PLANE GUIDE.

This device, which may be used on an ordinary work-bench, is particularly adapted for use with the dado plane in cutting gains transversely or obliquely, and is so constructed that, after one piece is gained, any desired number of duplicates may be made without being previously "laid out."

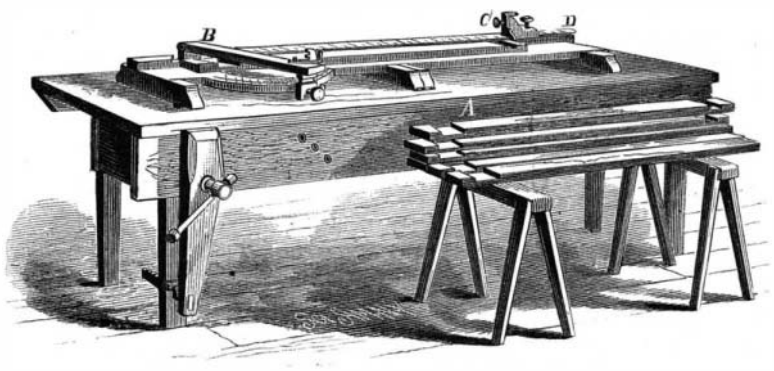
The plane guide—which may be eight or ten feet in length—is placed on an ordinary work-bench for use. An adjustable guide, B, is hinged at the rear to the pivoted bar, A, and capable of being opened or raised vertically to facilitate the placing and removal of the stuff to be worked. The guide can also be adjusted to suit material of different thicknesses.

C is a sliding gauge, which may be set at any desired position on the graduated plate or rule, D, and serves to mark the length between the gains to be cut.

In operation, the guide is opened to a vertical position, the material placed in position, the guide closed down and fastened, thus securing the material in position and furnishing a guide to direct the plane in cutting the groove. The guide, in connection with the pivoted bar, may be set at any desired angle and secured by the thumb-screw.

With this device, window frames, door frames, etc., may be accurately gained in less time than is required to lay them out for gaining in the usual manner with saw and chisel; besides, the work may be done by an unskilled workman.

When not in use, the device, being hinged at H, may be folded up and placed in any convenient place in the shop. Further particulars may be obtained by addressing the patentee, Mr. Wm. H. Stinson, Scandea, Kansas.



STINSON'S ADJUSTABLE DADO PLANE GUIDE.

Artificial Gems.

P. Weiskopf gives in the *Diamant* the following formulæ for the frit or mass used in Bohemia for making imitations of some of the precious stones:

Imitation agates.—10 kilos quartz, 17 kilos red lead, 3·2 kilos potash, 2 2 kilos borax, and 0·1 kilo arsenic. The quantity of chloride of gold added is equal to that obtained from 0·4 of a ducat.

Agate glass.—10 parts of broken glass is melted, and to it are added 0·15 part suboxide of copper, the same quantity of the oxides of chromium and of maganese, 0·02 part each of oxide of cobalt and nitrate of silver, 0 01 oxide of uranium 0 4 red argols, 0·3 part bone meal. Each oxide is added alone and at intervals of ten minutes. After heating the mixture for an hour, 0 3 or 0·4 part of fine soot is put in.

Red marble.—80 parts of sand, 40 of potash, 10 of lime, 2 of table salt, 1 of saltpeter, and 0·1 of arsenic. The mixture is melted, and then 25 parts of suboxide of copper and 1 part of saltpeter mixed in

Artificial turquoise are made in Paris and Vienna that cannot be distinguished by external appearances from the natural product, and when artistically made can only be distinguished by means of the file, being usually softer. They are made from phosphate of alumina and phosphate of copper mixed together and subjected to hydraulic pressure. Even in chemical composition it resembles the natural mineral, which is a hydrated phosphate of alumina with 2 per cent of oxide of copper.

Artificial Vanilline.

