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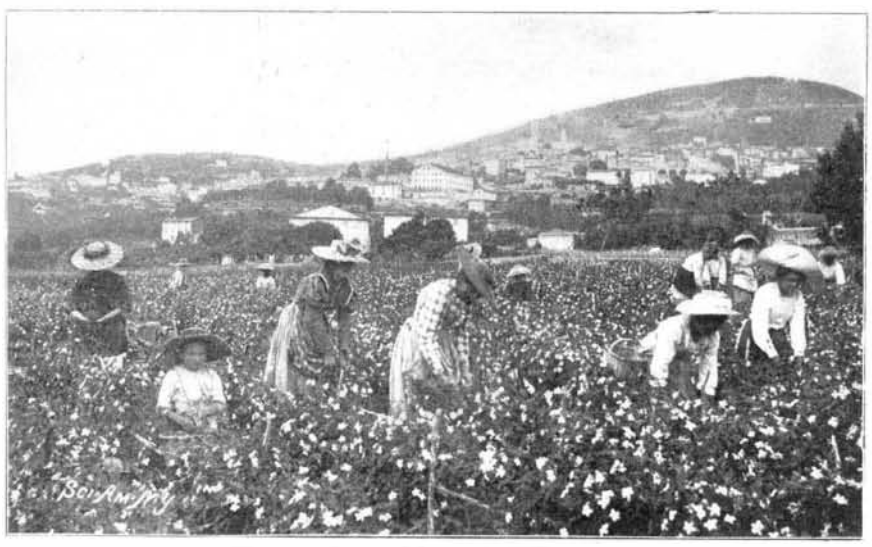
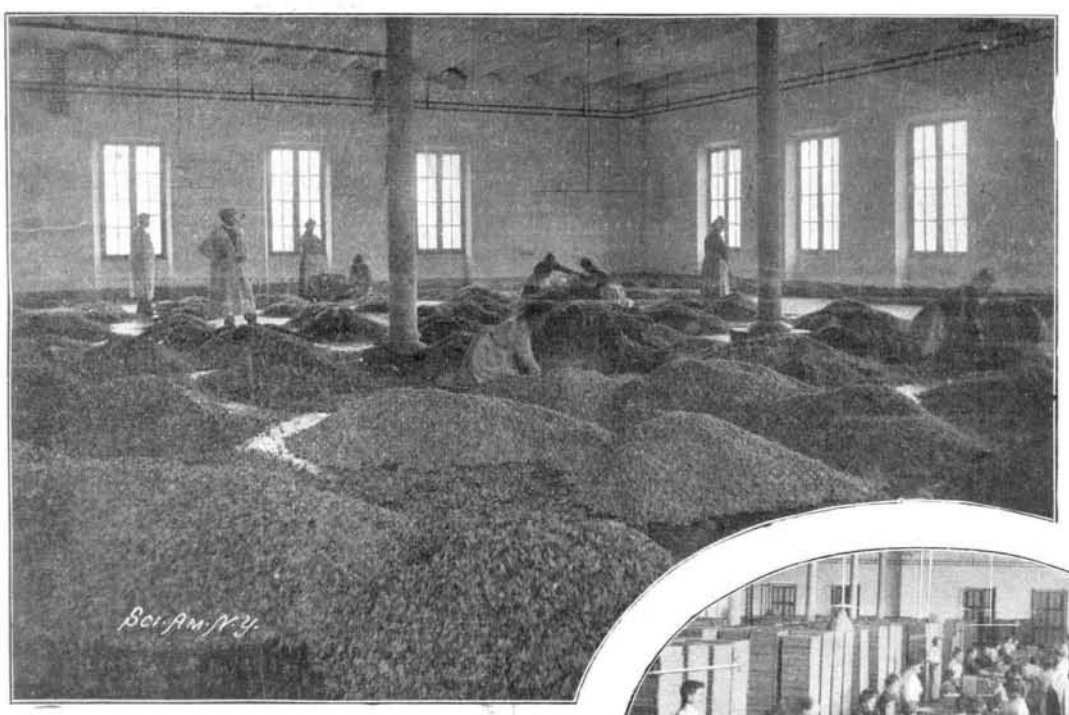


GATHERING JASMINES IN THE OUTSKIRTS OF GRASSE.

PICKING ORANGE BLOSSOMS IN THE HEART OF FRANCE.



THREE TONS OF VIOLETS.

PLUCKING ROSE PETALS IN A FRENCH PERFUMERY.

HOT MACERATION IN WATER BATHS.

THE MANUFACTURE OF EXTRACTS BY WASHING PERFUMED POMADES WITH ALCOHOL.

THE MANUFACTURE OF PERFUMES IN FRANCE.

