

circulation and the gravitation of blood. The cyanosis of the face with projection of the eyes and the congestion of the conjunctivæ are due to the expiratory effort, and these signs are also seen in fat persons who do not die of strangulation. Tardieu mentions a dotted redness or minute ecchymosis of the conjunctivæ and skin of the face, neck, and chest as constant; but this cannot be considered characteristic, because it has been seen, though not so well marked, in death from other causes. It has been found in suffocation from compression of chest and belly, and also where there was respiratory interference in the prolonged efforts of tedious labor and in convulsions. Liman found it in those who were hanged; in the conjunctivæ, lips, back of mouth, and in the muscles. It is due, according to Hofmann, to increased blood pressure and consequent hemorrhages. It is of importance as tending to show that there was a stasis of blood in the head and face during life. Maschka in 234 cases of asphyxia found capillary hemorrhages of eyes and eyelids 87 times.

Dastre and Morat claim that in asphyxia the cutaneous circulation becomes much more active than in the normal state, while at the same time the vessels of the abdominal cavity are contracted.

Post-mortem stainings (hypostases) are usually darker in strangulation than in other forms of death. They appear soon, as does also putrefaction, because of the quantity and fluidity of the blood.

In hanging the appearance of the face varies with the duration of the suspension; at first it is pale, afterward livid; congested and swollen if the subject has been long suspended. Roth found the face pale in 43 of 49 cases. In about one-half of the cases the features are calm and placid (syncope). Maschka found the lips bluish in 98 of 153 cases. Harvey, after examining reports of nearly 1,500 hangings, says: "In the majority of instances, immediately after death, the features were placid, the face pale, the eyes not unduly prominent, the mouth closed or half open, the tongue pressed against the teeth but not protruding, the superficial veins full, but the head, neck, and trunk free from lividity. After a longer or shorter time, however, and apparently after a few hours (in India), all this is changed. Livid patches appear about the chest, back, and shoulders, the face and head become bloated and puffy, and the tongue and eyes protrude."

In asphyxia the eyes are usually staring, prominent, and congested, and the pupils dilated. Casper doubts their prominence. Budin and Coyne state that in asphyxia the dilatation of the pupil progresses to a maximum, and then convulsions occur. Ophthalmoscopic examination during the dyspnoea of asphyxia shows a lessened fulness of the retinal vessels. In hanging, the eyes are often prominent, staring, and congested, and usually the pupils are dilated. Lacassagne and Maschka look on ecchymosis of the eyelids and conjunctivæ, *piqueté scarlatin*, as important, favoring the idea of hanging or strangulation. Roth found in 49 cases that the eyelids were closed in 28, half open in 12, congested in 6, ecchymosed in 2; pupils dilated in 31, narrowed in 2. There was dilatation of pupils in 97½ per cent. of Ogston's cases; in 2 cases there was rupture of crystalline lens.

Signs of hemorrhage from the nose, eyes, and mouth may be visible in asphyxia, as also bloody froth from the mouth and nose. Chevers saw bleeding from the ears in strangulation. Taylor states that Dr. Geoghegan informed him of a case of suicidal strangulation by a ribbon; the violence was great, there was bleeding from the ear, and the drum was found ruptured; the mark on the neck, which was deep, nearly disappeared after the ligature was removed. Taylor also says that Wilde, of Dublin, saw a rupture of the drum and hemorrhage in strangulation. Pellier says that Littre mentions a case of rupture of the tympanic membrane in strangulation. Harvey says the blood was found flowing from the ear in 6 cases out of nearly 1,500 hangings, but no details were given. Hofmann saw a case in which there was bleeding from

the ears. He says that this is not due, as has been supposed, to rupture of the tympanic membrane, but to hemorrhage from subcutaneous vessels.

In asphyxia the veins of the entire body are distended with very dark and very fluid blood, while the arteries, especially in the young, are mostly empty. Experiments on the lower animals have shown that the pulmonary artery and systemic veins to the finest ramifications are distended with dark blood.

