

so near the ground. They have no opportunity in their downfall for further development.

The origin of snow crystals is, without doubt, similar to the separation of crystals in a warmed salt solution. At first small crystals form upon the surface, which as specifically heavy bodies fall slowly to the bottom, and during their fall visibly increase, until they lie upon the bottom of the vessel in large flakes.

In the year 1790, Monge compared snow flakes to flakes of sal ammoniac, originating in this manner. The capillary hollow spaces, or air blisters, which appear in all snow crystals, originate with them, and may be explained in the same way as the air bubbles which are found frequently in ice and hail stones.

The most difficult question of all remains, the cause of the various forms of hexagonal crystals, which frequently change in the same snowfall. Instead of advancing a new hypothesis, it is better to acknowledge that we know nothing positively in regard to this. In our knowledge of the form and structure of the snow we have made great advance since the time of Kepler, but, after nearly four hundred years, we cannot give a satisfactory answer to his question "Cur autem sexangula?"

We do not know the special conditions which determine the formation of one or the other form of snow crystals. We have seen that a low temperature favors the formation of tabular crystals, a higher temperature the star-shaped crystals; these groups show such multifarious forms that it is necessary to seek for other causes which influence the formation of snow figures. There is offered here a broad field for new investigation and study.

THE WILD CLEMATISES.

By S. MOTTET.

AMONG clematises, one of the finest races of our hardy climbing plants, two classes may be made for garden purposes: one, including the large-flowering garden varieties, such as those that have been raised from crosses or selections of *C. patens* (De C.), *C. lanuginosa* (Lindl.), and *C. hakonensis* (Franch. et Savat); the other including all the introduced species which have kept their characters under cultivation or have given rise to but a few varieties. In the eyes of florists, the former are by far the better and much more esteemed.



CLEMATIS CIRRHOSA.

Hundreds of varieties are now grown, but they are rather delicate.

Those of the second class, although having smaller flowers, have a charm of their own, which they owe to their hardy, vigorous, and free-flowering character. These in the eyes of the true lover of plants are the finer, because they have kept their own natural grace.

The hardy-climbing clematises have many uses in gardens, such as covering arbors, trellises, walls, etc., but they look perhaps best when climbing upon old trees or hanging in elegant festoons from the tops of ruins; they may also be planted along walks, where



CLEMATIS VIORNA.

three poles tied together at the top provide a convenient support for them; in rockeries and the wild garden they may be let to ramble at will over the stones or on the soil, and for garnishing the front of buildings, balconies, etc., they are almost unrivaled. The wild clematises only will be dealt with in this paper.

Clematis orientalis (Linn.),* sometimes known in gardens under the name of *C. graveolens*, is perhaps the best of the half-dozen yellow species introduced. It is quite hardy, and flowers most profusely from August to October. It was introduced as long ago as 1771, from the Himalayan regions. The flowers, from 1½ inches to 2 inches across, are bright yellow, hardly scented, borne singly on peduncles from 3 inches to 4 inches long, and forming by their union clusters in the axils, or rarely on the top of the shoots. The sepals are four in number, or very rarely five or six, oval

lanceolate, mucronate, spreading, almost flat, downy, and recurved on their edges.

The fruits or carpels are olive green, with some scattered silky hairs, and their styles are long, feathered, dirty white, and quite reflexed; they form conspicuous and numerous downy heads, looking much like those of our Virgin's Bower or Traveler's Joy. The leaves are opposite, long-stalked, bearing three to seven leaflets, green on both sides, quite glabrous, and with their edges more or less frequently and deeply cut; the secondary stalks often twist themselves against



CLEMATIS GRAVEOLENS.

neighboring objects, acting the part of tendrils to assist the plant in its way up the trees.