THE MANUFACTURE OF NATURAL AND ARTIFICIAL PERFUMES.*

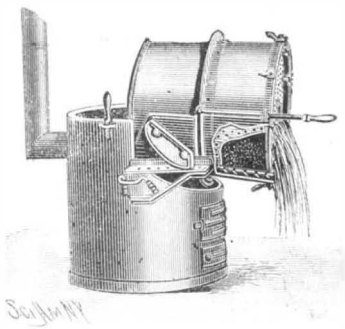
By JACQUES BOYER.

THANKS to the improvements introduced during the first half of the nineteenth century by Darcet, Leblanc, Robiquet and Chevreul, the perfume industry has developed rapidly and extensively. The reduction of the chemistry of essential oils to an exact science, and the simplification of the machinery employed, have done much for the industry, particularly in France. Recently a young French chemist, Eugène Charabot, has given an added impetus to the art through his careful study of the conditions which underlie the formation of essential oils in plants. It is largely through his interesting work that we have come to understand better how simple and ingenious is the mechanism to be found in all vegetable tissues.

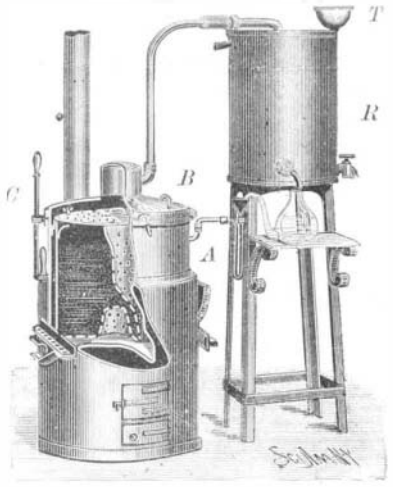
THE MANUFACTURE OF NATURAL PERFUMES.—In this brief article we shall first study the manufacture of the fragrant products to which the city of Grasse owes its worldwide fame. The preparation of all natural perfumes requires the exercise of the most delicate care. If, for example, the essence is contained in the flower, the perfume finally obtained will vary considerably with the age of the flower, with the atmospheric conditions at the time it was plucked, and with the process of extraction employed. It may happen, therefore, that instead of the exquisite aroma which is exhaled by the plant, an odor is obtained totally lacking in delicacy. No little skill, experience and knowledge are required in the art of making perfumes. Nevertheless, certain general methods are employed which may here be roughly outlined.

The process of infusion is employed for iris, musk, civet, benzoin and the like. The odorous substances are macerated with alcohol, thus forming tinctures.

The process of expression is employed to a certain extent in the making of citron, orange and bergamot



THE RETORT OF THE STILL TILTED TO DISCHARGE CONTENTS.



AN ESSENCE STILL.

perfumes. If the flowers can be gathered in abundance, the essential oil is obtained simply by squeezing the fruit with the hand. In Calabria, Italy, the expressed residue is afterward distilled with steam; but the essential oil thus extracted is of an inferior quality.

The process most widely employed is that of distillation, which is resorted to for the extraction of essences that neither a high temperature nor aqueous vapor can appreciably decompose.

Rosemary, thyme, ylang-ylang, roses, patchouli, lavender, cedarwood and sandalwood are thus treated. Long experience has shown that there are certain theoretical conditions which should obtain in practice. Among these conditions may be mentioned the picking apart of the flower to facilitate the diffusion of the essential oil; the treatment of proper quantities to obtain stronger products; distillation, gradually increased in violence by increasing the heat at the end of the process; the evacuation of the vapors with the utmost rapidity; and quick condensation. The apparatus used for the purpose of attaining these objects vary in form almost infinitely. Among the accompanying illustrations will be found a few devices which may be considered typical.

In order to prevent contact of the material treated with the walls of the retort, and in order to avoid variations in heat and accumulations of substances, a French inventor, Egrot by name, has devised a special form of retort. In a copper-plated boiler, *A*, a basket is contained, *M*, which receives the plants. In order that only the plant may project in the top of the still during ebullition, a perforated cover is employed. In order that the drippings may return automatically to the retort, it is necessary merely sufficiently to raise the refrigerant until the siphon, *B*, is set in operation. The evacuation or cleaning mechanism is easily operated by means of the reversing mechanism, *C*.