The mucous membranes in asphyxia are generally much congested. Serum is found in the serous cavities. Tidy, comparing strangulation and hanging, concludes that because strangulation is usually homicidal and greater violence is used, therefore the external marks are more complete in strangulation and the congestion of the air passages is invariably much greater. Maschka found the pharynx cyanotic in 216 of 234 cases of asphyxia. Ecker reported a case of judicial hanging in a man, aged forty, where the soft palate was swollen and filled up the passage so that the air evidently could not enter.

The lining membrane of the larynx and trachea is always congested in asphyxia and may be livid; the tube may contain bloody froth or blood alone. Froth tinged with blood in the air passages is considered by Tardieu one of the most constant signs of strangulation. In strangulation the trachea is sometimes torn or may be folded on itself. The cartilages of the larynx, especially if calcareous, may be broken; this is more likely to affect the thyroid than the cricoid. The fracture would seem to occur only as the result of enormous force, especially in the young, in whom the cartilages are so elastic. The experiments of Keiller on cadavers led him to conclude that falls on the larynx, even from a height and with superadded force, are unlikely to fracture this organ; severe pressure or a violent blow against the larynx from before backward may cause fracture, but severe lateral pressure, as in ordinary throttling, is more likely than other forms of violence to fracture the alæ of the thyroid or even the cricoid cartilages and also the hyoid bone. Taylor states that Dr. Inman, of Liverpool, had informed him of a case of splitting of rings of the windpipe from pressure. Maschka, in 15 cases of choking, found 6 fractures of the larynx. Chailloux has collected 8 cases of fracture of the larynx in strangulation; they were all made by the fingers. The experiments of Cavasse seem to show that there is no great difficulty in fracturing the thyroid in strangulation.

Langreuter made some experiments on a cadaver from which enough of the posterior part had been removed to enable him to view the throat. He saw that lateral digital pressure on the larynx closed the glottis; stronger pressure made the vocal cords override each other. Similar pressure between the larynx and hyoid bone caused apposition of the aryepiglottic folds and occlusion of air passages. He experimented on 16 bodies to ascertain the effects of blows and pressure on the larynx, with the following results: In 8 cases, women, the thyroid cartilage was injured 3 times, the cricoid 4; in 8 men the thyroid 8 times, and cricoid 5. Whence he concluded that the larynx is better protected in women. In the 16 cases the hyoid was fractured 10 times.

In hanging, the larynx and trachea are usually deeply congested, of a red color; a violet color indicates putrefaction. Ogston reports mucus but not bloody froth 9 times in the pharynx, 6 in the trachea, and 4 in the lungs in a total of 40 cases. In 1 case there was a quantity of blood in the larynx and pharynx. Taylor thinks that pinkish froth in the trachea indicates incomplete obstruction; and Chevers that it is due to spasmodic efforts to breathe when the obstruction is nearly complete. Chevers always found clear mucus in the larynx and upper part of the trachea, each follicle being marked by a minute globule of mucus. Harvey states that this was noted a few times in his reports. The larynx may be fractured or dislocated. These lesions are very rare in suicide, more frequent in homicide and judicial hanging, and in the old in whom the cartilages are calcareous. Remer found the injury in but 1 case of 101 of suicidal

hanging. Barker found the larynx lacerated in his judicial cases. Harvey says that the trachea was reported lacerated 11 times in nearly 1,500 cases; twice the laryngeal cartilages were separated from each other; in 5 these cartilages were fractured, but there was nothing to show under what conditions; hemorrhage in the vicinity of the larynx 43 times. Pellier reports 1 case, and adds that the lesion easily escapes notice because of the mobility of the cornua. Roth in 49 cases failed to find any fracture. Pellier found that the cricoid was injured oftener than the thyroid, which is the reverse of what is found in strangulation. Cavasse was unable to cause fracture of the larynx by hanging the cadaver. Chailloux collected 6 cases of fracture of the larynx in hanging; he concluded that the fracture could not be produced on the cadaver by hanging, and is therefore caused during life. Coutagne in 24 cases found fracture of the thyroid cartilage 8 times.