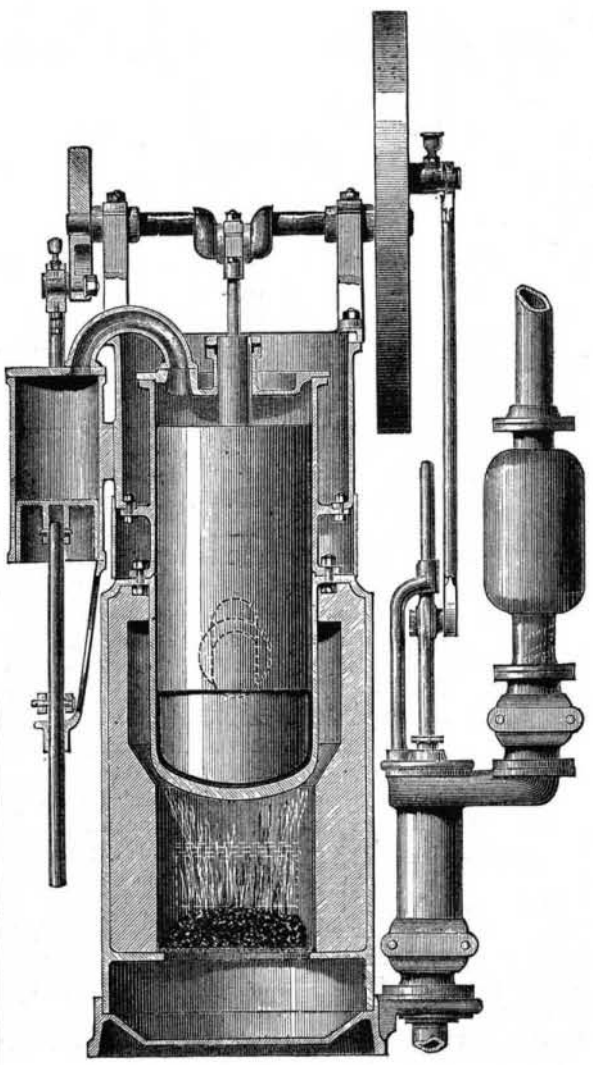
Some six or seven years ago, the discovery of a method for the preparation of artificial vanilline, the odorous principle of the vanilla bean, was announced. Its production as a commercial article was soon begun, and high hopes were entertained that it would be a financial as well as a scientific success, but as yet its use is very limited and its price very high. Several methods for its production have since been discovered and patented; the most recent is the subject of a patent taken by Meister, Lucins, and Brüning. Although a very simple one, the names of the products made use of enjoy the advantages of long names. The meta form of amido benzaldehyd is first converted into the diazo compound, in the usual manuer, and by decomposing with water it forms meta oxyl-benzaldehyd. This is nitrated and methylated, and thus converted into para-nitro-meta-methoxyl-benzaldehyd, $C_6H_3.NO_2.OCH_3.CHO$. By reducing the nitro group to an amido group, converting into a diazo compound and decomposing that with water, they obtain vanilline, $C_6H_3.OH.OCH_3.CHO$, the full scientific name of which is para-oxy-meta-methoxyl benzaldehyde. Whether this new and *simple* process will be any more successful than those hitherto tried is doubtful, to say the least.

Tin in Colorado.

A promising discovery of tin is reported in a Denver, Colorado, paper. The lode is said to be situated in the American basin, on the lake fork of the Gunnison, in Hinsdale county, just beyond the San Juan county line, Col. A poor prospector commenced work on the mine in 1874. The ore is of two kinds—leaf tin and English or silver tin, carrying also fifty ounces of silver and five ounces of gold. The vein is 12 feet wide, and shows on the surface for 1,500 feet. The ore is pronounced by experts in Denver, Pueblo, and Washington the richest tin ore ever discovered in this country.

IMPROVED HOT AIR ENGINE.

The "vertical" hot air engines, it will be observed, differ from hot air engines that have already been introduced into the market in the arrangement of the cylinders. The air cylinder is placed outside the casing, offering thereby greater facilities for cleansing and lubricating, also for examining the different parts. This cylinder is fitted with a metallic piston, and the shape of the cylinder enables this type of engine to be made as compact as possible. The action of the engine may be described as follows: After the fire is made the retort becomes heated to a dull red heat. This rise of temperature expands the small amount of air inside, which then forces the piston in the air cylinder downward. After this expanded air has done duty, the displacer, which is actuated from the crank, forces the air which has been condensed against the cold sides of the top part of the cylinder back to the hot end of the retort. As the piston performs its stroke, due to the expanded air in the cylinder, a small air valve is kept closed by the pressure, but as the piston makes the return stroke a small valve on the top of the cylinder opens for a sufficient length of time to permit air to enter the cylinder to replace any which has been permitted to escape through any defect in packing; so that it will be seen that not only is it automatic in receiving the proper supply of air for expansion, but it is also automatic in its lubrication, for wherever this down stroke is made a small amount of oil is drawn into the cylinder for lubricating the metallic piston. The manufacturers claim in this type of hot air engine that the design admits of the engine being made much cheaper, as well as affording great facilities for examining, lubricating, and repairing, than is the case with any other hot air engine. It is being made in considerable numbers by Messrs. Bailey & Co., Salford, London.—*The Engineer.*



IMPROVED HOT AIR ENGINE.

