

obtain an equilibrium, to about a half division of the lower dial.

The value of each division of this dial varies from 3 to 10 milligrammes according as the balance shows 0.1 or 0.5 milligramme. As the dial has 10 divisions on each side of the central mark, we thus estimate, without tentatives, the three last centigrammes or the last decigramme, according to the sensitiveness.

At this moment the doors of the cage are closed, in order to prevent draughts of air, the gas is turned on by means of a regulating cock, and the balance is manipulated by first lowering the beam and then bringing the pans to a standstill. We then read the difference of the divisions traversed to the left and right upon the luminous dial through the image of the reticule. The images are reversed upon the dial, but practice soon causes this petty difficulty to disappear. This number of divisions indicates the number of milligrammes and fractions of a milligramme by which it is necessary to shift the counterpoise on its arm in order to obtain a perfect equilibrium, which latter is verified by a simple reading. Every half division of the dial corresponds, as to weight, to the sensitiveness indicated for the instrument.

With a little practice a weighing effected as above described takes but a quarter or a fifth of the time that it does with an ordinary balance.—*Revue Industrielle*.

#### STARCHES FOR THE FINISHING OF COTTON FABRICS.

THE starches have been classified by Dr. Muter, according to the appearance they give under the microscope, into five groups:

*Class I.*—Hilum and concentric rings visible. All the granules, oval or ovate. Tous-le-mois, potato, arrowroot, etc.

*Class II.*—The concentric rings are all but invisible, the hilum is stellate. Maize, pea, bean, etc.

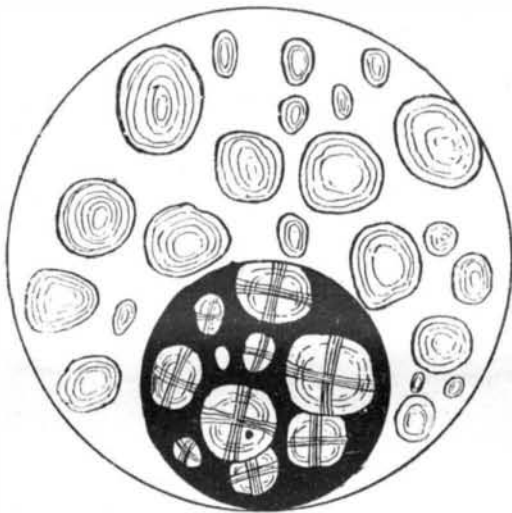
*Class III.*—The concentric rings are all but invisible, also the hilum in the majority of granules. Wheat, barley, rye, chestnut, etc.

*Class IV.*—All the granules truncated at one end. Sago, tapioca, etc.

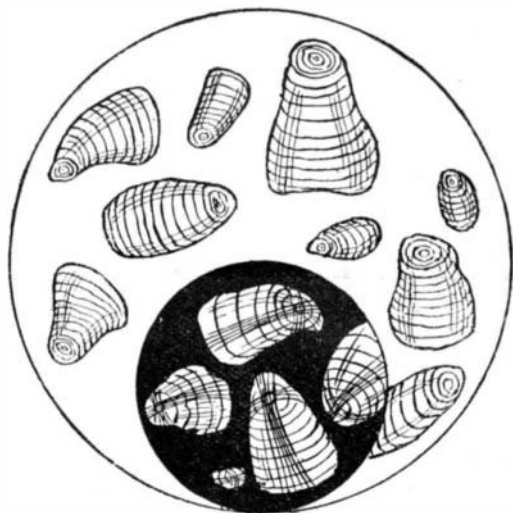
*Class V.*—All the granules angular in form. Rice, tacea, arrowroot, oats, etc.