In asphyxia the lungs are usually much congested, resembling red hepatization, except that the blood is darker. Hemorrhages (apoplexies) into the substance of the lungs are common. Tardieu found patches of emphysema due to rupture of the air vesicles, giving the surface of the lung the appearance of a layer of white false membrane. Ogston admits that this occurs in pure strangulation, but to a less extent in mixed cases. Liman found the lung surface uneven, bosselated, the prominences being of a clearer color and due to emphysema; the lungs were in the same condition of congestion and emphysema in strangulation, suffocation, and hanging. He failed to find the apoplexies described. The lungs are sometimes anæmic. In healthy young subjects, especially children, the blood-vessels of the lungs often empty themselves after the heart stops. The lungs may therefore be bloodless but emphysematous from the violent efforts to breathe. Page's experiments on the lower animals showed the lungs of a pale, reddish color, and not much distended; occasionally a few dilated air cells were seen toward their anterior borders, and small hemorrhages over the surface. His experiments appear to show that subpleural ecchymoses occur as a result of violent and repeated efforts to breathe. Among other experiments he stopped the mouth and nostrils of a young calf long enough to excite violent efforts at respiration; it was then instantly killed by pithing. The lungs were found pale red, not congested, but showing subpleural ecchymoses. Page believed that these were due to the changed relation between the capacity of the thorax and volume of the lungs. Liman found these ecchymoses in cases of strangulation, hanging, drowning, poisoning, hemorrhage, and œdema of the brain in the new-born, etc. He failed to find them in some cases of suffocation. He believes them due to blood pressure from stasis in the blood-vessels. Ssabinski made many experiments on dogs and cats to ascertain the presence or absence of subpleural ecchymoses in strangulation, drowning, section of pneumogastriæ, opening of pleural sacs, compression of chest and abdomen, closure of mouth and nose, burial in pulverulent materials, etc. Similar hemorrhages may appear on the mucous and serous membranes; on the respiratory, digestive, and genito-urinary tracts, and pleuræ, pericardium, and peritoneum, membrane of brain, and the ependyma. They are sometimes minute and stellate, at other times irregular in shape; many are bright-colored. According to Tardieu, the punctiform ecchymoses are rarely present except in suffocation. Maschka, in 234 cases of asphyxia, found the lungs congested 135 times, anæmic 10, and œdematous 42. He thinks the subpleural ecchymoses are valuable signs of asphyxia.

Page experimented on six kittens, strangling three by the hand, the other three by ligature. The results of the post-mortem examinations were nearly similar. The veins were full of dark fluid blood; the right cavities of the heart were similarly gorged, the left empty; lungs pale red, not congested nor distended. Brain normal. The differences were in the lungs: in the first series there were many small, irregular, circumscribed, dark-red ec-

chymoses scattered over the general surface; in the second a small number of bright-red ecchymoses somewhat larger than a large pinhead.

The bronchial tubes are usually full of frothy bloody mucus, and the mucous membrane is much congested and shows abundant ecchymoses.

In hanging the condition of the lungs and heart varies according to whether death is due to syncope or to asphyxia. Ogston found in 23 cases that the lungs were expanded in 4 and collapsed in 2. Harvey says the lungs are congested in over seven-eighths of the cases, emphysematous in a few, and subpleural ecchymoses present in a few. Patenko experimented on dogs by hanging them; when the constriction occurred after expiration, the lungs were congested; after inspiration, not congested. In the first case the blood flows from the periphery to the heart and thence to the lungs, but cannot flow from the lungs because of the difficult circulation in the dilated pulmonary vessels and deficiency of intrathoracic pressure. There is in both cases cerebral congestion in the region of the bulb. Tardieu holds that punctiform ecchymoses and apoplexies do not occur in hanging unless suffocation has preceded. Pellier, however, found these ecchymoses 14 times in 23 cases. He says that the lesion is not characteristic of suffocation, and quotes Lacassagne, Grosclaude, Dechoudans, Vicq, Chassaing, and Legroux to the same purpose. Hofmann says that the ecchymoses are relatively rare in adults. Maschka found them 18 times in 153 cases.

