1782 the troops of Hyder were driven from Calicut by the British; but in 1789 it was taken and destroyed by his son Tippoo, who carried off the inhabitants to Beypore, and treated them with great cruelty. In the latter part of 1790 the country was occupied by the British; and under the treaty concluded in 1792, whereby Tippoo was deprived of half his dominions, Calicut fell to the British. After this event the inhabitants returned and rebuilt the town, which in 1800 consisted of 5000 houses. The present population is upwards of 25,000, composed largely of Moplahs, but including about 4000 or 5000 Portuguese, besides Parsees, English, &c.

CALIFORNIA

CALIFORNIA, the name originally given to a portion of the region of western North America bordering on the Pacific Ocean, and apparently taken from a Spanish romance (*Las Sergas de Esplandian*), in which the author speaks of "the great island of California, where a great abundance of gold and precious stones is found." This romance was published in 1510, and, becoming quite popular, the name of California probably struck the fancy of some one of the officers or companions of Cortez, and was applied by them to the newly-discovered country, perhaps on account of its association with a region fabulously rich in gold, the early Spanish discoverers in America always expecting to find an El Dorado in every new region they entered

As at first used, the name of California was applied to the coast and the territory at a little distance from it, north of Mexico; gradually it was extended over what we now call the "Great Basin," and with no well-defined limits to the north At the present time, the name California means only the State of California, one of the United States of America, and the peninsula is called Lower California. To the Spanish Americans these natural divisions of the country were and still are known as Upper and Lower California (Alta and Baja California), and the two were called "Las Californias"—the Californias.

The first discovery of the coast of Lower California was made in 1534, by an expedition sent out by Cortez, and consisting of two ships, commanded by Bezerra de Mendoza, and Hernando de Grijalva; and later, the gulf now known as the Gulf of California was discovered and navigated by Cortez himself; after whom it was for a time called El Mar de Cortez, and later El Mar Vermejo (the Red or Vermilion Sea), in consequence of the red colour which it has at times, and which is probably due to the multitudes of small animalculæ (crustaceans?) inhabiting its waters. In 1540 the mouth of the Colorado River was discovered by Alarcon, in command of a fleet sent out by Mendoza for geographical exploration In 1542 the coast of California proper was explored by Cabrillo as far north as Cape Mendocino, in latitude 44° In 1578 Sir Francis Drake entered the Pacific, and coasted along the shores of the American continent, reaching a point as far north as 48°. Whether he discovered the bay and harbour of San Francisco has been and still is a matter of dispute. By some he is supposed to have tarried and refitted his ships at what is now known as Sir Francis Drake's Bay; by others he is believed to have done this in the Bay of San Francisco itself. The evidence seems to decidedly preponderate in favour of the first of these suppositions. In 1602 the bays of San Diego and Monterey were discovered by Viscaino; but more than a hundred and fifty years elapsed before the latter was visited again, and before settlements began to be made on the coast of Upper California. The peninsula (Lower California) was entered by Jesuit missionaries in 1697, and a permanent mission established at Loreto; where, and at other points, the Jesuits maintained themselves, on the whole successfully, until 1767, when they were expelled from the country by order of Charles III. of Spain, and all their property turned over to the Franciscan monks. Later, the Dominicans obtained exclusive possession of the peninsula; and the Franciscans, not unwillingly, withdrew to Upper California, where they established themselves, built numerous missions, and throve remarkably until Mexico became independent of Spain in 1822; this event was a death-blow to the establishments of the Franciscans, which from that time forward lost ground from year to year, and finally were broken up altogether in 1840. The treatment by the fathers of the natives of the country was successful so far as the accumulation of material wealth was concerned, but not in the slightest degree conducive to their intellectual advancement or development, as the so-called converts were simply the slaves of the "good fathers." The whole number of the mission establishments was twenty-one,—the first founded in 1769, the last in 1820. They were all on or near the coast or bay of San Francisco, and the fathers displayed most excellent judgment in selecting for their sites the very garden-spots of the country. The number of the aboriginal inhabitants of California has rapidly decreased within the past forty or fifty years. The various authorities agree in fixing their number at over 100,000 in 1823. In 1863, according to the census made by the Indian Department, there were only 29,000; the census of 1870 gave about the same results, namely, 29,025, 5784 being actually enumerated, and the remainder merely an estimate. It is certain that the decrease in the Indian population was at one time exceedingly rapid; it would appear, however, that at present it is much less so. The few that are left are mostly a degraded, miserable set of beings.

During the time of the flourishing of the missions of California, the connection of the country with Spain through Mexico was a very loose one. Gradually a trade of some importance sprang up between the Atlantic and Pacific sides of the continent. Boston had for a number of years an entire monopoly of this business, which consisted chiefly of an exchange of groceries and cotton goods for furs and hides. The voyage usually lasted two years or more, and the profits were large. A few Englishmen and Americans wandered into California from different parts of the world between 1810 and 1830; and some adventurous and daring men found their way across the continent, in the pursuit of the dangerous and exciting business of hunting and trapping. It is estimated that there were, in 1830, as many as 500 foreigners on the west side of the Sierra Nevada. Of all these early pioneers, John A. Sutter is the one who is best known, from the fact that the first effective discovery of gold, by the Americans, was made by men in his employ; and also on account of the generous hospitality with which he welcomed the first comers into California, notably Fremont and his party.