The principal starches used for finishing cotton fab-

Of course, the first proceeding is to prepare a design on a small scale, which shall embrace your notions of color only. Then follows a full-sized cartoon, which I need hardly add shall embrace your best efforts in drawing. A tracing is made of the latter and transferred to sheets of cardboard. This cardboard is cut to the size of certain sections of your design, and, for convenience, should not be more than, say, 20 in. square. Of course, it will not always be square, but will bear the same relation to your complete cartoon as a map of the counties would to that of all England. Now, working from the small design (of color), the tesserae are cut to the forms required, laid face downward, and glued on to the cardboard sections containing your enlarged cartoon. When the design is all worked out on these sections they are ready for fixing on walls or floor by laying them home on a float of cement. When the cement sets, the cardboard sticking to the face is washed off, and the joints of tesserae flushed over with cement and cleaned off, leaving all joints filled up level.



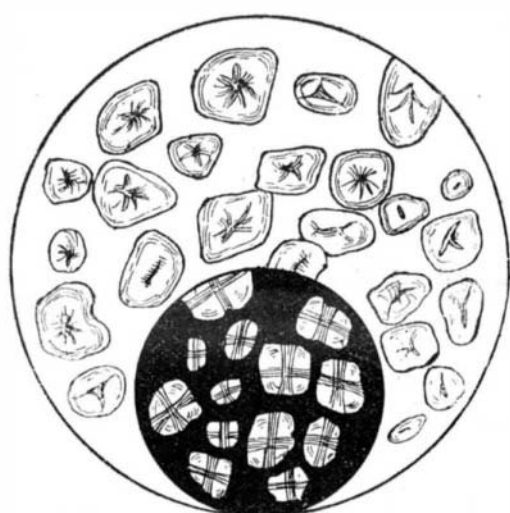
WHEAT STARCH.



POTATO STARCH.



RICE STARCH.



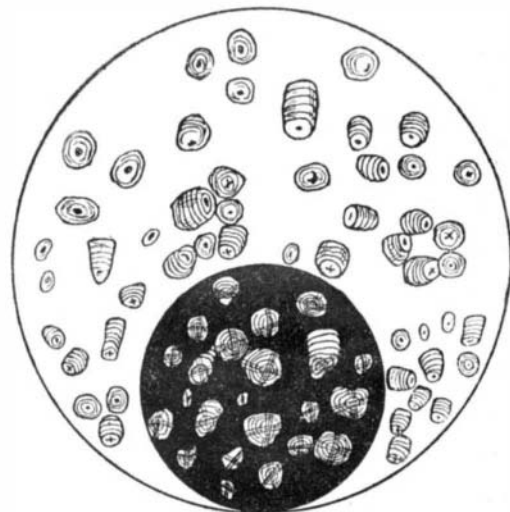
INDIAN CORN STARCH.



ARROWROOT STARCH



SAGO STARCH.



TAPIOCA STARCH.

rics are potato (farina), wheat, Indian corn (maize), rice, tapioca, arrowroot, sago; the last three not so often as those previously named.

#### MARBLE AND MOSAIC.\*

By T. R. SPENCE.

I DO not propose to enter into any historical details as to the first and subsequent application of mosaics. In a general sense we understand mosaic as a combination of various more or less imperishable materials—fixed together by cement or other adhesive substances—and laid over walls, floors, etc., with a view to permanent decorative effect. The substance of the tesserae is of many kinds, namely, glass, cheap and precious marbles, hard stone, and burnt clay, these mentioned being mainly in use for architectural purposes. For decorative schemes we collect as many gradations of color as are obtainable in such durable materials in their natural or manufactured state, and thus form a color palette which we regard in the same sense as a painter would his pigments.

\* A paper recently read before the Architectural Association, London. —*From the Architect*.

There are other processes used for the same end. The technical processes need not occupy our attention at present. There is one process that may appeal to you, and that is executing the work *in situ* by floating on a limited expanse of cement, and sticking on the tesserae at once. It has the advantage of enabling the artist or architect to see the effect of his efforts under the fixed conditions of light and height.