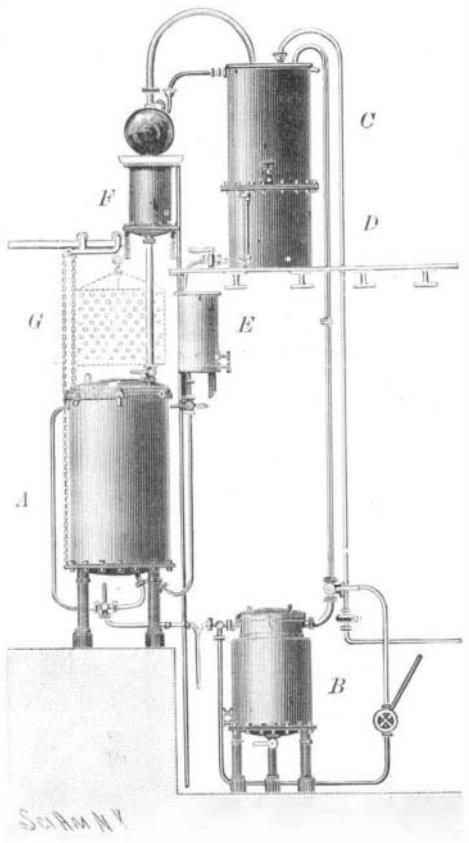
Still another general method of extracting perfumes is that of distillation, in which either fixed or volatile solvents are employed.

The use of fixed solvents depends upon the property which fatty substances have of absorbing perfumes by contact with fragrant bodies. If the cold process is employed, absorption, or *enfleurage*, as it is called by the French, is chiefly made use of for procuring the odoriferous principle of very delicate flowers. If the hot process be employed, in which case water or steam baths are used, maceration is resorted to. Either glycerine or, as is usually the case, vaseline can be employed. If a fat be employed it must be deodorized and treated to prevent its becoming rancid. For that purpose the fat of beef kidneys is made use of, mingled with hog's lard in suitable quantities. Cylinders studded with teeth and turning at different speeds grind the fats, whereupon the product is washed and rendered into vats. Odorless antiseptics are then added.

In the process of absorption or *enfleurage*, a number of shallow wooden frames about 3¼ feet long by 2½ feet wide and ½ inch deep are utilized. By means of a spatula, the fat or vaseline is spread over the bottom of each frame, or *chassis*, as the French call it. The flowers are then sprinkled or laid one by one upon the surface of the fat, where they are allowed to remain for about ten hours, after which they are removed and fresh ones substituted. The duration of the absorption process may vary from one to three days.

If oil be used, a piece of cotton fabric is employed soaked with the oil. The fabric is spread upon wired frames, on which the flowers are placed. By subjecting the fabric to great pressure, perfumed oil is extracted.

When macerated, the flowers are digested in large vessels having a capacity of about 220 to 330 pounds of fat. These vessels are heated by means of a steam or water bath to a temperature of about 65 deg. C. Women equipped with long, broad wooden palettes keep the flowers submerged until they have lost their aroma. The wilted flowers are then removed and others thrown in until the fat is completely saturated. In this manner the flowers are removed about twenty times. The entire process lasts about forty-eight



EGROT APPARATUS FOR THE EXTRACTION OF PERFUMES BY VOLATILE SOLVENTS.

hours. In this manner perfumed fats or pomades are made.

In the manufacture of extracts the flowers are treated with alcohol until the essence is entirely removed. In the manufacture of oils, flowers are placed in a large vial-like vessel, having a capacity of 15 liters, which vessel is carried on a plate to which a violent movement is given. In the making of pomades, the materials are treated in plated copper utensils, and are stirred up by dashers.

Two Parisian inventors, Egrot and Garange, have devised an apparatus for the treatment of esential oils by means of volatile solvents. The accompanying illustration shows an installation, the principal portions of which are an extracting-vessel, *A*, in which the flowers are to be treated, contained in a metallic basket, are placed; an evaporator, *B*, heated over a water or steam bath, in which evaporator the perfume is separated from the solvent by the evaporation of the latter. In the condenser, *C*, and in the reservoir, *D*, the ether, petrol, benzoin and other dissolving vapors are gathered to be used anew.

Still another process is carried out by the firm of Roure-Bertrand *fils* of Grasse. In this process the method of Milon, somewhat modified, is employed in concentrated essences. This modified process has been so far developed that it is possible to employ formerly unused substances entirely soluble in alcohol and to reduce them to their maximum concentration. By means of volatile solvents, the manufacturing firm in question is able to treat the flowers of the mimosa plant, hyacinths, narcissus, carnations and other flowers never before used in the perfumer's art. These flowers also yield solid essences which present no slight difficulties in the manufacturing process. For that reason M. Roure-Bertrand prepares solid liquid products, soluble in alcohol, the odoriferous efficiency of which is equal to that of the solid essences, weight for weight. More recently he has succeeded in obtaining absolute essences, which attracted no little attention at the Paris Exposition of 1900.

The brief space at our disposal prevents us from treating the manufacture of natural perfumes more in detail. A few statistics showing the extent of the industry may, however, not be out of place. Although most of the fragrant flowers which form the basis of natural perfumes are grown in the vicinity of Grasse, Cannes and Nice, nevertheless almost every quarter of the globe pays its floral tribute to the perfume makers of France.