C. montana (Buchan)* comes next in merit to the above; its flowers are pure white, 1½ inches to 2 inches or even 3 inches in the variety *grandiflora*, and look much like those of *Anemone sylvestris*; their stalks, 6 inches long, without bracts and one-flowered, make sessile clusters in the axils. The leaves, with rather long stalks, bear, as a rule, but three closely-set and shortly petiolate leaflets, which are toothed at the base and quite glabrous. This blooms in spring and beginning of summer, and is quite as vigorous and hardy as the former. It was introduced about 1831, from temperate Himalaya, Sikkim, etc., where it grows at 6000 feet to 10,000 feet.

C. viticella (Linn.)† is another important species of very variable character, and differs entirely from the former. The flowers are blue, violet, purple, pink, or sometimes pale white, from 1 inch to 2 inches broad, borne singly in the axils, or sometimes three to seven together on the top of the shoots, with very long slender stalks. The stems, which are at first slender and four-angled, never become large. This is one of the oldest inhabitants of our gardens, growing wild in the Mediterranean region, from Italy to Central Asia; hardy, but liable to be cut down by severe frost. There are a few varieties, notably a double one, which is



CLEMATIS DAVIDIANA.

purplish violet colored, hardier and taller climbing than the type.

C. flammula (Linn.) is a near ally of our wild indigenous species Old Man's Beard (*C. vitalba*), but with larger flowers, of a creamy white shade, very sweetly scented, not woolly outside, save on the edge. The leaves are also quite different, being bipinnate, with small, thickish, entire leaflets and much twisted stalks, while the leaves of *C. vitalba* are simply pinnate, with five large, thin, and coarsely-toothed leaflets. Both plants have small, but innumerable flowers, which expand from July to September, and a woody stem. *C. flammula* grows wild in the Mediterranean region up to the center of Europe, while *C. vitalba* extends to the north.

* *Clematis montana* (Buchan).—*Bot. Reg.* 1840, t. 58; Sweet's *Brit. Fl. Gard.*, ii., t. 253; *Rev. Hort.*, 1856, t. 43; var. *grandiflora*, *Hort.*; *Bot. Mag.*, 4,061; *C. anemoniflora*, D. Don.; *C. napalensis*, De C.

† *Clematis viticella* (Linn.). *Bot. Mag.*, t. 565; Reich. *Fl. Germ.*, iv., t. 65; Sibth. *Fl. Græca*, t. 516; Lavalley, *Clematites*, t. 7; *Viticella deltoidea*, Mœnch.

Among other wild climbing and hardy species introduced into gardens, but not so generally grown as the above, we may mention:

C. aromatica (Lenne and C. Koch), with deep, blue-violet flowers, smelling like heliotrope, and whose stems attain about 6 feet. Its native country is unknown.

C. campaniflora (Brot.), from Portugal, with purplish white half-opened flowers, and leaves bearing about twenty-four leaflets.

C. cirrhosa (Linn.), from South Europe, with creamy



CLEMATIS ÆTHUSIFOLIA.

white, involucreted flowers and persistent leaves. *C. balearica* (Rich.) is now referred to this species.

C. crispa (Linn.), with pale lilac or purple bell-shaped and nodding flowers.

C. eriostemon (De C.) (*C. Hendersoni*, Hort.), with blue-violet, widely-opened and solitary flowers. It is supposed to be of North American origin.

C. indivisa (Willd.), from New Zealand, with creamy-white paniculated flowers.

C. paniculata (Thunb.), from Japan, a small flammula-like flowered species.

C. Pitcheri (Torr. and Gray), from North America, with dull purple tubular, strangled, solitary, and nodding flowers.

C. reticulata (Walt.) rather newly introduced from the United States, with campanulate flowers, pale yellow inside and reddish outside.

C. texensis (Buckl.) (*C. coccinea*, Engelm.), with small, very thick, long-stalked, and almost top-shaped flowers, bright crimson outside and yellow inside. It requires some protection in winter.

C. Viorna (Linn.), the leather flower from North America, is closely related to the preceding, from which it differs chiefly by its flowers not being conical and reflexed at the summit of the segments. It is also hardier, and has been introduced since 1730.

