The tops of these plants are generally distilled *in situ*, under contract with the Grasse manufacturer, by the villagers in the immediate vicinity. The higher the altitude at which these grow, the more esteemed the oil. The finest oil of lavender is produced by distilling the flowers only. About 100 tons of lavender, 25 of spike, 40 of thyme, and 20 of rosemary are sent out from Grasse every year.

Among the less abundant labiates of these parts is the melissa, which yields, however, a very fragrant oil.

In the same family we have the sage and the sweet or common basil, also giving up their essential oils on distillation.

THE UMBELLIFERS.

Whereas the flowers of the labiate family are treated by the distillers as favorites are by the gods, and are cut off in their youth, those of the Umbelliferae are allowed to mature and develop into the oil-yielding fruits. Its representatives, the fennel and parsley, grow wild round about the town, and are laid under contribution by the manufacturers.

The Compositae are represented by the wormwood and tarragon (*Estragon*).

THE GERANIUM.

Oil of geranium is produced from the rose or oak-leaved geranium, cuttings of which are planted in well sheltered beds in October. During the winter they are covered over with straw matting. In April they are taken up, and planted in rows in fields or upon easily irrigated terraces. Of water they require *quantum sufficit*; of nature's other gift, which cheers and not inebriates—the glorious sunshine—they cannot have too much. They soon grow into bushes three or four feet high. At Nice they generally flower at the end of August. At Grasse and cooler places they flower about the end of October. The whole flowering plant is put into the still.

THE ROSE.

Allied to the oil of geranium in odor are the products of the rose. The Rose de Provence is the variety cultivated. It is grown on gentle slopes facing the south-east. Young shoots are taken from a five-year-old tree, and are planted in ground which has been well broken up to a depth of three or four feet, in rows like vines. When the young plant begins to branch out, the top of it is cut off about a foot from the ground. During the first year the farmer picks off the buds that appear, in order that the whole attention of the plant may be taken up in developing its system. In the fourth or fifth year the tree is in its full yielding condition. The flowering begins about mid-April, and lasts through May to early June. On some days as many as 150 tons of roses are gathered in the province of the Alpes Maritimes.

The buds on the point of opening are picked in the early morning. Scott says they are "sweetest washed with morning dew." The purchaser may think otherwise where the dew has to be paid for.

The flowering season over, the trees are allowed to run wild. In January they are pruned, and the branches left are entwined from tree to tree all along the line, and form impenetrable fences.

A rose tree will live to a good age, but does not yield much after its seventh year. At that period it is dug up and burned, and corn, potatoes, or some other crop is grown on the land for twelve months or more.

In the factory the petals are separated from the calyx, and are distilled with water for the production of rose water and the otto. For the production of the huile and pomade they are treated by maceration. They are finished off, however, by the process of enfleurage, in which the frames before alluded to are made use of. The fat, or pomade, is spread on to the glass on both sides. The blossoms are then lightly strewn on to the upper surface. A number of trays so filled are placed one on the top of the other to a convenient height, forming a tolerably air tight box. The next day the old flowers are removed, and fresh ones are substituted for them. This is repeated until the fat is sufficiently impregnated. From time to time the surface of the absorbent is renewed by serrating it with a comb-like instrument. This, of course, is necessary in order to give the hungry, non-saturated lower layers a chance of doing their duty.

Where oil is the absorbent, the wired frames are used in connection with cloths. The cloth acts as the holder of the oil, and the flowers are spread upon it, and the process is conducted in the same way as with the frames with glass.

From the pomade the *extrait de rose* is made in the same way as the orange *extrait*.

CASSIE.

The stronger, though less delicate, cassie is grown from seeds, which are contained in pods which betray the connection of this plant with the leguminous family. After being steeped in water they are sown in a warm and well sheltered spot. When two feet high the young plant is grafted and transplanted to the open ground—ground well exposed to the sun and sheltered from the cold winds. It flourishes best in the neighborhood of Grasse and Cannes. The season of flowering is from October to January or February, according to the presence or absence of frost. The flowers are gathered twice a week in the daytime, and are brought to the factories in the evening. They are here subjected to maceration.

JONQUIL.

A plant of humbler growth is the jonquil. The bulbs of this are set out in rows. The flowers put in an appearance about the end of March, four or five on each stem. Each flower as it blooms is picked off at the calyx. They are treated by maceration and enfleurage, chiefly the latter. The harvesting period of the jonquil is of very short duration, and it often takes two seasons for the perfumer to finish off his pomades of extra strength. The crop is also very uncertain.

JASMIN.