In 1842 Commodore Jones of the American navy captured the fort of Monterey, raised the stars and stripes, and took possession of the country for the United States; but the next day he hauled down his colours, and apologized for his mistake. About this time the attention of the United States Government began to be strongly attracted towards California; and, as is universally believed in that State, the French and the English were also looking in that direction, with a view to a future possible taking possession of the country All the circumstances connected with the seizing of California by the United States will probably never be known. It appears pretty clear, however, that the authorities at Washington, having determined on a war with Mexico, and fully aware of the importance to the United States of an extension of their territory on the Pacific, resolved to take possession of California, so that after the termination of the war, matters being settled on the basis of *uti possidetis*, that country would become a part of the United States. At all events, Fremont being accidentally engaged in conducting a scientific expedition on the Pacific coast, received in May 1846, verbal instructions from an officer dispatched from Washington in a national ship, and who had crossed from Vera Cruz to Mazatlan. In consequence of these instructions, he turned back, made his way at once to Sutter's Fort, then to Sonoma, where he organized a battalion of mounted riflemen; and on the 5th of July he called his forces together, and recommended a declaration of independence. On the 2d of the same month a United States frigate had arrived at Monterey, where, on the 7th, the commander hoisted the American flag, issuing at the same time a proclamation, in which California was declared to be, from that time forth, a portion of the United States. This was followed by some fighting with the native Californians, and much bitter discussion and dissension among the different officers of the navy and army, who were concerned in the conquest of the country. The principal result was, that Fremont, who was tried by court-martial, found guilty of mutiny, and sentenced to lose his commission, was ever afterwards considered by the people to have been the real conqueror of California; and, in consequence, he came near being elevated to the Presidency. The country was entirely pacified before June 1847; and in March 1848 a treaty was ratified between the Governments of the United States and Mexico, by which the whole of Upper California was ceded to the United States, just at the moment when the discovery of gold on the American River was beginning to attract attention; and when the news of the ratification reached the Pacific coast, the excitement had already spread far and wide; San Francisco was deserted, and the whole population of the country was at work in the mountains, digging gold. The discussion as to what should be done with California, when acquired, began in Congress in 1846; and the question of slavery or no slavery in the new territory was at once raised. A most furious conflict followed, and nothing was accomplished during that session or the next; even as late as the adjournment of Congress, on the 4th of March 1849, the only progress made towards creating a Government for the new territory, was that the United States revenue laws had been extended over it, and San Francisco made a port of entry. In consequence of this the people themselves got together in September 1849, and a constitution was framed forbidding slavery, and in other respects resembling the constitutions of the free American States On the 7th of September 1850, a bill finally passed Congress, admitting California into the Union as a State, and without slavery, but leaving New Mexico and Utah open to its introduction. At the same time the celebrated "Compromise Measures" became a law and these were supposed to have settled the question of slavery for ever in the republic; the lapse of a few years proved, however, that this was a problem which admitted of no peaceful solution. By the treaty with Mexico, the United States did not acquire the Peninsula of Lower California, although they had military possession of it at that time. It was probably known to the authorities at Washington that it was a region of little value, as compared with the country to the north of it, or California proper.

LOWER CALIFORNIA.—Under this designation is comprised the whole peninsula, and it extends from Cape St Lucas to the boundary between the United States and Mexico, which is a line "drawn from the middle of the Rio Gila, where it unites with the Colorado, to a point on the coast of the Pacific one marine league due south of the southernmost point of the port of San Diego." The breadth of the peninsula varies very much, it being from five to six times as great between the parallels of 27° and 28° as it is opposite the Bay of La Paz. The area of Lower California has been estimated as 58,000 square miles; the recent charts of the American Hydrographic Office, based on original surveys, make the peninsula narrower than it was formerly believed to be, and its area has not been computed since these surveys were made; it will probably not exceed 50,000 square miles.

The interior of Lower California is chiefly known to us, as to its physical and geological structure, from a reconnaissance made by Messrs Gabb and Loehr, of the State Geological Survey of California, in 1867. This exploration was set on foot in order that some information might be obtained relative to the value of a concession made by the Mexican Government to an American company. This grant was expected to lead to a settlement of the country, but the whole thing turned out a failure.

According to Mr Gabb, the peninsula is divided into three distinct portions. The northern and southern extremities have much in common with each other, while the middle division differs decidedly from the others in its physical characters. The most southern division consists chiefly of granitic rocks and high ranges, which with their spurs cover nearly the whole area from Cape St Lucas to La Paz. Within this district, and lying between the spurs of the mountains, are many small valleys, some of which are very fertile, and well supplied with water. According to the American hydrographic charts, there are in this part of the peninsula two well-defined ranges, and the culminating point is given as 6300 feet in altitude. It is in this region, about half-way from Cape St Lucas to La Paz, that the principal mines of the peninsula are situated; and these are the only ones which, thus far, have proved to be of much value. They are in the districts of San Antonio and Triunfo. In 1867 these mines were producing at the rate of about $20,000 in value of silver per month; and, from recent newspaper notices, it would appear that they are still worked with success. The ores are, however, refractory, and not easily treated.

Proceeding northwardly into the middle section of the peninsula, the granitic masses unite and form one mountain range, which runs parallel with the coast of the gulf, and at a distance of fifteen or twenty miles from it. It is known as the Sierra Gigantea, or del Gigante, and has an elevation of from 3000 to 4000 feet. Crossing this range and descending its western slope, its inclination is found to be very gradual, the granitic mass being flanked on that side by heavy accumulations of sandstone, which has a gentle dip away from the crest of the ridge. This sandstone is quite destitute of fossils, but is believed by Mr Gabb to be of Miocene age. It is cut by numerous volcanic dykes, and also contains great quantities of material of eruptive origin, in the form of interstratified masses. In this portion of the peninsula the settlements are confined to the eastern base of the Sierra Gigantea. Here, at numerous points along the coast, there are small valleys, with good harbours