

important industry, the annual production of the French factories alone reaching fifteen or twenty thousand tons; to which must be added a quantity ten to twenty times greater, due to imitations of the genuine article. We have now reached the second part of our subject—the uses and methods of application of crude asphaltum and of bituminous asphaltum.

#### USES AND APPLICATIONS OF CRUDE ASPHALTUM.

The principal one of the applications of this material is that of pavement making. The substance used for this purpose is called compressed asphaltum. It is scarcely necessary to go into the full details of the practical methods employed in making these pavements, since they are perhaps well known; it is sufficient to remark, in a general way, that the powdered asphalt rock is heated in rotary cylinders something like coffee-roasters, and then carried to the spot where it is to be used and where it is spread over a bed of beton and finally rolled. The good and bad qualities of asphalt are at present known to every one. The former lie in the good wheeling it affords, its noiselessness, its freedom from mud and dust, and the happy influence it exerts on the public health by these very properties; while the latter are found in the liability that horses have to slip up on it in wet weather, the too frequent necessity of destroying the asphalt crust to reach water and gas mains and service pipes, and, finally, the frequent necessity of repairs.

The advantages are beyond discussion. As for the alleged defects, without attempting to deny that they exist, it is safe to say that they are remediable, and that, if certain of them have not already been done away with, the system itself is not responsible for them. The slipping of horses on asphalt is an undeniable fact. At certain times, when there is a mist or fine rain, the dust of the road is changed to a slimy mud, and, until this has been washed off, the surface remains slippery. This inconvenience is a real one; but it may be pleaded in extenuation that a horse falling on asphalt receives less injury than he would if he fell on a macadamized or paved roadway. The second defect also undeniably exists at present; but as the municipal authorities of Paris cannot long defer relegating the water and gas mains to the sewers, as done at London, these evils destined to disappear with its cause. The third defect is one easily remedied, and is due to two principal causes: The first one is the neglect of an essential, vital precaution—that of spreading the asphalt as a hot powder only upon a dry, inflexible, and impermeable bed. The second cause of destruction is due to the use of improper or badly prepared materials. We now come to the

#### APPLICATIONS OF BITUMINOUS MASTIC.

Some years ago the application of this substance was limited to the construction of sidewalks (Fig. 4) and to the covering of the exterior of vaults and arches; and it appeared then doubtful whether it could be extended much further. Its application at the present time, however, as a material for floors is so common that it is scarcely necessary to advert to the fact. It has entered into general practice in all building operations, and the methods of using it are within the reach of any laborer, and not confined as formerly to a certain craft possessing certain trade secrets which they religiously guarded.

An attentive observation of the properties of this singular substance, however, has enabled those who have employed it to some extent to find other uses for it; and upon these we may now dwell for a few moments. If bituminous mastic be spread out in a thin layer, upon a sidewalk for example, this fact will be remarked: In winter it is brittle, a sudden shock sufficing to break it; but in summer it becomes soft and malleable, and it is only by means of gravel that it is prevented from becoming appreciably disfigured by the feet of those who walk over it. But if, after sand or pebbles have been mixed with it, it be cast into blocks of a certain size, not only will it offer great resistance to a blow, but under no temperature of the atmosphere will it become misshapen. Struck by this unexpected property, a French engineer, M. Léon Malo, conceived the idea of utilizing it on a certain occasion, as follows: In 1862, having to put up a 50 horse power horizontal steam engine, he needed a monolith about 24 feet long and hollow in the center for the passage of the crank. Not being able to procure one except at very great expense, he thought struck him to employ as a substitute a block of bituminous mastic moulded and mixed with rubble. The engine thus mounted has been running for eighteen years in a room in which the temperature varies from 30° to 50°, and yet the asphalt block has not changed its shape a hundredth of an inch. Encouraged by his success, this same gentleman then endeavored to extend the range of use of the material, and, among other applications, he used it successfully as a foundation for a high-speed Carr crusher, which has been running for six years; but up to the present time the asphalt beton has not varied a particle in shape. Foundations on the same system were likewise constructed by Mr. Delano for the Toufflin grinder at the Paris Exhibition of 1878, and the speed of which was 1,400 revolutions per minute. Owing to the slight elasticity of the asphalt this enormous speed was attained without producing in the apparatus the least jar. M. Delano (who is director of the Asphalt Company of France) has also established, under the direction of Captain Naquet, foundations for a steam hammer for the artillery workshop at Vincennes. These examples are sufficient to show the properties of asphalt under a new light—extreme rigidity and tenacity, and at the same time elasticity without deformation at any temperature of the atmosphere.

