TRICKS WITH VEGETABLES.
JOHN R. CORYELL.

THE extraordinary adaptability of growing plants to the circumstances of their environment is constantly exemplified, not only in singular accidental forms, but in a great variety of carefully designed ways practiced by the florist or horticulturist, either for purposes of effect or convenience. Illustrative of what may be called this docility of plant life, are a series of experiments, some of them sufficiently fantastic to fairly come under the head of "tricks."

No better subject for experiments of this sort can be found than any one of the large family of gourds. The best success will, of course, be had with the shapes which are naturally nearest the one desired to be produced, but with a little care forms may be produced

which are as far as possible from those naturally assumed by the gourd. All that is required is to confine the gourd, as soon as may be, in a mould of the desired form, and the yielding fruit will without a struggle adapt itself to it. For example, if the shape of a Florence flask be desired, the gourd should be placed in the flask and secured there by cords being tied from the neck of the flask to the vine. As soon as the gourd has completely filled the mould, it should be taken from the vine to check further growth, and the mould should then be broken. If an irregular shape is desired, the experimenter may exercise his ingenuity, and will discover then how singularly plastic the growing gourd is.

Causing a name to grow upon an apple, pear, peach, or other fruit is a trick interesting in itself, a wonder to children, and a joy to those young persons who are

described as in the "tender time of life." It is accomplished by cutting tinfoil, or any similar substance, into the desired letters and placing them on the fruit. The air and sunlight being thus kept from the fruit under the tinfoil, it will be of a distinct color.

To grow a bunch of grapes in a bottle, the neck of which is too small to receive even one grape, is an easy thing to do, but always causes great wonderment in persons who see only the result. As soon as the grapes are set on the bunch, the bottle should be slipped over the bunch and tied securely. Care must be taken to keep water out of the bottle, else the grapes will be likely to rot. Nothing more is necessary to be done, as the grapes will grow as well in the bottle as out of it.

To have a bunch of grapes growing on a vine in a flower pot requires some care, but is not really difficult. The part of a vine upon which a thrifty bunch of

TRICKS WITH VEGETABLES.

LAP DOGS. Drawn from life by Jean Bungart.

1. Maltese Dog. 2. Rough-coated Terrier. 3. Blenheim Spaniel. 4. King-Charles. 5. Pug. 6. Smooth-coated Terrier. 7. Silky Spitz. 8. Silky Poodle.
9. South American Hairless Dog. 10. Greyhound. 11. Yorkshire Terrier. 12. Skye Terrier.

grapes has started is put through the hole in the bottom of a flower pot, and drawn up until a reasonable length of vine extends beyond the rim. The pot is secured in position, and rich earth filled into it around the vine. After a time the vine in the pot will take root, and by the time the grapes are ready to ripen, the vine can be removed at the bottom of the pot without injury to the grapes, which will go on ripening. When successfully done, a very beautiful effect is produced, and nothing daintier as a gift for an invalid can be imagined.

Another very effective result is obtained by growing a strawberry plant in a carrot. Take as large a carrot as can be had, and scoop out the large end to form the receptacle for the earth in which the strawberry plant is to be grown. The earth used cannot be too rich, and it will be well to keep it moist, not wet, with some sort of liquid manure. Select a young, thrifty plant, and, first half-filling the hole in the carrot, place the plant in the hole with roots well spread. Then fill in the hole with earth until the crown of the plant is reached. The earth should be carefully pressed about the roots, and two or more holes should be made through the carrot in such a way as to drain the earth receptacle. The carrot may then be hung up in a warm place, and not only will the strawberry grow and bear its beautiful fruit, but the carrot too will throw out a beautiful green foliage, thus making a very pretty combination of colors. This can also be done with a sweet potato, as shown in illustration.

Another unique plan for growing strawberries is to fill a barrel with rich earth, first, however, boring a number of holes with an auger in the sides of the barrel. In each hole plant a strawberry vine, and in the course of time the barrel will be covered with green foliage, against which will grow the luscious red berries.

LAPDOGS.

LILIPUTIANS among dogs were acknowledged favorites with women even in the times of the Greeks and Romans, as they are now; but sometimes dogs of one class are in fashion and sometimes dogs of another class. Many of the different breeds have died out, and others have degenerated.

In the time of King Charles II. of England, the King Charles spaniel (Fig. 4 in the group shown in the opposite cut) and the Blenheim spaniel were great favorites, not only with ladies, but gentlemen also vied with each other in the acquisition of as many and as small specimens of these little dogs as possible, and they even went so far as to carry their pets about with them. Of late years these dogs have again come into vogue. The pug (Fig. 5), which has always played an important part as constant companion for old bachelors and foot warmer for old maids, has for a long time been neglected, but now he is so successfully bred that good specimens can be had at a low price.

