
## HOW TO MAKE CONCRETE POTTERY.—VI.

BY RALPH C. DAVISON.

*(Concluded from the issue of August 14th.)*

In the previous articles nothing much has been said in detail in regard to the numerous and various materials which can be used in making concrete, such as the different kinds of stones, pebbles, etc. Nor has anything been said about the quantity of each ingredient necessary to make a fixed amount of finished material.

Concrete is made by mixing together with water various proportions of Portland cement, sand, and stone. The sand and stone which go to make part of the mixture are commonly known as aggregates. It is by the careful selection of these aggregates that we are able to produce numerous pleasing and artistic results.

In many cases, if the proper aggregates are used in the right proportion, natural stones such as limestone, granite of all colors, brownstone, and French Caen stone, etc., can be so closely simulated that it takes an expert to tell it from the real material.

The ordinary concrete or cement surface as usually seen is most uninteresting in appearance. As a general thing, it is smooth and lifeless and of a dull gray color. The same general appearance as just described for ordinary concrete will prevail in almost any concrete surface, no matter what the aggregate used, unless the surface is treated so as to expose or bring out the aggregates used. If, however, the surfaces of the concrete in which selected aggregates have been used are property treated, a marked difference between these surfaces and those obtained with ordinary mixtures will be noted. By varying the kind, size, and proportions of the aggregate used, surface finishes of practically any desired color and texture can be obtained, the possibilities being limited only by the number of different kinds of aggregates available and the combinations of the same.

In small work, that is, where the thickness of the finished product is to be ½ inch or less, never use any aggregate exceeding ⅛ inch in size, especially so if the mixture is to be made thin enough to pour. In larger work having a thickness of 1 inch or more, aggregates up to ¼ of an inch can be used with good results.

Some interesting textures for pottery work can be obtained from the following mixtures:

A mixture composed of 1 part white marble chips not exceeding ¼ inch in size, and 1 part of trap rock or other dark stone of the same size mixed with 1 part of Portland cement and 1 part of marble dust will produce a surface similar in appearance to a light granite. This mixture should be allowed to set for twelve hours after pouring, then the molds should be carefully removed, as the concrete is still green, and the surface of the concrete should be lightly brushed with a stiff brush.

As the concrete is not thoroughly set or hardened yet, this operation will remove the surface cement, and thus expose the aggregates of marble and trap rock. After having performed the above operation, allow the piece to harden a few days, and then treat the surface with a solution composed of 1 part of commercial muriatic or hydrochloric acid to 3 parts of water. Dash this solution onto the face of the concrete surface with a brush, and allow it to remain for at least fifteen minutes. Then thoroughly scrub it off with a good stiff brush and plenty of clean water. This operation will remove all of the surplus cement, and will leave a good clean surface full of life and sparkle. Instead of using white marble chips and granite, as above, one can vary the results by using white marble chips and crushed-up red brick; or various colored marbles crushed to the proper size can be used, and then by treating the surfaces as explained, the colors in the various aggregates will be exposed, thus producing some very interesting surfaces.

A good light-colored surface somewhat simulating limestone can be procured by using 1 part Portland cement to 2 or 3 parts of white marble dust. After this has become thoroughly hard, treat it with acid as described above. The acid will eat off any surface cement, and thus the marble dust will be exposed, producing a pleasing sparkle throughout the entire surface. To simulate white marble, use 1 part white Portland cement to 2 parts of marble dust, and treat surface with acid as described.

By incorporating in the above mixture a small amount of yellow ocher a pleasing buff tint will be given to the mass, which will then very closely resemble French Caen stone. To simulate red granite, use red granite chips or screenings. These can be procured at almost any stone yard where they cut granite. The pieces to use should range in size from ¼ inch down to dust. If the pieces available are too large, they can be crushed up with a hammer. The proportions of the mixture should be 1 part of Portland cement to 2 parts of the granite. After having set for twelve hours, brush the surface out and treat it with acid as already explained, and the surface thus obtained will very closely resemble the real red granite. From the above details the reader will have grasped the possibilities to be obtained by the selection of aggregates, and now by using a little ingenuity can without further instruction experiment along original lines, which will be found most fascinating work.