I shall confine myself to vitreous or glass mosaic, which for durability, extended scales of primary colors and their numerous semi-transparent gradations is unequalled by any substance yet used for wall or floor decoration. I am surprised, having all these fine qualities, it is not more used by architects. If you require proofs of its triumphs, go to St. Mark's, of Venice, and stand under its mellow golden roof. There you will find its domes and vaulted aisles, nave and transepts entirely overlaid with gold mosaic, into which ground is worked—in the deepest and richest colors and their gradations that contemporary manufacturers could produce—subjects selected from the creation down to the life of Christ, in addition containing a complete alphabet of early Christian symbolism. The roof surfaces being one succession of over-arching curves become receptive of innumerable waves of light and

broad unities of soft shadows, giving the whole an incomparable quality of tone and low juicy color.

Never use your gold but on curved or undulating surfaces. Flat planes of gold only give the effect of a monotonous metallic yellow, and can never be beautiful, owing to the absence of the variations that come with waves of shadow. By letting out the reins of imagination we might feel that in this a tenth century Giorgione has given off the mental impressions of all the golden autumn of his life. His material gave him an advantage over his great followers of the fifteenth and sixteenth centuries, inasmuch that glass has a living and glowing quality of light not existing in the somewhat clouded purity of oil or fresco.

In St. Mark's we have an example of the superb treatment in deepest and most Titianesque scales applied to curved forms, but to find a similarly complete example of the use of lighter tones and on flat surfaces, we must turn to Ravenna. I can give you no adequate description of the wall mosaics of Ravenna. In the sense of delicate color they remind me of some of the subtle harmonies of many of the finest works of the modern French school—of the Impressionists and others who combine that quality with a true instinct for design. In standing before them you feel that the Dagnan Bouverets, the Mersons, the Cazins, the Puvis de Chavannes, etc., of the fifth century have had a hand in the conception and realization of the beautiful compositions to be found on the nave walls of the two churches of St. Appollinare Nuovo and St. Appollinare in Classe. Here all the scales are of delicate degrees of light tones, supreme in their beauty, completeness, and, most important to us, their true decorative instinct. In the Baptistery we find what I may term a third essay in color, by weaving in rich, dark, and glowing colors on figures and bold sinuous forms of ornament in such a skillful and judicious manner that the whole dome seems to be alive with harmonies, although they are mostly primaries.

As you know, rules for the disposition of color are futile, yet some details that struck me as eminently satisfactory may interest you. In all cases the tesserae are of small dimensions, about a quarter of an inch square. The stucco joints are large and open, surfaces far from level, but undulating considerably. The tesserae stick up in parts, brilliant edges showing. Absence of flatness gives play to the light. The gray of the stucco joints brings the whole composition to-

gether, serving as cool grays in a picture to give tender unity. Gold, apart from backgrounds and large surfaces, is used very cleverly in small pieces in borders of garments, and more especially in thin outlines to make out the drawing and certain flowing forms of ornament. Brilliant pieces of glass actually moulded at the kiln into forms of jewels add brilliancy to crowns, borders, etc. These stick boldly out from the surface. I noticed in the Baptistery below the springing of the dome a frieze about 2 ft. 6 in. deep, having the ground entirely in black, through which was woven in thin gold lines a delicate foliated design. This, in conjunction with the upper surfaces in dark, rich color, had a most delightful effect.

We, as students, can learn most from the Ravenna examples, for great are the needs of light and silvery color in this country, where gray and gloomy days far outnumber those in which the sun gives liberally of his light. I may say, in passing, as our subject is really a matter of decoration, that our nineteenth century efforts in this direction are all of a somewhat gloomy tendency. We fill our rooms with imitations of somber Spanish leather, stain and paint our woodwork in leathery and muddy tones, to arrive at what is now a sort of decorator's god. Quaintness is the name of that

god. Many are the sins for which he has to answer. Had we not better worship a deity called beauty, whose place is a little higher up Parnassus? Why should we not in our endeavors attempt in some measure to transfix the brilliant harmonies that follow the sun in his liberal and gracious course? This muddy quaintness is certainly pleasant for brief periods, when lamps are low and fire light gilds and deepens its parts. Turn the sunlight on these so-called triumphs of the modern decorator's art, and then you feel the lack of many a phase of color that might have been borrowed from the thousand and one examples that in nature he vivifies and makes brilliant.