In addition to these aristocrats, we will mention two breeds which are purely German; the first is the droll little rough-coated terrier (Fig. 2), with its wise eyes shaded by silky hair, and comical and affectionate ways; and the second, the smooth-coated terrier (Fig. 6), pure specimens of which, however, are seldom found. The silky poodle (Fig. 8) is a descendant, or rather a miniature edition, of the larger poodle. The silky spitz (Fig. 7) disappeared for a time, but it is now raised with great care, and is one of the most, if not the most, attractive of small dogs. He is covered with smooth, white, silky hair, and from under this beautiful coat the wise dark eyes and the little black nose peep out; the mouse-like ears and the delicately shaped limbs help to give him a very elegant appearance.

The English Yorkshire terrier (Fig. 11) is one of the most valuable of dogs, and is seen at all dog shows, where he generally lies stretched out on a silk cushion in a glass case. He is of low build, and the beautiful glossy, silver-gray hair on his body and soft golden hair on his head and legs give him a peculiar appearance. His hair is so long that it touches the ground, and completely covers his eyes and feet. The Skye terrier (Fig. 12) is not as elegant as the Yorkshire terrier. Its principal color is a mixed gray (so-called pepper and salt), and though its hair falls over its eyes, it does not cover them completely. His ears are large, and his head is rather heavy in proportion to the rest of his body.

The oldest of the dwarf dogs is the Maltese dog (Fig. 1), for he was mentioned in the time of Aristotle, when he was fondled by Greek beauties. The delicate greyhound (Fig. 10) with his light, springy motions, was the especial favorite of Frederick the Great. This animal has a delicate constitution, and seems to be always shivering; he is, therefore, generally kept covered. A less highly prized class is that of the hairless dogs (Fig. 9), natives of South America, the rarest specimens of which are spotted, and have bunches of hair on their heads and the ends of their tails.

The long-haired dogs require, of course, a great deal of care, daily brushing and, in warm weather, frequent baths being absolutely necessary. Dainties, and specially cake, are forbidden luxuries, milk porridge with bread or meat broth with vegetables and without seasoning being the best food for small dogs. This food with the addition of a pinch of magnesia and sulphur will keep the blood pure, and will prevent skin disease.—*Illustrirte Zeitung*.

GEOLOGY OF NATURAL GAS.

By CHAS. A. ASHBURNER.

THE general geological conditions upon which the occurrence of natural gas seems to depend, from a consideration of the facts at present at our command, are: (1) The porosity and homogeneity of the sandstone which serves as a reservoir to hold the gas. (2) The extent to which the strata above or below the gas sand are cracked. (3) The dip of the gas sand and the position of the anticlinals and synclinals. (4) The relative proportion of water, oil, and gas contained in the gas sand. And (5) the pressure under which the gas exists before being tapped by wells. Other conditions may still be discovered which will have as important a bearing upon the problem as these which I have stated.

The oil and gas regions of Pennsylvania are one in a geological sense. The strata drilled through by the gas wells in the vicinity of Pittsburgh (now considered

the most important gas district) are, in a general way, the same as the strata in the different parts of the Devonian and Carboniferous series pierced by the oil wells in all the oil pools from Alleghany County, New York, southwest to Washington County, Pennsylvania.

1. The first necessary condition for the presence of gas, however, is dependent upon the existence of a porous rock to serve as a reservoir to hold it. A number of wells have been drilled which have found gas, but, if the drillers' records are to be credited, have not pierced sand beds; in these cases the gas has been unquestionably obtained from a crack in the strata which serve as a conduit to convey the gas from its sand-bed reservoir to the well.

2. The origin of natural gas has an important bearing upon its economic geology. Although it is believed that we are in possession of much data to throw some light upon this interesting question of cause, yet it is still shrouded in too much uncertainty to permit of complete explanation. It is necessary, however, that some statement should be made in regard to the origin of gas in order to thoroughly comprehend the conditions upon which its existence seems to depend. It would appear that the gas is closely related to petroleum, and that their origin is due largely to the same cause—the decomposition of animal and vegetable life. It is believed that the gas is not indigenous to the sand rock from which it is obtained, but comes from the decomposition of life forms which were entrapped in underlying strata. If this be so, the amount of gas contained in any one sand depends, first, upon the extent to which the rocks are cracked between the horizons of such organic remains and the gas-sand reservoir, in order to permit the gas to flow into the sand; and, second, upon the extent to which the rocks are cracked above the gas sand, which would permit the gas to escape into the atmosphere and totally disappear.