In regard to the amount of the various ingredients to use for a fixed amount of finished material, the uninitiated often think, and naturally so, that if an amount of finished material equal in bulk to three glassfuls is required, all that is necessary to do, if it be a 1 to 2 mixture, is to take one glassful of cement and two glassfuls of sand, and then by mixing these together they will still have an amount of material that will fill three glasses. This is not so. The particles of cement are ground so fine that the cement is practically one dense mass; but the particles of sand are coarser, and between each of the particles appears a space or cavity. These cavities are called voids, and it is in these voids that the larger portion of the cement finds its place when the mass is mixed. The majority of sands used in concrete work contain from 25 per cent to 40 per cent of voids. If we take the larger figure for an example, then in two glassfuls of sand we will have 80 per cent of one glassful of voids. As we only have one glassful of cement to add to the two glassfuls of sand, and as the cement fills the 80 per cent of voids in the sand, it is plain that we have but 20 per cent left upon which we can figure for bulk. Therefore, instead of having three glassfuls of material, as one might naturally think, we will only have two glassfuls and 20 per cent of one glassful over, or two and one-fifth glassfuls of finished material. The percentage of voids varies largely in different grades of sands. The finer the particles of which the sand is made up, the smaller the percentage of voids. It is always best to use sand in which the particles are not uniform in size, or in other words, use what is commonly termed a well-graded sand. By this is meant a sand in which the particles vary in size say from 1/32 inch or less up to 1/16 inch or a trifle more. The heavier the work, the coarser the sand that can be used. Be sure that the sand used is clean. By clean sand is meant sand that is free from loam or clay. One can readily detect dirty sand by placing same in the palm of the hand and slightly wetting it. Then if by rubbing it around the hand becomes discolored, there is more or less dirt in the sand. A little dirt will not do much harm, but it is always well to have it perfectly clean. It is often found necessary to wash the dirt out of sand by means of water. This can be done by placing the sand in a pail of water and agitating it, thus making the dirt rise to the top. To thoroughly wash the sand, keep running the water into the pail and agitating the sand until the water discharged is practically clear.

When using a stone aggregate in the mixture, the spaces or voids between the particles of stone are filled by the cement and sand in the mixture, as were the voids in the sand filled by the cement. As in sand, the larger the particles of stone used, the greater the percentage of voids in it will be. Therefore a greater amount of sand and cement will be required to fill them.

By a little experimenting along these lines, one will become experienced enough to judge fairly closely the amount of each ingredient to use in mixing up any amount of finished material needed. It is always well to mix a trifle more material than is needed rather than not enough. For when one once starts pouring a cast, he should continue to pour until the mold is full. If not, a mark is very apt to show in the finished cast where pouring was left off and started again. Never try to use any material that has been mixed and let stand for more than half an hour. For in this time the concrete will have commenced to get what is called its initial set. If the mass is now disturbed and worked up again, the product produced will never have the same strength as one made with freshly-mixed material. In mixing, always mix the cement and sand together thoroughly before adding the water. One can judge by the color of the mass, fairly well, as to whether the mixing is complete. If the color is uniform throughout, it is a pretty good sign that the aggregates are well distributed through the mass. When making a mixture containing cement, sand, and stone, always mix the cement and sand dry first and then add the stone, which has previously been well soaked in water. In this way one is assured of having each stone coated with the cement and sand; for as soon as the damp stone comes in contact with the dry cement and sand, they adhere to it and cover the stone completely; thus a compact matrix of cement and sand is formed between each and every particle of stone, which binds them securely together into a dense and compact mass.

## HOME-MADE CHEMICAL PERFUME.

BY GUSTAVE MICHAUD, COSTA RICA STATE COLLEGE.