In asphyxia the right side of the heart, especially the auricle, is usually full of dark fluid blood due to the mechanical impediment to the passage of blood through the lungs. If the heart continues to beat after respiration has ceased, the right ventricle is commonly well contracted like the left cavities and nearly empty, the lungs being much congested. Sometimes the left cavities of the heart contain blood. This would most likely occur if the heart should stop in diastole. Sometimes clots are found in the right ventricle. Maschka found clots in the heart 25 times in 234 cases of asphyxia. Harvey states that in hanging the presence of serum in the pericardium seems more a matter of time elapsed after death than anything else. But it is found much oftener in strangulation than in hanging. The difference is explained by the comparative slowness of death in strangulation. Harvey finds that in about one-half the cases if the body is fresh the right side of the heart, pulmonary artery, and venæ cavae are full of dark fluid blood, the lungs being also much congested, and the signs of death by asphyxia well marked. When blood is found in both sides of the heart, it is probable that death is due to neuro-paralysis. When decomposition is advanced all the cavities are often empty. Taylor says that if the examination is delayed several days the distention may not be observed.

In asphyxia the external generative organs are sometimes congested; erection of the penis may have taken place and have persisted. The vagina may be moist. Tardieu, Devergie, and Casper deny that these appearances are usual. In about one-fourth of the cases of hanging the genital organs are congested. The penis is large and more or less erect; seminal fluid, generally prostatic and sometimes mixed with blood, is often expelled. The fluid may pass only into the urethra and it may be necessary to press the urethra to secure it. The clitoris may be found erect and there may be a sort of menstrual flow. Orfila showed by experiment that swelling of the sexual organs and emission of semen can be produced after death in those who have been suspended during life. The flow of semen is found in all kinds of death from violence. Roth, in 39 cases of hanging of men, found the penis enlarged 18 times and ejaculation in 19. Hackel found the penis swollen in 43 per cent. of cases of asphyxia. Erection may come on soon or late, even days after death. Involuntary discharges of urine, feces, and seminal fluid may occur in all kinds of violent death. There is nothing characteristic in their appearance. Tardieu found them, however, but twice in 41

cases of hanging. Roth, in 49 cases, found discharges of feces in 17 and of urine in 4; in 15 cases, not noticed.

Harvey mentions a case in which internal piles had burst and there were stains and clots of blood about the perineum and anus. In such cases without careful examination there would naturally be a suspicion of violence.

The abdominal organs are generally darkly congested in asphyxia, although Maschka denies this for the liver and spleen. The congestion of the viscera generally is doubtless due largely to the prior congestion of the lungs and engorgement of the heart. In hanging, the stomach is often much congested, and this fact might sometimes suggest the possibility of poisoning. The liver, spleen, and kidneys are usually much congested; Hofmann says that this occurs in the kidney only when the body has been hung a long time.

Maschka considers the rounded pinhead ecchymoses of the inner surface of the scalp and pericranium valuable evidence of asphyxia. The brain and membranes are sometimes congested, occasionally apoplectic. Maschka found congestion of brain and membrane 48 times, and anemia 30 times in 234 cases. In hanging, the brain is rarely much congested. In 101 cases Remer found hemorrhage but once, and in 106 cases Casper failed to find it. Tardieu says the brain is oftenest anemic. If, however, the body is cut down and placed horizontally, the blood-vessels of the brain may fill up. Evidence may be found in the brain suggesting insanity and therefore an explanation of a probable suicide. Harvey says that hemorrhages in or about the brain are found in a much larger proportion of cases of hanging in India than in Europe. "No common condition likely to cause extravasation is apparent, only one man being noted as plethoric, but in many the rope seemed to have been very tight." Wilkie reports a judicial hanging in which a man, aged about twenty-five, fell about three and one-half feet; a recent clot was found in the brain. The experiments of Brouardel of hanging rabbits showed the brain anemic.

The conjunction of the following appearances would suggest that the hanging has been of some duration: lividity of face, congestion and prominence of eyes, dryness of skin under the ligature, deep furrow, congestion of sexual organs, swelling and lividity of lower limbs, hypostatic congestion of lungs.