C. virginiana (Linn.), from the same country, has small, white, dioecious panicle flowers, and its shoots will climb up to 16 feet or 18 feet.

The non-climbing bushy clematises have also their value in gardens to decorate the herbaceous border, the rock garden or to form isolated clumps on the lawn. The best are:

C. æthusifolia (Turcz.), from Mongolia, with long, tubular, hanging, white flowers. It grows from 4 feet to 6 feet high.

C. Davidiana (De C.), (*C. mongolica*, Hort.), from China, produces axillary and thick clusters of porcelain-blue flowers of cylindrical shape, expanding as late as September. Its leaves are trifoliate and of a grayish tint.

C. integrifolia (Linn.), from Southern Europe, is distinguished by its entire, large, sessile and opposite leaves. It produces fine nodding flowers, deep blue inside and velvety grayish outside, on solitary and axillary peduncles, 6 inches to 8 inches long. It blooms in August.

C. ochroleuca (Ait.), from the United States, is similar in habit and shape of leaves, but its flowers are creamy white inside and yellow outside.

C. recta (Linn.), from South Europe, has very numerous small, white, and scented flowers, looking like those of *C. flammula*. The stems are herbaceous, more or less erect and do not exceed 3 feet.

C. stans (Sieb. and Zucc.), introduced in 1880 from Japan, has pale blue flowers, hanging, subverticillate and forming terminal panicles.

C. tubulosa (Turcz.), from China, has long, cylindrical light blue flowers, set in whorls on long, upright spikes. The leaves are opposite, long-stalked and bear three large oval leaflets. The stems grow upright to about a height of 2 feet. The *C. Hookeri* (De C.), referred by some authors to this species, differs chiefly by its lilac flowers.

This species, as well as *C. Davidiana* and a few others, have a quite special aspect, entirely different from the host of clematises, and which they owe to their narrow tubular flowers, looking like florets of hyacinth, besides their herbaceous and bushy habit.

All these non-climbing clematises do not become

* *Clematis orientalis* (Linn.).—Lavalley, *Aboret. Segrez.*, t. 29; *Olemares*, t. 21; *C. graveolens* (Lindl.), *Journ. of Hort. Soc.*, i., 307, cum ic.; *Bot. Mag.*, 4,495; *Fl. des Serres*, vi., t. 518; *Jard. Fleur.*, t. 128. *C. flava*, De C.

woody at the base and die, or are cut down to the soil by the frost. They may be treated just like herbaceous perennials, which they are in fact, and are easily propagated, when seeds fail, by dividing the roots in spring.

The species described above, and more especially the first-named, are hardy and need but little or no care when once established. Pruning is not necessary beyond the cutting in to due limits or taking away the dead parts. Most of those here noticed bloom on the young wood and may be shortened at will; but *C. montana* blooms on the wood of the preceding year, and this must of course be preserved for the sake of the flowers.

As a rule, clematises like a deep, sandy loam, rich and well drained; some refuse to grow where there is chalk, others do not mind it. Watering in dry weather, and especially during the season of growth, materially assists them, and some liquid manure may be given with benefit. When seeds are produced this is the easiest mode of propagation, but as they do not retain their germinating power for a long time, they are best sown when ripe, outside or under a cold frame. They may also be mixed with fresh sand in a pot or box and sown the following spring.

Layering is also an easy and sure process, useful for amateurs, as the layers root generally the first year. Young cuttings of most varieties may be struck in heat, and grafting in heat, under bell glasses, on roots of *C.*

used as a hay chute, to convey the hay from the loft to the main and basement floors.

The ventilation for the main floor is operated by opening the lantern sash, which has 78 in number, and are attached to a shaft that runs the whole length of the lantern, and a perpendicular shaft running down to the main floor operates six sashes at once.