Referring again to the Ravenna mosaics, I can only add that at the present day an extended palette of colored glass is available. The technical difficulties are not great, and there is no question as to the fine qualities of design and color that are to be obtained in this material. The great point in this, as in all other schemes of decoration, is the art, the mental quality of conception, and the sense of color and fitness. If we hold the precious heritage of an artist's mind—that divine and rare something which gives form, color, and completeness to a story, a dream or a vision—then very little difficulty follows in making vitreous mosaic a valued servant in the realization of a fine creation.

It is the function of architects to design suitable spaces for color decoration, so bound in by dignified mouldings and other details of his constructive art, in such a manner that the addition of decorative color shall in no way mar the scheme of his complete work, but shall (under these well ordered distributions) have set on them the seal and crown of color which is inseparable from a perfect piece of architecture. In such spaces he may dream his dreams, tell his stories, and stamp on them for centuries his subtlest and divinest thoughts. May I not urge that to such spaces must be given the best that is in you? for once placed so shall they remain unchanged through generations, time being powerless to add any mellow garment of tone or softening quality whatever.

I mistook the title of the subject in thinking that it was mosaic only, and at the last moment found it was marble and mosaic. However, the same dominant principles shall underlie the treatment of marble. It is a question of the finer instincts for form and color.

In recent years the demand for choice decorative materials has been the means of opening out many marble quarries all over the world. Transit being easy, a large scale of varieties is available. One fine addition is the Mexican onyx. My feeling is that the most beautiful marbles are those where the soft and sinuous veins melt and die into the general body, comparatively sharp markings dying right away at the edges into innumerable gradations. Marbles having strong and hardly marked veins present great difficulties in distribution. If they are near, they offend you with their coarseness; and, placed at a distance, the hard vein lines have very little decorative value. I should say use these in narrow slips, with very little moulded profile or as parts of intaglio.

Mouldings should be specially designed for different marbles. I should say mainly on the principle of sudden contrasts; that is, large members with very little curve bound with members very small in detail, thus obtaining sharp lines, having little surface to be influenced or distorted by the veined markings, and serving to sharpen up and give form to the broader members (which show the color qualities of the marble), much as you sharpen up an ink drawing by underlining. These small members serve the architect's purpose for the expression of vertical and horizontal lines, and where decisive and cutting shadows are required in the composition of his work.

If delicate carving forms part of your design, I should say statuary is the best, as you have no veins to distort your detail. I need hardly add that economy should be studied in using precious marbles, without injuring the durability of the work. Contours may be built up in thin sections.

Intaglio is a beautiful form of treating marble on an inexpensive ground. Gem-like effects may be obtained by inlaying with smaller pieces, following such ornamental forms as your inventive brains shall dictate. Perhaps the pockets of your clients will be the chief dictator.

Heraldic emblazonings, inlaid in marble, are highly effective. The conditions of the heraldry necessitate the use of many varieties, but in such small quantities that on a large simple field they are rarely out of harmony. In addition they map out a large and interesting variety that will save the worry of creation of designs coming entirely from your own brain, and you know the worry of an architect's life makes him hail with pleasure at times a rest from the strain of creation. This heraldic work may be seen to perfection in the chapel of the tombs of the Medici at Florence.

At the Pitti Palace are some tables which you may know where marble intaglio can no further go. Alabaster does not appeal to me, it is somewhat sugary in results. If you are fortunate enough to have a sculptor who is a sort of nineteenth century Donatello, let him work his will on statuary or such restful marble.

The celebrated monument in the church of S. Giovanni Paulo, at Venice, which Ruskin says is the finest monument in the world, if my recollection serves me correctly, is in white marble, and its beauty comes entirely from the sculptor's art. Such monuments give you much better than any words of mine ample suggestions for marble treatment. I may quote such names as Nicolo Pisano and Verocchio.