That the absence of both petroleum and natural gas in our plicated strata east of the oil regions is to be explained by the cracking of the rocks would seem to be evident, since the survey of the outcropping rocks and a study of the records of dry wells show that the oil and gas sands extend far beyond the limits of the area of the region in which any traces of oil or gas have ever been found. Even within the area where oil and gas wells have been found, the cracking or jointing of the rocks must have a potent influence upon the amount of oil or gas obtained in certain localities.

3. The general structural geology of the oil and gas regions is comparatively simple. The rocks lie nearly horizontal, being thrown into broad and almost imperceptible rolls by southwest-dipping anticlines and synclines which are parallel, in a general way, to the escarpment of the Alleghany Mountains, and which produce gentle northwest and southwest dips from the crests of the anticlines down toward the centers of the synclines. An appreciation of the intensity of these dips may be had from the following figures: From the city of Bradford, in McKean County, immediately south of the Pennsylvania and New York State line, and about 72 miles in an air line a little south of east of the city of Erie, the strata dip at an average rate of 14 feet per mile to Oil City, which is 64 miles south 55° west of Bradford. From Oil City to Pittsburgh, a distance of 70 miles in a direction south 12° west, the average rate of dip per mile is about 20 feet. From the city of Erie to Beaver, on the Ohio River, at the mouth of the Shenango River, the distance is about 100 miles in a direction south 7° west, and the average rate of the fall of the strata is 20 feet per mile. Although these are the general dips of the rocks, yet many very much greater local dips occur in the areas between the localities named.

The maximum dip in the Bradford oil region, which I determined from my surveys in 1879, was 69 feet per mile, and this for a distance of only 2½ miles. In the Venango oil belt and southern end of the Butler oil belt the dip of the oil sands, as shown by Mr. Carll's survey, rarely exceeds 35 feet per mile. A dip in the strata at the rate of 75 to 100 feet per mile, for even very short distances, is the rarest occurrence.

Although the dip of the gas sand and position of the anticlines and synclines have an important bearing upon the occurrence of gas (in many cases this would seem to be the most important consideration), yet it is not believed that natural gas wells can be located independently on what has been formulated as "the anticlinal theory," since all great gas wells are not found along anticlinal axes, although some of the largest and most important wells in Pennsylvania have been found in such positions. A great many wells have been drilled in synclines which have found gas. These two statements are of great importance, since a large amount of money is now being expended in drilling wells which have been located on the basis of the anticlinal theory, so called.

In a paper which I read before the American Institute of Mining Engineers in September, 1884, on the geology of natural gas, I cited a number of cases where large gas wells have been found on monoclinical slopes or in synclinals far removed from any anticlinal axes.

Mr. John F. Carll, assistant geologist in charge of the Survey of the Oil and Gas Region, in referring to the Murrysburg district, and to the Bear Valley and Pine Run wells, about nine miles northeast of the village of Murrysburg, says in his forthcoming report of progress for 1885, now going through the press:

"Here we have a good illustration of the uncertainties that must ever attend all operations for oil and gas. A large gas well (Beaver Valley) on an anticlinal, in the Murrysburg-Leechburg sand; a good gas well (Pine Run) in a synclinal, where the Freeport upper coal is found 210 feet lower than at Beaver Valley well, but in a sand 125 feet deeper than the Leechburg sand; a dry hole on the anticlinal with no available gas in either of the gas horizons of the upper wells, and all within a radius of less than two miles."

Making special reference to the anticlinal theory, Mr. Carll says:

"The anticlinal theory—that gas wells should always be located on anticlinals, and not in synclinals, because gas is lighter than water or oil, and should seek the highest reservoirs—premises a permeable sand rock containing water, oil, and gas, or only water and gas, in such proportions, and under such conditions, that the fluids may stratify themselves as freely and completely as they would do in an open tank under air, the water and oil at the lower levels and gas at the higher.

"There is nothing new in the theory, as many suppose, for it has been long ago discussed and illustrated in text books on geology and in nearly every book published relating to the production of petroleum. Well locators, however, gave it but little attention until developments intended exclusively for natural gas commenced.

"Wherever the proper conditions exist, there seems to be no objection to accepting an anticlinal as one of the factors in locating gas wells; but, in most cases, it is being too inconsiderately used, without giving due thought to other and much more important considerations.