On the main floor the windows are fitted up with blinds and hung with Worth's patent awning blind hinges, and they can be used as a common blind, and also be adjusted so as to form an awning. The gutter on the outside of the building is of galvanized iron, and patented by Mr. Dudley Newton, of Newport, and was only used by privilege on this barn, as Mr. Newton, the architect, last year used it, it being his own, and the builders this year were granted the privilege of using the same style of gutter. There are 15 conductors, 8 of which lead the water to the bottom of the area on the east side of the barn, the bottom of the area forming a gutter to carry the same around the south end of barn into a drain. In this way the water is carried away from the barn. On the west side the conductors connect in a system of tile drain which carries the water to a main drain.

It required 250,000 ft. of yellow pine timber and 250,000 ft. of spruce to construct the building. It also required 310,000 shingles to cover the roof and sides from the brick wall. These shingles are cedar. After using all the brick that were good that passed through the

gratings passed through the fire and were taken apart and straightened, speaking well for the material of which they were made; this being the only iron which passed through the fire and was used again in the barn. The box stalls have T gutters leading to the main gutters in the barn. The overhead trolley track has four lines on each floor. Carriers are provided to carry cars with feed to the cattle and also to carry manure to manure shed, where it is dumped in wagons and then carried out and spread upon the land. The track and carrier are so arranged that each carrier can be run upon every track by the use of turntables and switches; track guaranteed to carry 5,000 lb., and to be easily moved by one man. In the ell part there is a hay carrier to unload hay or grain, with the use of sling, and deposited at any spot in the mow. It is calculated for three slings to the load, a great improvement on the patent hay fork. The system of drainage is the best that can be used, especially for cleanliness. There is one main drain in the east side of the barn, in the basement, running the whole length of the barn, consisting of an 8 in. steel pipe, put together in sections, and 4 cross drain pipes from the gutters above, carrying everything from the gutter to cross gutter at the north end of stable which leads to cesspool. The main gutter in basement is made of concrete, the bottom of which slopes to the main cross gutter which empties into the cesspool. The basement bottom is made of concrete 6 in. thick, with brick piers to accommodate chestnut sleepers, which carries a 2 in. floor of spruce, where stalls are put in and fitted up same as on the main floor.

The water pipes in the basement are all covered, to prevent freezing. In the L part of basement there is a root cellar, which can be filled from the main floor through a trap door. Three compartments in this cellar, with a shelf partition in each, made of slats 1 in. apart, 1½ by 5 in. spruce. The barn is fitted up and completely lighted with electric light, put in by Mr. B. W. Philbrick, electrician and engineer, who is constantly employed on the place doing all plumbing, gas and steam fitting. There are 30 lights in the barn run from storage batteries. The electric heat alarm system is extended throughout the barn. A thermostat being placed 15 ft. apart on every floor, on the roof and in each ventilator, closet and room. At no point can heat rise above 140° without the alarm being given in the farm house by the ringing of a large gong over the main south door of the barn, on the outside, and so long as the heat continues the bells will ring and continue the alarm. There is over the main door to the superintendent's office, outside, an indicator that records the place where the heat or fire is. There are in the barn 300 thermostats and 6 miles of wire, it being the largest stock barn ever fitted up with the heat alarm system. Connected with this alarm in the superintendent's office is an ingenious clock, by which the superintendent can test daily and see that the whole system is in perfect order, testing every thermostat and every inch of wire in the whole system. An engine, 25 horse power, is used to run the ensilage cutter, feed mill, elevator, and saw. A line of shafting runs through the ell part of the barn, with sufficient number of belt pulleys on to run each piece of machinery. All journal bearings are protected by a thermostat, and should heat rise to 140°, alarm will sound by the ringing of a bell over the door to the engine room, where there is an indicator showing upon which shaft the journal is hot.