Another property still more unexpected is that which makes asphalt an excellent preservative against fire.

Some twenty years ago M. Leon had laid an asphalt coating on the floor of a workshop. On the ground floor there were some furnaces which one day set fire to the floor beams above, and in an instant the whole lower surface of the floor was a sheet of flames. The flames were finally gaining the roof when the carbonized beams gave way and the planking fell. Then occurred a curious circumstance: the layer of asphalt, softened by the heat, fell in a single mass, as a thick heavy cloth might have done, suddenly enveloped the furnaces in its folds, and completely extinguished the fire. This experiment was repeated on a small scale, and as a consequence the Omnibus Company of Paris and several like associations have had the floors of their barns, etc., coated with the material.

In compact masses, mixed with stones or other heavy and inert materials, bituminous mastic is valuable for use in all foundation work which requires considerable tenacity and an elasticity without deformation; in addition is the advantage that it possesses of being easily moulded and not attackable by atmospheric or saline agencies. It is, then, an exceedingly interesting substance and one worthy of occupying the attention of scientists. However, it must be con-

fessed that, with the exception of a few chemists and certain geologists who have considered with interest this mineralogical curiosity, each from his own point of view, there are as yet very few scientists who have done it the honor of a profound study. But it has taken, as if by force and without being invited, its place among the most useful, and, we might say, most indispensable materials of construction, and there appears to be destined for it a brilliant future.

#### A NEW VIOLET FOR PIGMENT.

By E. GUYARD.

MANY attempts have been made to turn to account the violet blue color obtained on adding an excess of ammonia to a solution of a salt of copper. Guyard has to some degree succeeded. To an ammoniacal solution of blue vitriol he adds a solution of yellow prussiate. The precipitate thus obtained is well washed and dried at a heat of 338° F., when it loses ammonia and cyanogen, takes up oxygen, and becomes converted into a fine violet-colored pigment. If heated 392° F. a blue product is obtained, and at 432° F. a dull green.

The violet powder has more coloring power and covers better than ultramarine. If fifteen grains of it are stirred up with its own weight of water, thickened with sixty grains of solution of albumen, printed and steamed, the color is not in the least affected nor is it injured by the action of the air. Boiling lime-water turns it rather more to a blue, and chloride of lime gives it a more reddish tone. Concentrated solution of salt of tin turns it to a vinous red. Strong muriatic acid has little action, so that the new pigment may rank among the more permanent violet colors.—*Chem. Review.*

#### IMPROVED APPARATUS FOR BLEACHING, WASHING, CLEANING, DYEING, OR DISINFECTING TEXTILE GOODS.

By M. SCHARR.

THE object of this invention is to effect a great economy in the use of soap and other materials used in washing, dyeing, or bleaching, and to render practicable to use less time and labor in the processes of boiling and preparing for bleaching as well as in bleaching and dyeing.

Two or three recipients called steeping becks are connected respectively with reservoirs placed at a certain height by means of pipes and valves. The pipes are disposed so that the flow from each reservoir may take place into one of the steeping becks, acting upon the goods placed in the latter, whether wool, woolen yarns, jute, China grass, cotton, lincin, or silk.

The fiber is placed in the steeping beck, in which it is fixed by means of a grating and a cover, as may be desired; in this manner, on opening the valve, the liquid enters between the bottom of the beck and a false bottom perforated, so that the operator may be sure that it passes in a regular and clear stream through every portion of the goods contained in the beck.

The liquid rises in the beck and passes by an overflow into a gutter, which leads it into a reservoir, whence it may be conveyed into any other reservoir by means of a pump or an injector. To each reservoir and each steeping beck is connected a steam-pipe to regulate the heat and the pressure according as the process may require.