"First, it is proved by the experiences of over twenty-five years that no profitable oil or gas well can be obtained in the upper Devonian strata and rocks of later ages in the Pennsylvania oil fields unless a good sand-rock reservoir is found. Second, it is a generally accepted conclusion that the oil and gas-making material was deposited before—and, perhaps, in some cases, with—the producing sand rock, not after it; that the tendency of gas and oil when generated is upward, not downward. Therefore, the two primary conditions to be sought are gas-producing materials and sand-rock reservoirs to hold the products. All others are secondary, for, without these, no profitable oil or gas wells can be had.

"Now, what has an anticlinal to do with these indispensable qualifications? Evidently nothing, in a primary sense, for it had no existence when they were being prepared. Nevertheless, I have heard experienced operators, self-confident in their geological acquisitions, assert that certain oil fields could not extend beyond fixed limits on account of anticlinals which interrupted the deposition of the oil sands when they were forming.

"It is well known that all our oil rocks are sedimentary; that they are composed of materials derived from older rocks, the disintegrated particles of which have been sifted, assorted, and deposited in stratified layers by the action of water. These rocks are known to be several thousand feet in thickness, and untold ages elapsed while they were forming. For the purposes of this discussion, we need go no farther back in the eons of the past than the time when the Murrysburg gas sand (taking a definite stratum to avoid confusion) was completed by those changes of conditions—whatever they were—which terminated the sand deposits at that spot and commenced to lay down the overlying shales.

"At that date the two most important requisites for a future gas field had been provided. The gas-making material had been deposited; the receiving tank, so to speak, put in place, and the impervious cover was being put on. But the sedimentary deposits were not yet completed. Other carbonaceous shales, other sand rocks, alternating with beds of coal, slates, fire clays, and limestones, were yet to be superimposed to a height of 3,000 feet or more. These all were deposited in the course of time in regularly stratified layers, showing that no deep-seated, unequal, or local disturbance had occurred up to the date of their completion. Subsequently some great change took place. The whole region was lifted above ocean level; the Alleghany Mountains rose in crested ridges, and the Murrysburg anticlinal, with other comparatively minor flexures, was formed.

"Now, what effect could these anticlinal movements have had upon gas-producing capabilities of the rocks at Murrysburg, where, as we have seen, the gas materials and the reservoirs had been provided ages before. Had the hydrocarbons stored in the shales lain dormant all these ages awaiting some awakening energy to set them free, which could only be furnished by the crash and pressure accompanying anticlinal movements? This can hardly be admitted, for oil and gas are plentifully found in regions where the rocks have not been so affected. Did the anticlinal movement open up crevices below the gas sand leading down to some deep-seated storehouse of gas beneath the sedimentary rocks? This question is open to the same objection as the former one; and, furthermore, is it not reasonable to suppose that the side thrust and pressure which caused these anticlinals to rise would have a tendency to consolidate the basal shales confined under a heavy mass of incumbent strata, and to fracture and loosen the rocks near the surface if anywhere? It is probable that gas, after forcing its way up through thousands of feet of clay shales and slates, such as have been penetrated by wells to the depth of at least 1,800 feet without encountering any noticeable leads, would stop in the gas sand; only checked by a covering of a few feet of clay shale overlain mostly by sandstone to the surface.

"If, then, anticlinals had no part in depositing the gas-making materials, and sand-bed reservoirs were not the special agents that caused the generation of gas to commence, and the anticlinals did not open crevices to deep-seated sources of unlimited supplies, what other favorable conditions could there have been instrumental in rendering the anticlinals more prolific in gas now than any other locality? I can imagine but one, which is this: When the anticlinal uplift tilted and warped the previously horizontal strata, destroying the equilibrium of the fluids in them, a new adjustment of their positions in the sand beds followed. This readjustment, in cases where all the conditions were favorable, probably resulted in storing larger quantities of gas in the anticlinals than elsewhere; but we have no assurance that all the arches were thus fortunately circumstanced, or that the conditions making one part of an arch productive would be equally efficient in another part.

"If the sand rocks were continuous, instead of being in chains of beds or pools, and sufficiently porous to allow fluids to circulate through long distances—say, for instance, from the southerly part of the Butler oil belt at Herman Station to Murrysburg—then, according to the principles upon which the anticlinal theory is founded, the Murrysburg rock should now be deluged by water, while the Herman Station rock should be stored with gas, for the monoclinical slope of 22 feet to the mile would submerge the anticlinal at Murrysburg, where the gas sand on the crown of the arch is more than 200 feet lower than it is at Herman Station.

"In applying the anticlinal theory to locating gas wells, this great monoclinical slope has, in most cases, been lost sight of by those who do not understand the geological structure of the country. Knowing the tendency of gas to seek the higher levels, and only