A more reliable crop is that of the jasmin. This plant is reared from cuttings of the wild jasmin, which are put in the earth in rows with trenches between. Level ground is chosen; if hillside only is available, this is formed into a series of terraces. When strong enough, the young stem is grafted with shoots of the

Jasminum grandiflorum. The first year it is allowed to run wild, the second it is trained by means of rods, canes and other appliances. At the approach of winter the plants are banked up with earth to half their height. The exposed parts then die off. When the last frost of winter is gone the earth is removed, and what remains of the shrub is trimmed and tidied up for the coming season. It grows to four or five feet. Support is given by means of horizontal and upright poles, which join the plants of one row into a hedge-like structure. Water is provided by means of the ditches already mentioned. When not used for this purpose, the trenches allow of the passage of women and children to gather the flowers. These begin to appear in sufficient quantity to repay collecting about the middle of July. The jasmin is collected as soon as possible after it blooms. This occurs in the evening, and up to about August 15, early enough for the blossoms to be gathered the same day. They are delivered at the factories at once, where they are put on to the chassis immediately; the work on them continuing very often till long after midnight. Later on in the year they are gathered in the early morning directly the dew is off. The farmer is up betimes, and as soon as he sees the blossoms are dry he sounds a bugle (made from a sea shell) to announce the fact to those engaged to pick for him.

TUBEROSE.

The tuberose is planted in rows in a similar way to the jasmin. The stems thrown up by the bulbs bear ten or twelve flowers. Each flower as it blooms is picked off. The harvesting for the factories takes place from about the first week in July to the middle of October. There is an abundant yield, indeed, after this, but it is only of service to the florist, the valued scent not being present in sufficient quantity. The flowers are worked up at the factory directly they arrive by the enfleurage process.

MIGNONETTE.

The *reseda*, or mignonette, is planted from seed, as here in England. The flowering tops are used to produce the huile or pomade.

VIOLETS.

Last in order and least in size comes the violet. For "the flower of sweetest smell is shy and lowly," and has taken a modest place in the paper.

Violets are planted out in October or April. October is preferred, as it is the rainy season; nor are the young plants then exposed to the heat of the sun or to the drought, as they would be if starting life in April.

The best place for them is in olive or orange groves, where they are protected from the too powerful rays of the sun in summer and from the extreme cold in winter. Specks of violets appear during November. By December the green is quite overshadowed, and the whole plantation appears of one glorious hue. For the leaves, having developed sufficiently for the maintenance of the plant, rest on their oars, and seem to take a silent pleasure in seeing the young buds they have protected shoot past them and blossom in the open.

The flowers are picked twice a week; they lose both color and flavor if they are allowed to remain too long upon the plant. They are gathered in the morning, and delivered at the factories by the commissionnaires or agents in the afternoon, when they are taken in hand at once.

The products yielded by this flower are prized before all others in the realms of perfumery, and cannot be improved; for, as one great authority on all matters has said: "To throw a perfume on the violet . . . were wasteful and ridiculous excess."

HOW TO MAKE PHOTO. PRINTING PLATES.

THE drawing intended for reproduction is pinned on a board and placed squarely before a copying camera in a good, even light. The lens used for this purpose must be capable of giving a perfectly sharp picture right up to the edges, and must be of the class called rectilinear, *i. e.*, giving straight lines. The picture is then accurately focused and brought to the required size. A plate is prepared in the dark room by the collodion process, which is then exposed in the camera for the proper time and developed in the ordinary way. After development, the plate is fixed and strongly intensified, in order to render the white portions of the drawings as opaque as possible. On looking through a properly treated negative of this kind, it will be seen that the parts representing the lines and black portions of the drawing are clear glass, and the whites representing the paper a dense black.

The negative, after drying, is ready for the next operation, *i. e.*, printing upon zinc. This is done in several ways. One method will, however, be sufficient for the purpose here. I obtain a piece of the bichromatized gelatine paper previously mentioned, and place it on the face of the negative in a printing frame. This is exposed to sunlight (if there is any) or daylight for a period varying from five to thirty minutes, according to the strength of the light. This exposed piece of paper is then covered all over with a thin coating of printing ink, and wetted in a bath of cold water. In a few minutes the ink leaves the white or protected parts of the paper, remaining only on the lines where the light has passed through the negative and affected the gelatine. We now have a transcript of the drawing in printing ink, on a paper which, as soon as dry, is ready for laying down on a piece of perfectly clean zinc, and passing through a press. The effect and purpose of passing this cleaned sheet of zinc through the press in contact with the picture on the gelatine paper is this: Owing to the stronger attraction of the greasy ink for the clean metal than for the gelatine, it leaves its original support, and attaches itself strongly to the zinc, giving a beautifully sharp and clean impression of our original drawing in greasy ink on the surface of the zinc. The zinc plate is next damped and carefully rolled up with a roller charged with more printing ink, and the image is thus made strong enough to resist the first etching. This etching is done in a shallow bath, which is so arranged that it can be rocked to and fro. For the first etching, very weak solution of nitric acid and water is used. The plate is placed with this acid solution in the bath, and steadily rocked for five or ten minutes. The plate is then taken out, washed, and again inked; then it is dusted over with powdered resin, which sticks to the ink on the plate. After this