The process of bleaching is performed in the following manner:

The yarn is placed in a beck fitted with false bottom and lid, and the reservoirs are filled with the liquids required for steeping, cleaning, or preparing the fiber, and then for the process of bleaching itself.

When the beck is full a current of steam is passed in, if necessary, in order to soften the foreign matters which it is desirable to remove from the goods. The lye of fatty soaps, etc., in the reservoir, is brought to a boil by means of a jet of steam, which is kept up for half an hour; the liquid which has been employed for two or three times previously is run off into the sewer. The liquid of the second reservoir is then run into the same beck for the same length of time; this liquid is then raised by means of a pump and an injector into the first reservoir, now empty, and can be employed again after it has been strengthened a little. We then run into the same beck the liquid of the third reservoir, and raise it afterwards into the second reservoir, and pump into the third water at any required temperature, which then passes into the beck. The goods contained in the beck are now clean and suitably prepared for bleaching or dyeing.

While the goods are thus treated in this beck, those of the second and third may be treated in the same manner if desired.

In the process of dyeing the same method of operating may be adopted; the dye-bath may be prepared in the reservoirs.—*Moniteur de la Teinture.*

#### ON THE ULTIMATE ANALYSIS OF ORGANIC SALTS OF THE ALKALIES AND ALKALINE EARTHS.

By H. SCHWARTZ and P. PASTROVICH.

THE ultimate analysis of organic salts of the alkalies and alkaline earths is now generally performed by means of chromate of lead, which is more costly than copper oxide, as it cannot be regenerated, and as it admits of only one use of a combustion tube. It has been proposed to add pure fused potassium dichromate to the substance in the boat, and placing granulated copper oxide before it. Accurate determinations of carbon have been obtained in this manner, but a simultaneous estimation of the mineral constituent has to be dispensed with. If, however, as is now very general, the combustion is performed in a current of oxygen, the following method appears useful: We prepare pure mercury chromate by precipitating pure neutral potassium chromate with mercurous nitrate, and washing by decantation. It is dried and ignited in a porcelain capsule, leaving pure finely-divided chromic oxide. An excess of this is thoroughly mixed with the weighed organic salt, and placed in a platinum or porcelain boat, not too small. The combustion tube is open at both ends, and filled for two-thirds of its length with granular copper oxide, and ignited in a current of dry air. The charged boat is then introduced at the back, and the combustion is completed in the well-known manner. Pure dry oxygen is finally passed through for a sufficient time, whereby the carbonates of the alkalies and alkaline earths are entirely converted into neutral chromates, and the whole of the carbonic acid is obtained. Even nitrogenous substances may thus be burnt without danger of the formation of nitrogen oxides if the current of oxygen is kept moderate at the outset, so that the metallic copper placed

in front may remain unoxidized till the last. If the boat is carefully drawn out when cold the base present in the salts may be accurately found by determining the chromates. In case of the soluble alkaline chromates this is performed most simply by means of a decinormal lead solution, which is run into the aqueous solution of the contents of the boat till a drop no longer gives a red precipitate with silver nitrate. In case of the chromates of the alkaline earths, it is more convenient to mix the contents of the boat with an excess of an acid solution of ferrous chloride of known strength, and to titrate the non-oxidized ferrous salt in the filtrate with permanganate.

In case of explosive nitro-products, such as potassium picrate, it is necessary to mix the substance first with chromic acid, and then with an excess of copper oxide. The separation of the chromate formed from the copper oxide presents no difficulty. The same method may be adopted in the analysis of carbonates.—*Berichte der Deutschen Chemischen Gesellschaft.*

#### PRODUCTION OF AMMONIA FROM THE NITROGEN OF THE AIR.

MULLER and GEISENBERGER draw the combustion gases of a furnace through caustic lime, where they are freed from carbonic acid, so that nearly pure nitrogen remains. In another apparatus hydrogen gas is produced by bringing water in contact with ignited coke, and the two gases, hydrogen and nitrogen, pass into a receptacle, where they are thoroughly mixed together, and subjected to the action of electric sparks. The ammonia is removed as soon as formed.

It may be useful to recapitulate the former attempts made to attain this object, unfortunately without success.