Page experimented on a young cat and young dog; both were hung in the same way. Examination of the cat showed the veins generally engorged; sublingual veins much engorged; tongue protruded slightly and much swollen; no frothy mucus in bronchi. In the dog the tongue did not protrude and was not swollen; right cavities of the heart contained blood, left empty; brain and other organs normal. In the cat the lungs were uniformly congested, dark red; no ecchymoses. In the dog the lungs were much distended, posterior borders mottled violet; emphysematous patches on surface; no apoplectic effusions; subpleural ecchymoses bright red, irregular, clearly defined in outer surface, most numerous toward the roots and on the lower lobes.

Pellereau gives an account of hanging as seen by him in warm climates. He had not seen the elongation of the neck described nor the erection of the penis, subconjunctival ecchymoses, fracture of larynx, rupture of walls of carotid artery, subpleural ecchymoses, nor fracture of vertebra. He always found a mark on the neck; the left cavities of the heart always empty, the right always full of black blood. Mackenzie says that in 130 cases of suicidal hanging the protrusion of the tongue between the teeth, the open and protruding eyes, clinched hands, and blue nails were very frequent; the tongue was found bitten many times; there were urethral and rectal discharges and rupture of the carotid artery. The penis was found erect several times. The hyoid bone was fractured 24 times in 93 cases. In no case was the larynx or vertebra fractured. In 73 cases ropes were used; in 30, portions of clothing. The marks of ropes were always well defined, indented, and parchment-like; the marks of soft ligatures faint and reddish. In no case were the muscles of the neck, the larynx, trachea, or large bronchi injured,

and in none was there subcutaneous hemorrhage or blister.

Hofmann says that the rupture of the carotid in hanging is always transverse, may be simple or multiple, and may occur in suicides; more apt to occur when the ligature is thin. Lesser tabulated 50 fatal cases of suicidal hanging; in 29 he was satisfied that the hanging occurred during life; in 3 of these the skin of the neck alone showed any lesion; there was a double mark, the skin being otherwise bloodless; in 5 the deeper soft parts were the only ones affected; in 3 the skin showed lesions, the deeper soft parts none, but either the hyoid bone, larynx, or vertebrae were involved; in 12 the skin showed no mark, but the deeper soft parts and either the larynx or hyoid bone were involved; and in 6 the hyoid bone only or the bone and larynx were injured. In the remainder it was not possible to say that the hanging occurred during life. In two cases there were no marks at all; in 9 there were changes in the skin; in 4, changes in the skin and deeper parts; in 2, changes in the skin, deeper parts, and hyoid bone or larynx; in 3, changes in the skin and hyoid bone, or larynx, or both. In 14 of the 50 cases the hyoid bone was fractured; in 20, the larynx; and in 1, the vertebrae. The common carotid arteries were injured in 6. The number and severity of the lesions bore no constant relation to the thickness of the ligature nor to the force used, but rather to the position of the body.

Daniel S. Lamb.

**STRAWBERRY.** See *Rosaceae*.

**STRONTIA MINERAL SPRING.**—Baltimore County, Maryland.

Post-Office address, 305 and 307 Exchange Place, Baltimore. No hotel near springs.

This spring is located about nine miles from the heart of the city of Baltimore. It is reached by the Green Spring branch of the Northern Central Railroad to Strontia Spring station, thence one-half mile to springs. The elevation of the locality is about six hundred feet above the sea-level, and the average summer temperature is about ten degrees lower than that of Baltimore. An analysis of the spring water made in 1887 by Prof. W. W. Simon, of Baltimore, resulted as follows: One United States gallon contains (solids): Potassium nitrate, gr. 2.71; sodium nitrate, gr. 0.83; sodium chloride, gr. 7.50; magnesium chloride, gr. 3.91; calcium chloride, gr. 20.67; calcium bicarbonate, gr. 3.93; strontium sulphate, gr. 0.13; strontium bicarbonate, gr. 1.08; iron bicarbonate, gr. 0.51; alumina, gr. 1.08; silicic acid, gr. 1.19; and traces of phosphoric acid, iodine, ammonia, and organic matter. Total, 43.54 grains. Gases: Oxygen, cub. in. 0.48; nitrogen, cub. in. 0.71; carbonic acid, cub. in. 2.04.

