sels from sea to sea. Some other mode of lighting would, however, require to be arranged to insure the safe passing of vessels under way by night if the canal should ever be enlarged to the full dimensions contemplated by the directors in 1885; as the traffic managers of the canal are convinced by experience of the impracticability of two vessels in motion, carrying electric projectors, passing each other in contrary directions without danger, owing to the dazzling effects of the traveling lights on the vision of the pilots.

The first vessel that effected the through passage by night was the P. & O. steamer "Carthage," in 1886, the time of transit being 18 hours. In 1888, 46 per cent of the total shipping took advantage of the permission to steam through the canal day and night as compared with 71 per cent in 1889; the result being that for the whole navigation, the average passage for all vessels was reduced from 30 hours and 45 minutes in 1888 to 26 hours and 44 minutes in 1889. In 1898, 94 per cent of the total shipping made part of their passage by the aid of electric light, the average duration of transit being 17 hours and 22 minutes, and the minimum duration only 16 hours and 36 minutes, whereas the average time taken by steamers navigating by day was 28 hours and 20 minutes. These figures prove that the passage of the Suez Canal by night has become almost universal, to the immense relief of the navigation.

THE FENCING HORSE OF THE THIRD DRAGOONS.

THE fencing horse, devised by Fencing-Master Adjutant Monlun, of the 3d regiment of dragoons, at Nantes, presents the peculiarity that after one has seen it in operation he immediately asks himself why it was not invented a long time ago; it is so simple. But such simplicity does not exclude ingenuity, and in nowise robs M. Monlun of any of the merit of his very practical invention.

Up to the present, recruits have been exercised in the manipulation of the sword in quite a rudimentary way, especially at the inception of their instructions. The young recruit was placed upon any sort of a wooden horse whatever, with stationary dummies arranged around him within easy reach of his hands, one to the right, one to the left, one in front and one behind. Then he was ordered now to strike one and then another, by cut and thrust, according to the progression of the theory involved. This exercise was tiresome and monotonous, and consequently did not give the result desired. With Adjutant Monlun's mechanism, all this is changed. The tedious exercise of former times becomes exciting and pretty closely resembles real fighting. The soldier's "amour propre" enters into it, and something of the unexpected always occurs. The instructor himself, in manipulating the controlling wheel, becomes warmed up, and ends by identifying himself with the dummy, which he turns in every direction and every position around his pupil. The latter, while complying with the regulations and with the orders of the instructor, introduces into his work an ardor and an interest that have hitherto been unknown, and that, moreover, are shared by the spectators, officers, non-commissioned officers and young soldiers who are awaiting their turn and are impatient to enter into competition with their tow-stuffed adversaries.

But the movable apparatus is not employed solely for the instruction of the pupil placed in the center. Not only does it advantageously replace the five or six stationary dummies of the old sytem, but serves also as a target for half a dozen combatants, on foot or on horseback, armed with lath or lance, who, outside of the circle, lie in wait for it, strike it, prick it, split it and transpierce it with a conviction that gives one pleasure to witness. Let us add that the Minister of War, through a circular of September 13, 1900, authorized the commanders of cavalry corps to employ the fencing horse on condition that the expenses thereof be paid by the private fund of the regiment.

The price of 246½ francs is not of a character to frighten any one, and, if financial reasons have prevented the Minister from offering this mechanical horse gratuitously to the entire French cavalry, it is to be hoped at least that a number of colonels will decide to purchase it.—For the above particulars and the engraving, we are indebted to La Nature.

FENCING HORSE ADOPTED IN THE FRENCH ARMY.

FRUITS: THEIR FORMS AND MODES OF DISPERSAL.*

By B. COCKBURN, Ph.C.

A FRUIT, in botanical language, is the ripened ovary or mature gynæcium; it consists of an outer covering, and the seed or seeds within. Now, the seed is a most important part of the plant, essential, as you all know, in the multiplication of the species. It is a young plant in embryo, capable of germinating and of becoming an independent individual. A plant lives for the preservation of the individual and the propagation of the species, and the safeguarding of reproduction always seems of more importance than even the life of the parent plant. Many instances might be given of a plant sacrificing its life for the sake of its seeds. The flowering and fruiting processes are the most important events in the whole life-history of a plant, and there is great expenditure of energy, and much complexity and ingenuity of contrivance shown in the details of this part of its cycle. The structure of the flowers is often connected with the visits of insects, and I will try to show that the form of the fruit is correlated with various external agencies.