the plate is heated until the ink and resin on the lines melt together and form a strong acid-resisting varnish over all the work. The plate is again put into the acid etching bath and further etched. These operations are repeated five or six times, until the zinc of the unprotected or white part of the picture is etched deep enough to allow the lines to be printed clean in a press, like ordinary type or an engraved wood block. I ought perhaps to explain that between each etching the plate is thoroughly inked, and that this ink is melted down the sides of the line, so as to protect the sides as well as the top from the action of the acid; were this neglected, the acid would soon eat out the lines from below. The greatest skill and care is, therefore, necessary in this work, especially so in the case of some of the exquisitely fine blocks which are etched for some art publications.

There are many details which are necessary to successful etching, but those now given will be sufficient to convey to you generally the method of making the zinc plate for the typographic block. After etching there only remains the trimming of the zinc, a little touching up, and mounting it on a block of mahogany or cherry of exact thickness to render it type high, and it is now ready for insertion with type in the printer's form. From a properly etched plate hundreds of thousands of prints may be obtained, or it may be electrotyped or stereotyped and multiplied indefinitely.—G. S. Waterlow, *Brit. Jour. Photo.*

ANALYSIS OF A HAND FIRE GRENADE.

By CHAS. CATLETT and R. C. PRICE.

THE analyses of several of these "fire extinguishers" have been published, showing that they are composed essentially of an aqueous solution of one or more of the following bodies; sodium, potassium, ammonium, and calcium chlorides and sulphates, and in small amount borax and sodium acetate; while their power of extinguishing fire is but three or fourfold that of water.

One of these grenades of a popular brand of which I have not found an analysis was examined by Mr. Catlett with the following results: The blue corked flask was so open as to show that it contained no gas under pressure, and upon warming its contents, but 4 or 5 cubic inches of a gas were given off. The grenade contained about 600 c. c. of a neutral solution, which gave on analysis:

	In 1000 c. c. Grammes.	In the Flask. Grains.
Calcium chloride*	92.50	850.8
Magnesium "	18.71	173.2
Sodium "	22.20	206.9
Potassium "	1.14	10.6
	134.55	1241.5

As this mixture of substances naturally suggested the composition of the "mother liquors" from salt brines, Mr. Price made an analysis of such a sample of "bittern" from the Snow Hill furnace, Kanawha Co., W. Va., obtaining the following composition:

	In 1000 c. c. Grammes.	In 200 c. c. Grains.
Calcium chloride*	299.70	925.8
Magnesium "	56.93	175.7
Strontium "	1.47	4.5
Sodium "	20.16	62.2
Potassium "	5.13	15.8
	383.39	1184.0

There is of course some variation in the bittern obtained from different brines, but it appears of interest to call attention to this correspondence in composition, as indicating that the liquid for filling such grenades is obtained by adding two volumes of water to one of the "bittern." The latter statement is fairly proved by the presence of the bromine, and certainly from an economical standpoint such should be its method of manufacture.—*Amer. Chem. Jour.*

MOLECULAR WEIGHTS.

A NEW and most valuable method of determining the molecular weights of non volatile as well as volatile substances has just been brought into prominence by Prof. Victor Meyer (*Berichte*, 1888, No. 3). The method itself was discovered by M. Raoult, and finally perfected by him in 1886, but up to the present has been but little utilized by chemists. It will be remembered that Prof. Meyer has recently discovered two isomeric series of derivatives of benzil, differing only in the position of the various groups in space. If each couple of isomers possess the same molecular weight, a certain modification of the new Van't Hoff-Wislicenus theory as to the position of atoms in space is rendered necessary; but if the two are polymers, one having a molecular weight n times that of the other, then the theory in its present form will still hold. Hence it was imperative to determine without doubt the molecular weight of some two typical isomers. But the compounds in question are not volatile, so that vapor density determinations were out of the question. In this difficulty Prof. Meyer has tested the discovery of M. Raoult upon a number of compounds of known molecular weights, and found it perfectly reliable and easy of application. The method depends upon the lowering of the solidifying point of a solvent, such as water, benzene, or glacial acetic acid, by the introduction of a given weight of the substance whose molecular weight is to be determined. The amount by which the solidifying point is lowered is connected with the molecular weight, M , by the follow-

ing extremely simple formula: $M = T \times \frac{P}{C}$; where C

represents the amount by which the point of congelation is lowered, P the weight of anhydrous substance dissolved in 100 grammes of the solvent, and T a constant for the same solvent readily determined from volatile substances whose molecular weights are well known. On applying this law to the case of two isomeric benzil derivatives, the molecular weights were found, as expected, to be identical, and not multiples; hence Prof. Meyer is perfectly justified in introducing

* Trace of bromide.