Since 1876, when the properties of this water were discovered, it has acquired a wide reputation in the treatment of sea-sickness, dyspepsia, gout, rheumatism, and diabetes. It is used commercially and as a table water. It has found its way into many of the leading hotels, clubs, and cafés of New York, Baltimore, and other cities. It is a saline-calcic, and has tonic, diuretic, and alterative properties. It is probable that the considerable quantity of strontium in the water modifies its action to some extent, but in what way cannot be explained in the present state of our knowledge.\*

James K. Crook.

**STRONTIUM.**—*General Medicinal Properties of Compounds of Strontium.*—Salts of strontium resemble those of calcium in being practically non-poisonous to the human system and in tending to improve nutrition. Also they are of low diffusion power, and accordingly are comparatively slow of absorption. Strontium has been proposed in medicine as affording a base for medicinal salts that is non-poisonous and even agreeable to the stomach. Accordingly strontium has been suggested for

\*Some of the strontium salts are now used in the treatment of epilepsy, diabetes, parenchymatous nephritis, muscular and subacute articular rheumatism, and acute gastritis.

the basic carrier of bromine, iodine, and salicylic acid, and the bromide, iodide, and salicylate of the metal are considered preferable to the corresponding potassium and sodium salts, because better borne by the stomach. The United States Pharmacopœia recognizes strontium bromide and iodide (see *Bromides* and *Iodides*), and also the lactate, which latter salt will be considered here, since its effects are not due specifically to its acid radical.

**Strontium Lactate.**—The salt is official in the United States Pharmacopœia under the title *Strontii Lactas*, Strontium Lactate. It occurs as a white, granular powder, permanent in the air. It is odorless, with a bitterish, salty taste. It dissolves in about four parts of cold water, and freely in boiling water and in alcohol. Strontium lactate is a harmless salt, whose use in medicine is because of a reputation, in chronic Bright's disease, for diminishing the albumin in the urine and improving the patient's condition generally. In the form of the disease accompanying rheumatism and gout, it is praised, but it should not be used in conditions of acute inflammation with high fever. In albuminuria from heart disease, also, the medicine is reported to diminish the albumin. The drug may be given in doses of from 1.3 to 2 gm. (gr. xx. to xxx.) or more, two or three times daily.

Edvard Curtis.

**STROPHANTHUS.**—(*Kombe, Arrow Poison, Inée, Onaye*, etc.) The dried ripe seed of *Strophanthus Kombe* Oliver, and perhaps of other species (fam. *Apocynaceae*), deprived of its long awn. The British Pharmacopœia names the plant as above, under the title *Strophanthi Semina*. The German, under the title *Semen Strophanthi*, says "very probably from *Strophanthus Kombe*." The United States Pharmacopœia, because at the time of its revision ten years ago information on this point was very imperfect, specifies the seeds of *S. hispidus* De C., which we now know to be incorrect.

The strophanthus plants are woody climbers of tropical Africa, where an extract of the seeds of several of them is used as an arrow poison and in other ways for poisoning. The seeds occur in lanceolate or lance-ovoid follicles, of which two develop from each flower. These are 15 to 30 cm. (6 to 12 in.) long, and about a sixth or a fifth as thick. They are densely filled with seeds, the bodies of which are embedded among the long, white, plumose awns. The seeds are imported either in the pods or after removal, and in the latter case either with or freed from their awns. They should be imported and reach the consumer in the pods, since this permits the identification of the contents by the testing of one seed from each pod. This is an almost necessary method of examination, since good and poor varieties of seeds so closely resemble one another that an admixture is very difficult to detect in the cleaned seeds. Some varieties are practically inert, while others are extremely powerful, and in different ways, so that the employment of correct methods of identification of the seeds is of vital importance to the patient. Although all parts of the plant are bitter, the seeds alone have been investigated.