Photos of some of their work I have brought. Note Pisano's beautiful white altar at Bologna, and Mina de Fiesole's work in Florence. They all show the sculptor as supreme. Why should not we encourage individual young sculptors more? Give them portions of your work in which they can put all the fervor and enthusiasm of young manhood. Their powers may not be ripe, but they possess a verve and intensity that may have forever fled when in later years the imagination is less enthusiastic and the pulses slower. I am sure there are many young sculptors now wanting commissions who have been trained at the academy, and better still, in the best French schools. I maintain that the contemporary French school of sculpture is in its line equal to any school of sculpture that has ever existed, not excepting that of Phidias or that of the Italian Renaissance of the fifteenth and sixteenth centuries. I believe history will confirm this. Why not give these men an opportunity, and help on the

movement to found a truly English school of sculpture, rather than give all such work to trading firms of carvers, who will do you any number of superficial feet, properly priced and scheduled, and in the bills of quantities, of any style you please, from prehistoric to Victorian Gothic? Of course, this is our British way of founding a great school.

There is one method of treatment that appeals to me very strongly, and that is the application of colored metals to marble, more especially bronze and copper. I may quote as a successful example near the Wellington Memorial at St. Paul's. Another suggestion—although it is not used in combination with marble, but it nevertheless suggests what might be done in the way of bronze panels—that is, the Fawcett Memorial, by Gilbert, in the west chapel at Westminster Abbey.

#### THE ST. LAWRENCE HOSPITAL FOR THE INSANE.

THE St. Lawrence State Hospital at Ogdensburg, N. Y., is a center of public, professional, philanthropic, and legislative interest. Though projected in advance of the adoption of the system of State care for the insane, it was opened at a time to make it come under close observation in relation to the question of State care, and the friends of this departure from the inefficient, often almost barbarous provisions of county house confinement could have no better example to point the excellence of their theories than this new and progressively planned State hospital. The members of the State Lunacy Commission and Miss Schuyler and her colleagues of the State Charities Aid Society, who fought the State care bills through the Legislature this winter and in 1890, would be repaid for all of their trouble by contrasting the condition of the inmates of the St. Lawrence State Hospital with the state they were in under their former custodians, the county officers of the northern New York counties. At the best, even when these officials realized the responsibility of their charge and were actuated by humane impulses, the county houses offered no chance of remedial treatment. Custody and maintenance, the former mainly a reliance on force, the later often of scant provision, were the sum total of what was deemed necessary for the lunatics. In their new environment they find eve-

woodland, meadow, farm land, and a market garden tract of the \$100 an acre grade. The location of the institution in these particulars and in reference to salubrity, sewerage facilities and abundance and excellence of water supply, is wonderfully advantageous.

In planning the hospital Dr. P. M. Wise, who has since become its medical superintendent, aimed to take the utmost advantage of the scenic and hygienic capabilities of the site, and to improve on all previous combinations of the two general divisions of a mixed asylum—a hospital department for the concentration of professional treatment, and a maintenance department for the separate care of the chronic insane. He was anxious to secure as much as possible of the compactness and ease of administration of the linear plan of construction, with wings on either side of the executive building of long corridors occupied as day rooms, with sleeping rooms opening out of them on both sides. But he wanted to avoid the depressing influence of this monotonous structure, as the better results of variety and increased opportunities of subdivision and classification are well recognized. He was not, however, prepared to accept wholly that abrupt departure from the linear plan known as the "cottage plan," which in some institutions has been carried to the extreme of erecting a detached building for every ward. The climate of St. Lawrence county forbade this. Her winters are as vigorous as those of her Canadian neighbors, even as her people are almost as ebullient in their politics as the vigorous warring liberals and conservatives across the river. And there are features of the linear plan that can only be left out of our asylum structure at the expense of efficiency. Other rules that he formulated from his experience were that a building for the insane should never exceed two stories in height; that fire proof construction and at least two stairways from the upper floors should be provided; that day rooms should be on the first and sleeping rooms on the second floor; that all buildings for the insane who suffer from sluggish and enfeebled circulation of the blood should be capable of being warmed to 70° in the coldest weather; that ample cubic space and ventilation should be provided; and that, as far as possible, without too great increase of the cost of maintenance or sacrificing essential provisions for treatment and