In 1864 Hunt patented a process for obtaining sal-ammoniac by passing a mixture of muriatic acid and nitrogen or air over red-hot coke, impregnated with chloride of iron or manganese. Wagner had made the same proposal as early as 1856, but he recommended chloride of magnesium in place of manganese.

Margueritte and De Sourdeval, and also Moermann-Laubuhr, make bricks of charcoal or coke, and an alkaline salt to promote the formation of cyanogen. These bricks are heated in a furnace, and air freed from oxygen, mixed with carbonic acid, is passed over them. A cyanide is thus formed, and converted into ammonia or an ammoniacal salt by four methods.

E. Solvay soaks coke in chloride of ammonium, and burns it so that the products of combustion, including sal-ammoniac, may be collected.

In 1877 Julien patented a process for forming ammonia by the action of the electric spark upon a mixture of hydrogen and nitrogen.

J. Swindells, in 1876, proposed to pass a mixture of air and steam over burning coke, and drive the gases into soda-lye. The escaping nitrogen and hydrogen are heated in chambers full of fragments of clay, and are to form ammonia.

In August 24, 1878, Rickman patented a process for passing a mixture of watery vapor and air into iron or clay retorts filled with coke or spongy iron, and heated to about 1,031° F. The watery vapor is decomposed by the ignited carbon, and its hydrogen combines with the nitrogen of the air to form ammonia.

The new patent evidently adopts Julien's principle for combining the gases. The manner in which the hydrogen and nitrogen are obtained is a secondary matter, presenting no difficulties.—*Chemiker Zeitung.*

#### PROCESS FOR BLEACHING BLOOD-ALBUMEN BY MEANS OF THE ELECTRIC LIGHT.

By LEON MANET.

THE process which the inventor has devised for decolorizing blood-albumen is based upon the action of the electric light. Under the prolonged influence of the electric rays the coloring matter which remains in the blood is gradually destroyed, the albumen loses its color, and becomes almost as white as that extracted from eggs.

The inventor makes no change at all in the present method of manufacturing blood-albumen. It is after the albumen has been separated from the clot, whether while still liquid or after it has been dried, that it is exposed to the influence of the electric radiations. The inventor arranged electric lights fitted with lenses or reflectors, so as to cast their light upon the albumen which is to be bleached. If it is still liquid the light is thrown upon the plates or trays which contain it in the drying stove.

These plates may be made of glass, so as to let the rays pass through them. If the albumen is dry the light can be thrown upon layers of the article arranged upon a stage. In either case the process varies in duration according as the albumen has been more or less completely separated from the clot. Under ordinary circumstances twenty-four hours will suffice to bring about a perfect decoloration. For more efficacy the electric light may be brought into action at the beginning of the process when the clot and the albumen are being separated.—*Moniteur des Produits Chimiques.*

#### NEW PROCESS OF DYEING FAST BLACK FOR MIXED FABRICS, WOOLEN FABRICS, COTTON FABRICS, AND FOR YARNS.

By M. J. CLARE, France.

THIS invention consists in preparing a bath with solutions of logwood, combined with an extract of bark quercitron, in proportions according to the intensity to be given to the dyed goods, and in adding to the bath a solution of sesquioxide of chrome and a solution of copper; sulphate, chloride, nitrate and acetate of chrome will answer well, and also the sulphate, chloride, nitrate, and acetate of copper. The fabrics or yarns are passed in the bath, and steeped; the black coloring matter is developed by means of an alkali solution. To dye cotton fabrics, the process can be modified as follows: A bath is made of extract of logwood and quercitron, or any other yellow coloring materials, to which is added a solution of alum of chrome and sulphate, chloride, nitrate, and acetate of copper, but the alum of chrome can be dispensed with. The fabrics are passed in the bath, then dyed, and afterwards passed in an alkali solution. If the fabrics to be dyed are of velvet, they are placed in a basket, then put in the bath, and pressure applied to the fabrics, to squeeze out any excess of dyeing mixture, which is returned in the bath; the fabrics are then dried, and afterwards passed in a solution of soda and water in the proportions of 1 lb. of soda to every 20 gallons of water; this sets the black. If the fabrics are of satin, or of any other kind of similar material, they are passed through the dye bath, then calendered, and then dried.—*Le Jacquard.*