The old idea that the beautiful and sweet-smelling flowers and luscious fruits were solely for the benefit of man has been exploded long ago. A plant lives for itself as an individual, and there are probably no instances of a plant assisting, in any way, another plant or an animal, except when this is at the same time advantageous to the plant itself.

The fruit may be large or small, hard or soft, smooth or prickly, sweet or bitter, dry or fleshy, and we shall go on to see that most, if not all, these characteristics are adaptive modifications of the plant, and give it some advantage in the struggle for existence.

Large numbers of fruits or seeds may be produced by a single plant, and the advantage of an efficient means of distribution is obvious. If seeds merely fell to the ground, there would be the evil of competition among the plants produced. Also, the soil is necessarily impoverished in the immediate neighborhood of the parent plant, and better conditions are to be found at a distance. Seeds are usually laden with a supply of food for the young plant, and thus there are two conflicting factors. One of these tends to increase the weight of the seed by storing up food in it, and the other to lighten the seed to facilitate distribution. Sometimes the fruit, sometimes the seed itself, takes up the task of distribution. The main factors concerned are wind, water, animals, and a propulsive mechanism in the plant itself. I purpose saying a little about each of these four agencies.

DISTRIBUTION BY WATER.

The dissemination in this way is not common, and not of very great importance in the vegetable kingdom. Of some interest is the case of the cocoa-nut. Only part of the fruit is known to most people. Outside of the hard shell which protects the seeds there is a fibrous coat, two or three inches thick. This covering enables the fruit to float, and protects it from the action of the sea-water, during, it may be, a long voyage. There can be no doubt that these fruits are carried great distances in this way. The presence of the cocoa-nut palm as the first, and often only, tree upon the coral island is sufficient to encourage the belief in the success of this instance of water distribution. Seeds of the water lily are said to sink to the bottom in autumn, and to lie protected from animals and cold all winter. In the spring they become lighter, rise to the surface, and may be washed ashore for germination. Fruits or seeds to be dispersed by water must be lighter, that they may float, and must be able to resist the injurious action of the water.

DISTRIBUTION BY WIND.

This mode of distribution is quite common, and very important. The fruits or seeds may be so small and light that wind-diffusion is easily effected. In this connection may be mentioned the spores of ferns and mosses. Though very different from fruits and seeds there is a certain resemblance, in that each spore can give rise to a new fern or moss plant. It is difficult to give any conception of the small size and immense number of these spores. It has been calculated that a single fern-plant may produce over 100,000,000 spores in one season. Then there are wonderful contrivances to insure the opening of the cases only in dry weather, and the scattering of the contents only by degrees. Among the higher plants, the orchids have very minute seeds. The effect of the wind may be reinforced by the presence of a broad flange of tissue, or a tuft of hairs. Many different parts of the fruit or seed are thus modified, and it is interesting to notice the same result accomplished in so many different ways. In some fruits part of the pericarp becomes flattened, and there can be no doubt that this expansion is to aid the action of the wind. It is pointed out by Sir John Lubbock that this would be of use only in the case of trees where the fruits have some distance to fall, and are exposed to higher wind. This is exactly what is found in nature. Fruits similar in this respect are to be found upon the ash, sycamore, maple, elm, lime, etc., and seldom upon plants of a shrubby or herbaceous habit. Plants of small height require a more effective modification, which usually takes the form of a tuft of hairs. Most familiar of this class is the dandelion, though many of the same order are well known, e. g., the thistles and hawk-bits. Seeds may be similarly modified. Those of firs and pines are provided with wings, while seeds of smaller plants have sometimes hairs attached. Examples are found in the

*Read before the Glasgow Chemists' and Druggists' Assistants' and Apprentices' Association, on Wednesday, December 12, 1900.—Pharmaceutical Journal.

seeds of the cotton-plant, poplar, willow, epilobium, and strophanthus.

DISTRIBUTION BY ANIMALS.