Early in the nineteenth century, chemists generally thought it impossible to make organic compounds out of the elements found in them. Synthesis they believed to be practicable only in the case of minerals. Woehler, with his remarkable synthesis of urea, shook that belief at least as much as the Curies recently shook the common belief of chemists in the integrity of the atom. Other organic syntheses followed that of urea, and some of them, as that of the alizarin dye, were made in conditions so favorable that it became unprofitable to grow the plants from which the chemical had hitherto been extracted. Thousands of acres have thus been so far given back to the cultivation of food stuffs, and one may confidently expect a time in which most, if not all, of our drugs, dyes, and even food will be made through synthesis. Agriculture then will be a thing of the past. Factories will make for us sugar, starch, fats, proteids, that is to say bread, eggs, milk, fruits, besides some new foods which may prove as superior to the old ones as antipyrin and pyramidon have proved superior to the natural alkaloids formerly used in similar circumstances.

The most recent and greatest advance in the organic synthesis of industrial products can be observed to-day probably in the perfume industry. The fragrance of heliotrope, hyacinth, pink, rose, violet, hawthorn, lilac, musk, wintergreen, vanilla, cinnamon, bitter almonds, and that of many fruits, are now produced with chemicals which frequently have but a repugnant smell or no smell at all. Most of these syntheses require complicated apparatus as well as considerable chemical skill, but in one case at least, that of terpinol, an essence now sold sometimes under the name of lilac, sometimes under that of lily of the valley, the operations are simple enough, and the synthesis is but an enjoyable experiment easily performed at home or in the class room.

Besides the vessels found in every kitchen, the only needed apparatus are a round-bottom flask (capacity about one pint), a rubber stopper with one hole, and two glass tubes united with a piece of rubber tubing. The preparation may be divided into two operations, i. e., the transformation of common oil of turpentine into terpin and the transformation of terpin into terpinol. The first operation requires much time and no care whatever. The second operation is made in less than a quarter of an hour.

APPARATUS FOR MAKING ARTIFICIAL LILAC PERFUME.

One-half of a quart bottle is filled with oil of turpentine. Three-fourths of a pint of alcohol at about 80 per cent is mixed with it, and one-fourth of a pint of nitric acid is added to the mixture, which is left to itself for several days, until crystals are formed. These are collected, and dried with some blotting paper. They are pure terpin. To get the full amount formed in such circumstances, one should wait over three months; but, for experimental purposes, such a delay is, of course, unnecessary. Moreover, should the experimenter wish to prepare the perfume at once, he may get the ready-made terpin at the drug store, as it is prescribed by physicians for a kind of lung trouble.

To transform odorless terpin into fragrant terpinol, terpin must be heated with water containing a small amount of sulphuric acid. The round-bottom flask is half filled with water. Two or three large spoonfuls of terpin are thrown into it, and about as much sulphuric acid is slowly poured into the flask. There is no danger in pouring sulphuric acid into water, but water should never be poured into sulphuric acid, as the heat thus suddenly generated may cause some of the caustic liquid to be thrown out of the bottle.

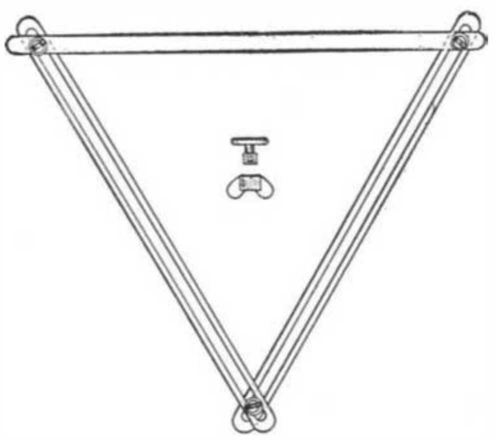
An alcohol lamp is now lighted directly under the flask. If a gas stove be used, a piece of wire gauze should be interposed between flame and flask. As soon as the liquid in the flask begins to boil, the glass tube is plunged into the water in a tumbler. There the steam and the terpinol carried along with it noisily condense. A delightful scent fills the room. To keep the tumbler cool, place it in a bowl of water. The operation is over when the liquid in the tumbler has become nearly hot in spite of the water in which the glass is immersed. A layer of liquid terpinol will then be found to float over the water. The fragrance, which is extremely strong while the essence is warm, becomes much more agreeable after it has cooled. Some odoriferous plants, such as marjoram, contain terpinol in their leaves, but the extraction of the essence from such sources is always much more expensive than its synthesis with oil of turpentine.