**DESCRIPTION.**—Good strophanthus seeds are of a peculiar pale greenish-brown color, and are densely covered with very fine, closely appressed silky hairs. This appearance of the surface constitutes the best guide to selection, outside of chemical examination. Two classes which should be rejected are those of a distinctly brown to dark brown color, and those of a very pale yellowish or yellowish-white, without greenish tinge, and the hairs coarse and more or less roughening the surface by their irregular projection. Strophanthus seeds are about 1.25 cm. or a little more in length, and one-fourth to one-third as thick, lanceolate, obtuse at the base, gradually pointed at the summit; they are somewhat flattened or even a little hollowish on one side, and have a narrow ridge running along the other, and are often warped or even semi-twisted. They are brittle, the fracture whitish and oily, the kernel consisting of rather long cotyledons, enclosed in sparse albumen. They have a slight odor and an extremely bitter taste. On being crushed and tested with

strong sulphuric acid, a green color should quickly develop, due to the reaction of the strophanthin, which is mostly contained in the albumen or endosperm. In this way, the testing of a single seed taken from a pod determines the identity and quality of the entire contents. However, should the test fail, it should be repeated with one or two more seeds from other parts of the pod, as individual seeds sometimes occur which are imperfect.

**CONSTITUENTS.**—With various ordinary constituents of seeds, strophanthus contains two or three bodies of therapeutical interest. The important medicinal constituent is two to three per cent. of strophanthin, considered below. The properties of the twenty-five to thirty per cent. of fixed oil are not known with certainty. We should expect it to be inert, but indications of its irritating and toxic properties are not wanting. On the other hand, these are more likely due to contained substances than to the oil itself. Some species of the seeds contain the very poisonous glucoside *pseudostrophanthin*, and, since the commercial seeds are almost always mixed, it may be the presence of this in the oil which makes the latter poisonous. The poisonous properties referred to are not the same as those of over-doses of strophanthin, since the greater toxicity is not accompanied by a correspondingly greater cardiac tonic effect, but often by a lesser one. *Kombic acid* is present, but its properties have not been investigated, and the name has apparently been applied to more than one substance. Other constituents reported are uncertain, since the specific identity and freedom from admixture of the seeds analyzed has not been determined. *Strophanthin* is a crystalline glucoside, usually appearing amorphous, as a fine white powder, soluble in alcohol and water, especially the latter, insoluble in ether and chloroform. The formula usually given (C<sub>21</sub>H<sub>41</sub>O<sub>12</sub>) cannot be considered as fully established. Upon decomposition, it yields *strophanthinidin*. Commercial strophanthin is very rarely, if ever, pure.

**ACTION AND USES.**—The therapeutical action of strophanthus is that of strophanthin, and is directly and almost wholly referable to the heart. It is commonly stated as being identical with digitalis, but the statement is very misleading, unless certain differences in other directions are carefully considered. Although its direct action is almost identical with that of digitalis, the resultant effect is quite different, owing to the absence of those complications from arterial effects which result from the use of digitalis. Strophanthus does not contract the arteries, hence none of the gain from cardiac stimulus is counteracted, and there is none of that danger of damming back the blood upon an incompetent heart, which sometimes exists when digitalis is used. Another very important difference between the two is the great promptness with which strophanthus gets to work, its effects being observed in from a third to a half of the time required for digitalis. This is partly due to its purely cardiac action, partly to the fact that the absorption of strophanthin is very rapid. Strophanthus strengthens and slows the heart beat, prolonging the diastolic period, and it is especially valued for its power of restoring rhythm to an irregular beat. It is thus especially useful when a very prompt action is desired, and also where cardiac action is weak relatively to arterial. Even in those cases in which digitalis is properly called for, a great gain may be secured by giving an initial dose of strophanthus, following it with the digitalis.

On the other hand, the effect of strophanthus is far less prolonged than that of digitalis, and is not cumulative like the latter. Hence, small doses, repeated at frequent intervals, is the rule for the administration of strophanthus. Even in this way its effects cannot be prolonged like those of digitalis, for the beneficial effects first seen soon decrease. It cannot therefore be regarded, like digitalis, as a mainstay, but rather as an emergency remedy. The effect upon the stomach is far less irritating than that of digitalis, hence there is not the same tendency to emesis. The same principle applies to the kidneys, the local effect upon the latter being very