The steam from the engine is conducted to it under the ground from the power house, which is situated about 300 ft. away. There is a bone mill, so that they can grind meat and bone for their chickens. The elevator for elevating grain into the bins is of the Jeffers patent, and has a capacity of 300 bushels an hour. The feed mill is so arranged that the grain can be let in the hopper in just the proportion they wish to grind, when the elevator carries it back to the bins, ground, when, with chutes, it is loaded in cars and conveyed to the cattle in their stalls and fed to them as desired.

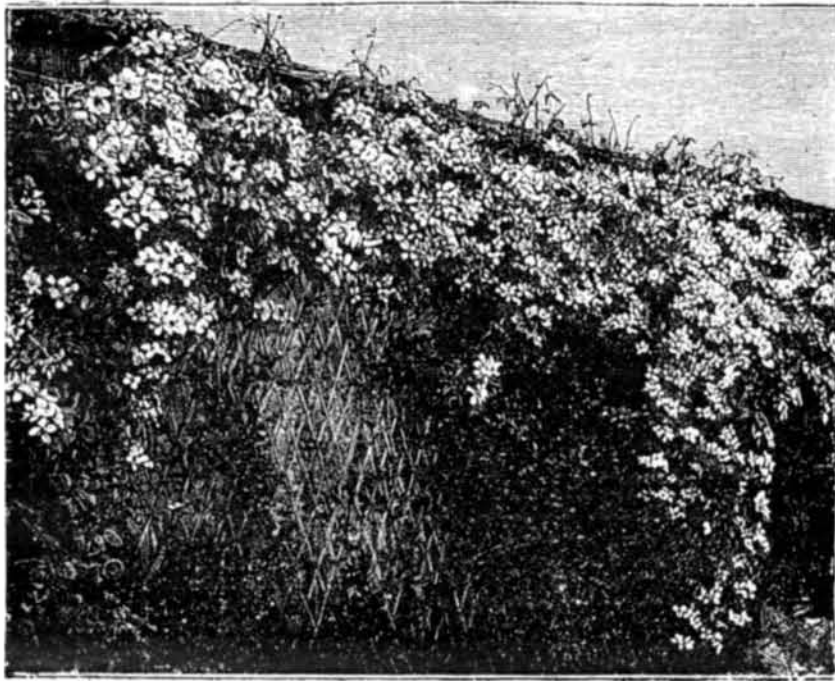
All the work of rebuilding has been under the superintendence of Mr. H. M. Cottrell, superintendent of Ellerslie, who has given his immediate attention to all the work in detail, and the success of the building and rapidity with which it was constructed was all due to him, and it will pay any person who wants to spend a short time pleasantly to visit the barn and see the many improvements developed in its building.

THE BROODER HOUSE AT ELLERSLIE.

At the time Ackert & Brown were building the barn they had a gang of men building an incubator and brooder house, one of the largest and best in the United States. This department is under the immediate supervision of Mr. James H. Seeley, who has had Mr. Morton's chickens in charge for nearly two years. When the fire came which destroyed the barn last year, it also destroyed the incubator and brooder houses with all the stock of chickens. When they got ready to rebuild, they located the buildings farther away from the barn. They began the first plant in August last, by building 6 hen houses, to accommodate 600 laying hens. Sufficient number of hens were bought to start with, and then came the erection of brooder houses to raise and care for the small chickens, which are to be hatched with incubators and raised for fancy market broilers and larger ones for roasting.

The hen houses are fitted up with electric wire, and no person is allowed or can cross the threshold of the door or open the windows without ringing a bell in the house; also it will ring a bell in the room in the incubator house, where the man sleeps. Chicken thieves stand a poor show to get a living around these houses. They are built for winter laying hens. The size of the hen houses are 16 by 54, made in three sections, two rooms in each section, one room for laying and roosting, the other one is for exercise on bad, snowy, or stormy weather, there being no floor but the ground. Down under the top of the ground is placed wire netting to prevent rats from getting in or making a home in the building. The room for laying is fitted up with movable nests, 12 in number; in each cabinet and in each room are crates to confine hens that want to set, as they have no use for setting hens; the incubators do all their work.