The distilleries of essential oils in the department of Alpes-Maritimes use annually 5,500,000 pounds of orange blossoms; 4,400,000 pounds of roses; 440,000 pounds of jasmine; 330,000 pounds of violets; and an equal quantity of cassia and tuberoses. In Basse-Alpes, Gard, Drôme, Hérault, and Var 220,000 pounds of lavender essence; 88,000 pounds of thyme essence; 55,000 pounds of rosemary essence, and the same quantity of aspic essence are annually manufactured. Furthermore, the environs of Algiers, Staouëli, the plain of Mitidja and Boufarik (Algeria), annually send to France a contingent of 13,300,000 pounds of geraniums.

THE MANUFACTURE OF ARTIFICIAL PERFUMES.—The first synthetic perfumes were discovered by Cahours, Grimaux and Lauth; but the industry of artificial aromatic products hardly developed until the last part of the last century. The industry took its sudden rise after the remarkable synthesis of vanillin by Tiemann and Haarman. By artificial perfumes French and German chemists usually mean compounds formed entirely from artificial substances, and aromatic products obtained by the manipulation of natural essences. The methods of preparing artificial perfumes are of great theoretical simplicity; but in practice they are exceedingly difficult of application. Indeed, the principles underlying the preparation of artificial perfumes are by no means well understood. For alcohols, Haller has shown that succinct anhydrides are to be preferred. In the case of ether, the resultant alcohol is saponified and then re-etherized by means of an acid combined with the essential oil. The alkaline bisulfites are used in the treatment of aldehydes and ketones, which are separated from the compound formed by means of an acid or alkali. For the phenols, potassium is used, and the salt obtained is decomposed by means of an acid.

In this brief article it is impossible even to enumerate the perfumes which have thus far been invented. We shall therefore confine ourselves entirely to the more important ones, following the classification recently proposed by Charabot.

Among the more important nitrated derivatives, the first place should be given to the artificial musk invented by Albert Baur. This ingenious German chemist prepares his substitute for the costly natural musk by heating a mixture of isobutyl chloride and toluene with aluminium chloride. Water is added to the product of this reaction; the compound is subjected to distillation; and the distillates which pass over at a temperature between 170 and 200 deg. C. are collected. These distillates are then treated with nitric and sulphuric acid; the product is washed with water, and when treated with alcohol yields crystals having a marked odor of musk. This same characteristic odor has been encountered in many of the benzenes. The compound most widely used in commerce is the compound invented by Baur, and the ketone musk which Mallemann obtained by nitrating ketones with butyltoluene. More recently trinitro-butylxylene has been used as a substitute for natural musk.

In the series of alcohols and ethers, terpilene should be mentioned. This compound is prepared by hydrating terpenes. Terpilene is much used by perfumers, by reason of its strong odor of syringa. It is often mixed with heliotropine, the two blending well.

Among the phenols, thymol, discovered by Doveri in the essence of thyme, but also extracted from other essential oils, is of extreme importance. In obtaining this aromatic compound, the essential oil of *Ajowan ptychocis* is agitated with soda lye. The mixture is allowed to settle, and the liquor is then decanted. Employed as an antiseptic, thymol finds its chief value as an ingredient of medicinal soaps.

Vanillin is both an aldehyde and a phenol. Many ways have been devised for its preparation; but they are all more or less modifications of two methods—synthesis of benzene derivatives which are of slight scientific interest, and the oxidation of natural compounds, which is of more importance from an industrial point of view. Vanillin is employed not only by perfumers, but also by bakers and cooks, as a substitute for the vanilla of nature.

Passing by piperonal, which enters in the composition of all heliotrope perfumes, we finally reach ionone, which is obtained by condensing citral with ordinary acetone in the presence of an alkali, the resulting product being then treated by dilute acids. Ionone, by reason of its exquisite violet fragrance, is destined to become of vast importance in the perfumer's art.

In concluding this brief review, we may call attention to the influence which artificial perfumes have had upon the industry. Up to the present time it must be confessed that artificial perfumes have not curtailed the production of natural oils and pomades. At first it seemed that synthetic perfumes would result in cutting down the price of the natural product. But experience has shown that artificial essences, by reason of their coarseness, have not been able to dethrone natural perfumes in popular favor. Scientists, ingenious though they may be, have not as yet completely succeeded in reproducing the delicacy of nature. Strange as it may seem, the inventors of artificial essences have actually aided the distillers of natural perfumes, more than they have suspected. The discovery of ionone is a typical example; for according to statistics the culture of the violet has considerably increased in France ever since the introduction of its artificial rival. Ionone has proven to be a most effective complement of the feeble violet; and that may be the reason why violet perfumes are now more widely used than ever before.

*This article was written and the photographs were especially procured for the SCIENTIFIC AMERICAN SUPPLEMENT, by M. Jacques Boyer, of Paris.