THE ST. LAWRENCE HOSPITAL FOR THE INSANE.

rything as different in accommodations and treatment as the word hospital in the title of the institution is different in sound and significance from the hope-dispelling, soul-chilling names of "asylum," "mad house," and "bedlam" formerly given to all retreats for the mentally afflicted. They find, and it is an encouraging feature of the plan that so many of them quickly see and appreciate it, that they are considered as sufferers from disease and not from demoniacal possession. The remarkable range of classification provided for, the adaptability of construction to the different classifications, the reliance on occupation, the dependence on treatment, and the subordination of the custodial feature, except where a wise conservatism demands its retention, are apparent alike to inmates and visitors.

This hospital is complete as to plans, and as to the power plant, drainage, and subway construction necessary for the 1,500 patients, that the legislature has provided for in its law establishing the institution. Buildings are already finished and occupied that accommodate 200 inmates, and the contractors have nearly finished part of the central group that will bring that number up to nearly 1,300. The appropriation asked for this year by the managers will be scaled down considerably by Mr. McClelland, the very economical chairman of the Ways and Means Committee of the Democratic Assembly. But, unless he has miscalculated, there will be money enough to carry on the work of construction to advantage for the year. An appropriation sufficient to complete the buildings at once was thought by many to be the wisest economy, but big figures in an appropriation bill have very little chance this year. The bill establishing the State Hospital district and providing for the building of the institution fixed the per capita cost of construction, including the purchase of land, at \$1,150, and the plans have been made on that basis for 1,500 patients. But if the needs of the district should require it, the capacity could be increased by an almost indefinite extension of the system of outlying colony groups at a very small per capita cost, as the central group is by far the most expensive in construction.

The administration group in part, and one outlying group, with the general kitchen, bakery, workshop, laundry, employees' dwelling house, power house, and pumping station, are already erected, and have added a feature of architectural beauty to Point Airy. This point, of itself of picturesque and romantic beauty, juts into the St. Lawrence River at the head of the Gauleop Rapids, three miles below Ogdensburg. It is a part of the hospital farm of 950 acres, which includes

necessary restraint, asylums should aim to reproduce the conditions of domestic life.

State Architect Isaac G. Perry planned the St. Lawrence State Hospital buildings on ideas suggested by medical experience, with a breadth of comprehension and a technical skill in combining adaptability, utility, and beauty that have accomplished wonders. The buildings are satisfactory in every particular to every one who has seen them, and even the most casual observer is impressed with the effect of beauty. This was accomplished without elaboration of material, expressive carving or finish. The ornamentation is purely structural and is obtained by a handling of the materials of construction which also yielded the largest promise of strength and durability.

The central hospital group, of which an idea is given in the cut, now consists of five buildings. The picture shows three, the center one and two of the flanking cottages on one side. They are matched on the other side. The central or administration building is a three story structure of Gouverneur marble, and like all of the stone used, a native St. Lawrence county stone. The marble's bluish gray is relieved by sparkling crystallizations, and its unwrought blocks are handled with an ornamental effect in the piers, lintels, and arches, and well set off by a simple high-pitched slate roof, with terra-cotta hiprolls, crestings, and finials. The open porches are both ornamental and useful, taking the place of piazzas. The tower is embellished with a terra-cotta frieze. All accommodations for an executive staff for the 1,500 patients may be provided in this building.

Behind it on the south is a one story building whose ground plan is the segment of a circle. It contains sun rooms, medical offices, general library, laboratory and dispensary, and the corridor connecting the reception cottages, one for women, on one side, and one for men on the other, with the administration building. As this one story structure is 171 feet by 41, the buildings known as cottages of the central group are more than nominally separated. All the advantages of segregation and congregation are combined.

The reception cottages are of pale red Potsdam sandstone. Their simple construction is pleasing. The ground plan is in the form of a cross; the angles of the projections being flanked by heavy piers between which are recessed circular bays carried up to the attic and arched over in the gables. The cross plan affords abundant light to all the rooms, and as much of the irregular outline as possible is utilized with piazzas. With still another recourse to the combination corri-