Distribution by animals is brought about in two ways. The fruit may be eaten and the seed rejected, or it may be carried away mechanically by a passing animal. In the first case, there is present a succulent portion, usually part of the pericarp, by which the bird or other animal is attracted. The fruit is eaten and the seed rejected. The seed is guarded from injury by digestion through being inclosed in a hard shell, or by the stony nature of the seed itself. Examples of this are seen in the cherry, blackberry, grape, strawberry, and date. This is one of the best methods of seed distribution, because there is not so much left to chance. The animal scatters abroad the seed, and is repaid for its services by the food it receives. The bright color of the fruit is, of course, to render it conspicuous. Red is most common and contrasts well with the green of the leaves. Sometimes, when the fruits are small, they are grouped together in bunches, as in the case of the rowan, and so get over the disadvantage. This reminds us of the aggregation of small and inconspicuous flowers, as in the Compositæ and Umbelliferæ.

The Cape gooseberry or winter cherry is delusive in the way it makes itself attractive. A persistent, floral, envelope is brightly colored, and very much inflated. The actual edible portion is far less than might be expected from external appearances. Another interesting fruit is that of the mistletoe. There is a succulent, edible portion for which birds seek the fruit of this parasite. The bird, however, is not able to swallow the seed in this case because of a coating of very viscid substance around the seed. To get rid of the seed the bird rubs its beak against the branch of a tree, the seed sticks to the twig, and, if the tree is a suitable one for germination, the roots of the mistletoe penetrate into the tissues of the tree.

Fruits are known which resemble caterpillars, snakes, beetles, etc. These curious modifications are either to attract carnivorous or deceive graminivorous birds, but as a rule too little is known of the habits of the plant to enable us to decide upon the exact raison d'être of the presumed mimicry. The castor oil seed is a well-known example of this class, but there are many seeds which have a much more striking resemblance to beetles and other animals. That seed distribution by birds is effective was well illustrated some time ago in this way. An American currant used for giving color to wines was brought over to Europe and cultivated in Bordeaux and its neighborhood. The fruits were devoured greedily by birds, and the result is that now the plant has spread over France and Spain, and, indeed, is found over the whole of Southern Europe.

MECHANICAL DISTRIBUTION BY MEANS OF ANIMALS.

Fruits and seeds provided with strong, hooked hairs and spines attach themselves to passing animals, and are carried away. This is often a successful method, but the objection to it is the element of chance. The hooks may be derived from the teeth of a persistent calyx, from the style, or from an involucer of bracts, or the whole surface of the fruit may be covered with suitable hairs or spines. The distribution of cleavers, carrot, horehound, avens, burdock, and spinach is brought about in this way. It is again pointed out by Sir John Lubbock that in this case only plants of little height would be able to benefit by such hooks, and the theory is borne out by observation. Fruits of this kind are never found at any distance above the ground, and never upon water-plants. Sticky fruits may be carried away similarly. There are not many indigenous examples. The heads of grindelia are, when fresh, covered over with a sticky excretion of oleo-resin. In other cases, spiny or hard pericarps may serve to protect edible seeds from animals, and the external nature of the fruits of the star-nut, palm, beech, and Spanish chestnut may serve for such a purpose. Other fruits bury themselves in the ground before maturity, and seek protection in this way. The pea-nut and other fruits are forced below the soil, and ripen in this curious position.