DURING a recent tornado in Brewer, Me., a plank was blown with such force against a cistern with wooden walls an inch and a half thick, that the board penetrated some distance through the wall into the water. It was found that the board was wedged in so closely that the water did not leak, and the owner simply sawed the plank off, leaving the wall in the cistern all right.

Are Toads Poisonous?

In answer to this query, propounded by Mr. Herbert Brown in a recent number of *Knowledge*, a decided affirmative may be returned. The toad *is* venomous, though not in the way that is implied by the general acceptation of that term, as is commonly believed. Nothing can be more harmless than the bite of the common toad—if it can be said to bite, for it has no teeth. But the glands contained in the papillæ and rugosities of the skin covering the back, and especially those which can be plainly seen in the form of two bean-like eminences just behind the head, secrete a milky, highly acrid fluid, which is exuded profusely on irritation. Indeed, if it were not for this poisonous secretion, the poor toad would fall an easy victim to many enemies, having neither the agility of the frog or lizard to enable it to make its escape, nor the teeth and claws of other reptiles wherewith to defend itself. Cats, which are eager hunters of frogs for food, spit and foam at the mouth when they pick up the wrong batrachian by mistake, and are often affected in a similar manner to Mr. Brown's St. Bernard; frog-eating snakes, too, detect the difference, and will not take toads, as a rule. When a snake, greatly pressed by hunger, swallows one, it usually rejects it again immediately afterward, and not unfrequently dies. Those frogs which prey upon their own kind (as most frogs do) despise their ugly relative from an alimentary point of view; and, curiously enough, certain toads which devour frogs share the same antipathy to their race. Except with very small animals, the poison appears to act rather as a local irritant than a toxæmic agent; it has no effect upon the sound skin, but will cause any abraded surface to inflame to extensive ulceration, while great pain results from its application to the conjunctiva or internal mucous membranes. Any one who can overcome his repugnance to the creature sufficiently to put his lips or tongue against the skin of an angry toad will experience an intensely acrid taste; he should shut his eyes in making such an experiment, as the post-occipital glands sometimes emit their secretion in a jet. Mr. Frank Buckland quotes a case which occurred in Oxfordshire, where a drunken brute bit a toad's head off. Happily, his teeth went right through these glands, and his mouth and throat immediately became swollen and inflamed to such an extent that his life was in jeopardy for some hours. These characteristics are much more strongly marked in many of the tropical Bufonidæ. My giant toads (*Bufo agua*) used to swelter venom when they were taken in the hands in such abundance that it would pour off their backs and drip from them, before they became tame; and I was thus enabled to collect a large amount. This species feeds on rats, and it is possible that this copious exudation may serve to prevent their prey from biting them when seized by the leg, or otherwise awkwardly caught. I once put a "cribo" snake (*Dromicus fugitivus*) into a box with three of these toads for a single night, for lack of other accommodation; it was a fine, active specimen, five or six feet long, and its movements during the night so disturbed them that in the morning I found the floor of the box all awash with fluid. The snake was lying on its back, apparently dead; and, though it recovered somewhat on being plunged into a bath, it survived only a few days.—*Arthur Stradling, C.M.Z.S., in Knowledge.*

Photograph of an Explosion.

The United States Engineers recently photographed the explosion of a wreck, which was blown to pieces by submarine charges of dynamite, to ascertain, among other things, how long the spectacle really lasted. The result was exceedingly interesting. There were six cameras employed, and the instant of the explosion, as also the several instants when the exposures were made by shutter, were electrically timed by a chronograph.

A photograph taken one-tenth of a second after the explosion showed the vessel broken, and a column of water 70 feet high; a photograph secured 1·5 seconds after the instant of explosion showed a column of water 160 feet high; a third photograph, taken 2 3 seconds after, showed the column at its full height of 180 feet, while fragments of wreckage were in the air, but none had fallen to disturb the surface of the water; a fourth picture, taken 3·3 seconds after, showed the column falling, and the surface of the water disturbed; while a fifth photograph, secured 4·3 seconds after, showed that all was over.

Height of Buildings.

In the Insurance Cyclopedia, Mr. Walford mentions the Swedish law which came into force in 1875, and which prohibited the erection of buildings in cities and towns of a height more than five feet above the width of the street on which they are built. A wise precaution, says the *American Exchange*, to secure proper ventilation and avert the spread of conflagrations, and which somewhat qualifies Capt. Shaw's rule that the safety or saving of the individual ignited building is indirectly in the ratio of the height to area or cubic content under equal combustible conditions otherwise. This is part of the question, whether we shall in the future build *cities*, or continue, as in the past, to build capricious individual structures.