### PAPER HANGER'S ADJUSTABLE TEMPLET.

BY I. G. BAYLEY.

This handy tool wil be found useful, and will save considerable time, in cutting wall paper up the rake of a stairway or where any roof slants, allowing the paper hanger to cut a number of lengths of paper on the paste board at once, where at present it is only customary to cut one at a time.

The tool can be made of wood, and satisfaction obtained, although a better tool can be made from saw steel. Each blade is about three feet in length, two of them being furnished with slots, running almost the full length. Three thumbscrews, detailed on a larger



PAPER HANGER'S ADJUSTABLE TEMPLET.

scale, will be necessary to hold the frame together after the proper adjustment is obtained. The paper should be hung in position on the wall, and one side of the tool held along the perpendicular edge of the paper, while one of the other sides of the tool is adjusted to suit the angle of the stairway or slanting roof, when the screws are tightened up, and the frame permanently set.

### HOW TO MAKE A SIMPLE DRY BATTERY.

BY GEORGE F. WORTS.

Often the experimenter is in need of a good dry battery of a certain size or shape for some particular work, where the ordinary standard sized cell is either too large or not of the right shape for the same work. An inexpensive dry cell that will produce results, and can be made by anybody capable of handling a soldering iron, has long been the desire of every experimenter. The cell as described herein has been used for many purposes and with marvelous results by the writer, and has been used in other shapes where economy in space was desired, such, for instance, as in wireless telegraphy.

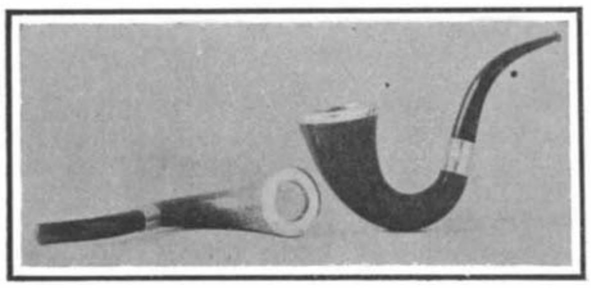
To make a cell of the standard size, a strip of zinc of medium thickness, 8¼ inches long and 6 inches wide, is necessary. The zinc is rolled into a cylinder 6 inches long and 8 inches in circumference, thus leaving a quarter of an inch which is to be tightly soldered. A zinc cap is next soldered on one end of the cylinder. Any solder showing on the inside is to be well shellaced. Do not shellac any zinc surface, as that will interfere with the action of the battery. Line the inside of the cylinder with a thin layer of blotting paper. For the positive pole of the battery the carbon from a wornout cell is the best if procurable, but if not, a bundle of arc light carbons with the copper surface well filed off is the next best. The chemicals for producing the action that generates the electricity are, ¼ pound of sal ammoniac, ¼ pound of chloride of zinc (paste form), ¼ pound oxide of zinc, and ¼ pound plaster of Paris. These salts should be thoroughly mixed with a mortar, and packed tightly in the cylinder about the carbon, which is a half inch from the bottom of the cell. This paste will fill the cylinder to within half an inch of the top, the rest being filled with paraffine. A copper terminal soldered to the zinc and a heavy copper wire scraped clean and bound about the protruding end of the carbon, form the negative and positive connections for the cell.