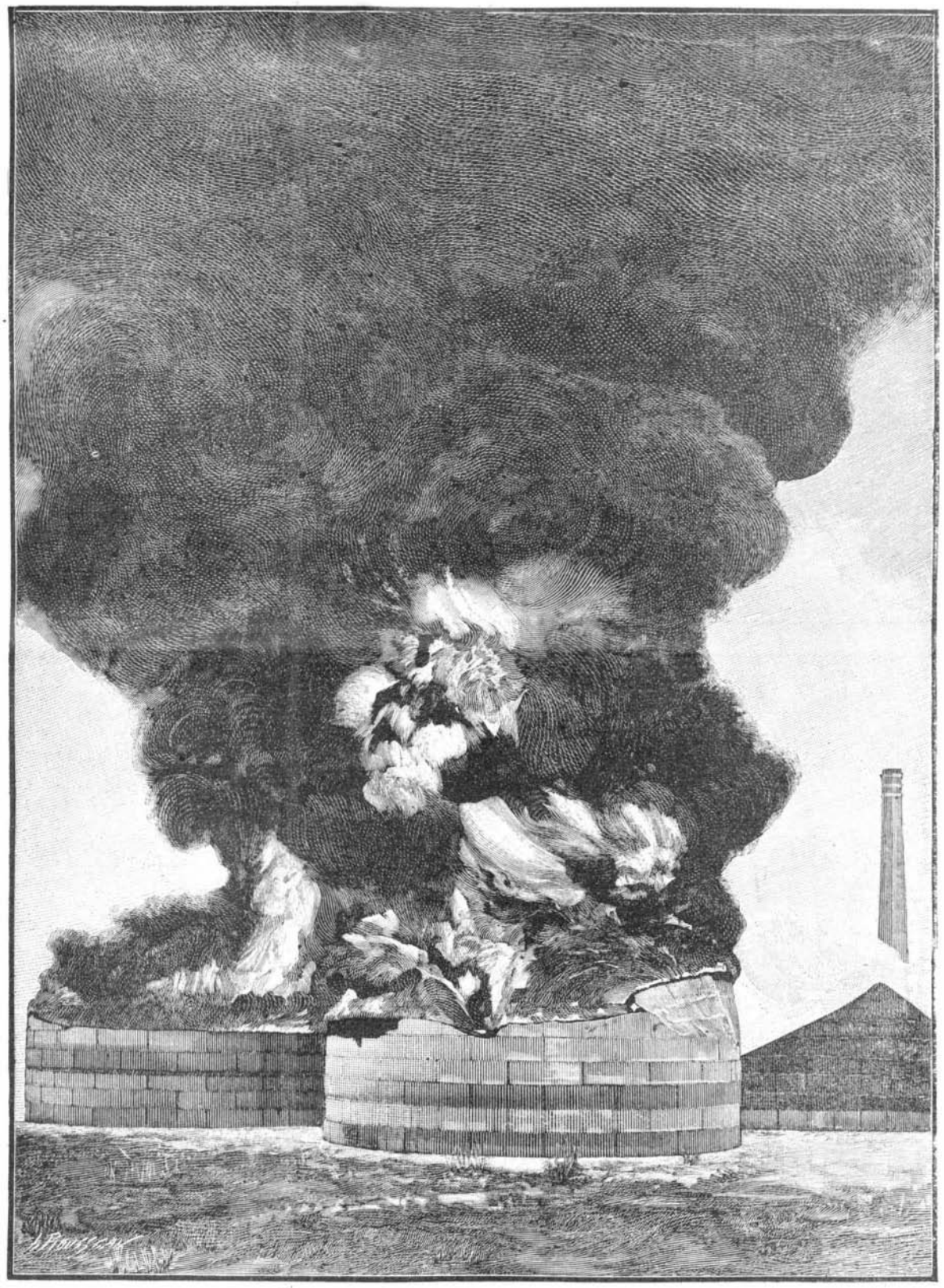
MECHANICAL DISTRIBUTION BY EXPLOSIVE DEHISCENCE.

An ingenious mechanism upon some part of the plant may scatter the seeds to some distance, as in the case of the sling or catapult fruits. A tension set up in certain parts of the fruit, and a sudden disruption when fully mature, are the distinguishing marks of such fruits. The tension may be produced by the unequal lengths of parts of the fruit, or by the change which occurs in tissues on drying. Many examples might be given, but the aptness and versatility of modification in these fruits can only be appreciated by actual examination. The squirting cucumber is a striking example. It is of the nature of a berry, and the fluid contents are under great pressure. The ripe fruit falls to the ground, and as it leaves the stalk an opening is formed through which the contents, seeds and juice, are squirted with great force. A more typical example is the touch-me-not, a Japanese variety of which is commonly cultivated. When the fruits are ripe the slightest touch is sufficient to bring about the dehiscence of the capsule with explosive violence. Similar in their methods of splitting open are the siliquas of many Cruciferæ, and the fruits of the Leguminosæ, Geraniaceæ, Violaceæ, etc. By this means of distribution the seeds are not so likely to arrive at a distance from their parent, as by those already considered. Probably a few yards is about the average.