This cell can be easily formed in various other shapes to suit the experimenter's fancy. The cell herein described, if constructed according to specifications, will produce very satisfactory results, especially in ignition work or for wireless. It will register about 1 2/5 volts and between 10 and 15 amperes.

### HOME-GROWN CALABASH GOURDS.

BY CHARLES A. SIDMAN.

The Department of Agriculture, through its office of foreign plant introduction, has brought to the notice



PIPES MADE FROM CALABASH GOURDS.

of the smokers of the country one of the most useful articles of their trade. This is the curious calabash gourd, a plant indigenous to South Africa, and from which the highest quality of pipe bowls can be made.

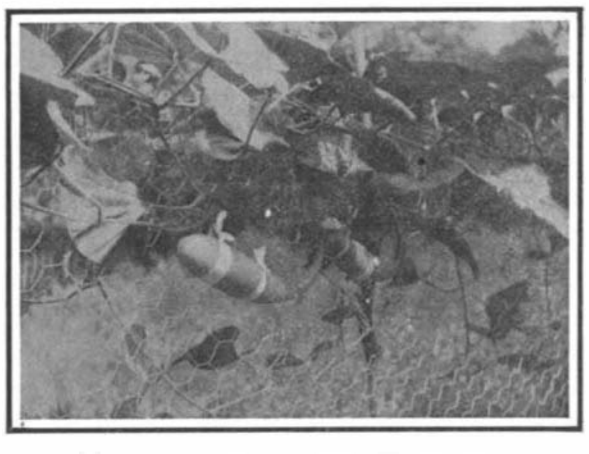
The plant is now being introduced into the United States for the purpose of pipe making, and it has been found by experiments to thrive perfectly in our climate. The perfect success with which the gourd can be grown in almost any part of the country warrants the belief that it will prove a good investment to import a large amount of seed from South Africa.

A curious feature of the calabash gourd pipe is its great resemblance to a certain capacious-bowled meerschaum popular in Germany. It is said that a Boer farmer first utilized the gourd as a pipe, and that the English shortly afterward recognized its merits and the use to which the plant could be adapted.

From the educated smoker's point of view, the calabash pipe not only yields a very sweet and cool smoke, but it colors beautifully, far surpassing in this respect the finest meerschaum. Besides taking on a high polish, its life is about as long as that of a French brierwood pipe. The usual lining is of plaster of Paris, usually known by the trade as pipe meerschaum.

The present market price of these calabash pipes is rather high, owing to the fact that there are but few grown in this country, and also to the fact that these gourds are never of the same shape and size, necessitating the making of the mountings by hand.

The writer was given a few seeds for testing, and his success was all that could be desired. The plant was of very hardy growth, and the fruit set very easily. As there was only one plant, each flower had to be pollenized. The plant was grown on a trellis about five feet high, but as the fruit began to get very heavy, it had to be tied to the wire. In growing the



THE GOURDS ARE TIED TO THE TRELLIS TO GIVE THEM THE PROPER SHAPE.

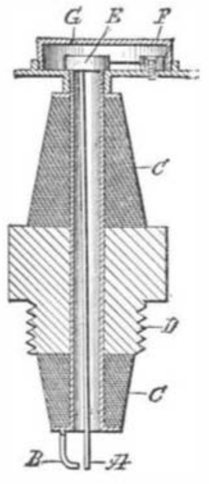
plant for pipes, it seems to demand a very hot and dry soil, with rain at the right season to bring the gourds to perfection. The curved stem end of the calabash forms a light and appropriate shape for the pipe. The majority of the gourds take their own shape, but for special shapes they must be tied.

Any man who has a small space in his yard can grow enough pipe gourds in a season to last him for several years.

### THE HANDY MAN'S SPARK PLUG.

BY R. W. PEARSE.