SPECTRA OF RADIUM AND POLONIUM.—By means of Runge's method of fusing the salt into a platinum coil and then using it as an anode for a spark-gap, G. Berndt has discovered no less than 15 lines of the polonium spectrum. This is all the more interesting as no measurements of the lines due to polonium had yet been made. The two strongest lines in the photographic spectrum have a wave length of 3,361.5 and 3,349.2 Angström units respectively, with a maximum error of 1.5 units. Active bismuth nitrate of intensity 300 was used for the measurements. For extending the known spectrum of radium, the author used active barium chloride and bromide. Salts of the intensity 240 only gave the radium line at 3,814.59. But a salt of activity 1,000, prepared in Paris, gave, in addition, the lines 4,682.346, 3,814.591, and a new line 2,708.6. Down to $\lambda = 2{,}100$, no further radium lines were found. The spark was in all cases furnished by two Leyden jars charged by a large induction coil, and the platinum coil was kept in a state of incandescence. Under these circumstances, the space between the electrodes was filled with the vapor of the salt, and the platinum and air lines were quite faint.—G. Berndt, Phys. Zeitschr., December 22, 1900.

THE BURNING OF A BAKU OIL DEPOT.

FROM Baku comes the news that a fire broke out on February 5, in one of the huge oil-tanks of the Caspian and Black Sea Company. In the tank some six million poods (about 166,666 pounds) of petroleum were contained, which in burning set fire to three other storage reservoirs with a capacity of 12,000,000 pounds. The result was a frghtful catastrophe. Workmen's dwellings were inundated with burning oil, and many persons lost their lives. Up to the present twenty charred bodies have been found. Fifty persons were terribly burned. Four hundred families were made homeless.



THE BURNING BAKU OIL STATION.

Russian oil-fields have been visited by other fires, which fortunately were not always accompanied by the appalling loss of life which marked the last conflagration. Our French contemporary, L'Illustration, assures us that not so long ago an oil depot on the road from Petrovsk to Vladikaukaz, in southern Russia, was swept away by fire. The conflagration, it is said, was a most imposing and terribly beautiful spectacle. The Baku oil fields have been described and pictured in the SUPPLEMENT more than once. In output they are surpassed only by our own Pennsylvania fields. One of the peculiarities of these Russian springs is the enormous pressure under which the oil bursts forth. The wells are drilled after the American fashion. The oil is found at depths ranging from ten to six hundred feet. When struck, the oil spurts out to a great height and is thus wasted. One of the Nobel wells spouted 50,000 barrels a day; and others have proved equally unmanageable.

DANGERS FROM DUSTY TRADES.

A RECENT investigating committee of the British Parliament, appointed to inquire into the dangers of certain trades and operations, finds that there is peculiar harm in those that involve working in an atmosphere laden with dust, sometimes because this dust is poisonous, but often simply because it is irritating to the air passages. From a summary of the results, published in The Hospital, we quote the following:

The connection between dust and disease has often been noted; and even the ordinary dust of the street and the household carries insidious dangers; but these are not so sure in their action as those carried by the dust raised in various manufacturing processes. Take, for example, the work of paper staining. In the old days there was a great fancy for what was called "flock" papers; they were regarded as handsome and comfortable looking, and after a long period of neglect flock papers are beginning again to come into fashion. Fashion is thoughtless rather than cruel in her fads, and therefore it may be well to point out how the process of "flocking" is carried out. The paper having had the pattern outlined on it, the parts to be flocked are covered with a thin coat of size, and are then dusted over with the flock—a sort of felt dust—which is shaken out of something like a pepper caster. This flock adheres to the parts that are coated with size, and when it has dried upon them the remainder is shaken off. All through the process dust is in evidence, penetrating to the worker's nostrils and lungs, irritating the membranes and causing disease.

Very similar to this is the process of bronzing, as applied to paper or leather. Here also the powder is dusted on to the prepared surface, generally by means of a pad, and the worker is exposed to the dangers of inhaling it.

The employment of "flake white" or "Chinese white" is also injurious when these substances contain lead, and when they are dusted on in powder. Some forms of flake white are harmless, while others are more than half white lead, the remainder being French chalk. Says the writer:

One firm which had used this compound, finding that some cases of illness resulted among those employed,