The spark plug shown here is equally well adapted for high or low tension ignition. It may be made by a handy workman out of an old mica plug by taking out the steel wire down the center and putting in its place a piece of brass tubing, 3/16 of an inch ouside diameter and ⅛ of an inch inside diameter. *A* and *B* are the terminals forming the spark gap, *C* is the mica, and *D* the threaded body of the plug. The upper end of the terminal *A* is riveted to a small valve which is pressed down by a weak spring and thereby closes the upper end of the tube, as shown in the sketch. A valve chamber is screwed on the upper end of the tube, thus holding the mica together. The valve operates in the chamber, being fastened thereon by the screw *F*. The valve and its seat should be ground flat, and then the terminal *A* should be riveted to it. There is a small hole *E* in the cover of the air chamber. The cover should be fastened to the chamber with a screw or other simple means, so that it may easily be detached for the purpose of cleaning the valve. In use the terminal *A* vibrates with a noise like the trembler of a coil, and in this way strikes the terminal *B*.




THE HANDY MAN'S SPARK PLUG.

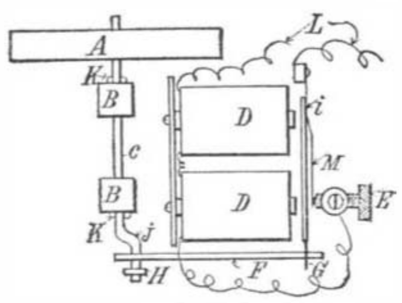
During the compression stroke the compressed gases travel up the central tube, lift the small valves, and instantly fill the valve chamber to the same pressure as the cylinder. With the same pressure on both sides of the valve, it will be forced down by its spring. But as the gases in the chamber *C* escape through the hole *G*, the pressures will be thrown out of balance, and the valve will again be raised by the pressure in the cylinder. This action will continue during the entire compression stroke. The hole *G* should be extremely small, and the amount of gas that will escape during compression will not perceptibly lessen the power of the engine. It will be clear that as the valve is raised, *A* approaches *B* and also that *A* moves away when the valve is closed, because the fulcrum is virtually at the screw *F*.

As *A* keeps striking *B* while it vibrates the low-tension contact, or touch spark, may be used with this plug. This plug gives many contacts, and therefore many sparks, instead of the single contact given by the usual hammer and anvil. This plug is far simpler than the hammer and anvil system, and besides it does not leak and lose compression like the latter does when worn. It will work with high-tension ignition with a trembler coil. As the terminal vibrates, it keeps itself clean, and an excess of oil or soot will not affect it like an ordinary plug. If used for high-tension ignition, the period of vibration should not be the same as that of the coil trembler, or an odd spark will be missed, owing to *A* being sometimes in contact with *B* when the high-tension current is in the act of flowing. The terminal *A* may be made to vibrate as rapidly or slowly as desired by strengthening or weakening the valve spring.

### HOW TO MAKE A SIMPLE ELECTRIC ENGINE.

BY ROBERT H. BROCKMAN.

A simple electric engine may be made as follows: Take an ordinary electric bell and remove the gong. The striker arm should be cut off about ¾ inch from the armature, leaving the butt *G*. A strip of brass 1/16 inch thick and ¼ inch wide of suitable length is bored at both ends, one end to fit the butt *G* and the other end to fit the crank *J* of the shaft *C*. The shaft is made of ⅛-inch diameter brass or steel. Care should be taken to make the stroke of the crank *J* the same as that of the armature. The balance wheel *A* is fastened to the shaft *C*. Any wheel of suitable size and weight can be used. In the model made by the writer a valve wheel 2 inches in diameter was used.




A SIMPLE ELECTRIC ENGINE.

The bearings *B* can be made of strip brass—in the model screw eyes were used. *K K* are wire rings soldered to the shaft *C* to keep it in place. *H* is a wire ring soldered to the crank to keep the strip *F* in place.

When the screw *E* is properly adjusted and the terminals *L* are connected to a battery the engine will run at a high rate of speed.