All hens purchased are white Monarchs, white Plymouth Rocks, white Wyandotts, sprinkled with a few light Brahmas. It is wanted to have hens enough to



CLEMATIS MONTANA.

Vitalba, *C. viticella* and others, is the way by which nurserymen propagate garden varieties or any delicate or scarce species.

A GREAT BARN.

FOR six months there have been actively engaged at Ellerslie, near Rhinebeck, Dutchess County, N. Y., Mr. L. P. Morton's stock farm, all kinds of workmen employed, rebuilding the barn destroyed by fire on August 2, 1893, and it may be said it is the only work that has been going on in the town for the past six months, and the benefit derived has been great to this community. While Mr. Morton has been in Europe he has been helping his fellow townsmen very much, contributing to their support by giving them work. The general plan from which the barn was rebuilt this year is the same as drawn by Mr. Dudley Newton, architect, of Newport, under whose supervision the builders, Ackert & Brown, worked last year. There have been some very decided improvements carried out this year that were not in the barn last year, and, upon the whole, the structure is a much better one.

It was rebuilt by Ackert & Brown, of our town. Mr. Morton has added to the barn some extras which were not considered in last year, and greatly added to its cost, and upon the whole they have been worth the time and expense. To appreciate the amount of labor and material in the barn, it needs to be seen, and then it begins to dawn upon the mind of the beholder what it is to build a barn and have all first-class appointments.

The barn is 297 ft. long, 65 ft. wide and 50 ft. in height, with an L 89 ft. by 52 ft. The barn includes, besides, three 500 ton silos, each 47 ft. deep, a tool and engine room, lavatory and bath room, grain bins, and ample hallways, no less than 120 common stalls, and 46 box stalls on the main floor, and an equal number are placed in the basement, which is light and airy, its floor bottom being level on one side with the ground, while on the other side its windows are protected by an area wall, having a heavy coping on top guarded by an iron pipe fence 4 ft. 6 in. high.

The bays above the stalls accommodate 400 tons of hay, without covering over the corridor, and the grain bins will hold 20 car loads of grain. The main door on the south, looking up through the center of the building, is large enough to admit an engine and train of cars, and it would have more than ample room inside, the passage being 16 ft. wide and 39 ft. high in the clear. The cows stand in two long rows in the basement; on the main floor they are placed head to head, with a wide feeding alley between them, and back of them are the rows of large, roomy box stalls for calves, bulls, and lying-in cows. In laying out the plans, no point of hygiene, comfort or convenience seems to have been overlooked; the basement is made light and airy, windows run to the bottom and give an abundance of light; the air is kept pure by means of box ventilators running from the basement and out of the roof of the lantern. These ventilators are also

fire, there were purchased 330,000 brick. Carpenter work was begun August 10, and the frame was framed by the system of box framing, not usually done in a barn; the timber was all planed yellow pine; all work was done in the most workmanlike manner, and must cast favorable reflection upon the builders. There have been actively engaged in the rebuilding of the barn about 100 men steadily employed, divided up into about 70 carpenters, 10 masons, and 20 laborers. These men have been under the immediate supervision of Ackert & Brown, the builders, and we should judge it must speak well for the firm to have built the barn and then have established themselves so well in Mr. Morton's confidence that he could go to Europe and leave the barn in their hands to rebuild, so complete in every detail, with all the labor employed; there has been given by the builders work to men who have applied, living in this community, and it has been a great help, not only to the builders, but to the men in their employ, who appreciate their efforts and Mr. Morton's generosity. There was paid to workmen about \$20,000, and, in these times, when men are curtailing their expenses, this money has done a great amount of good.

The main floor of the barn is made of 2 by 9 spruce tongued and grooved, plain side laid down, and then there was applied a coat of tar, then 3-ply tarred paper was laid on it which was covered with tar, on this for a finish floor 1½ by 5 in. tongued and grooved spruce was laid, making a floor ¾ in. thick and perfectly water tight. In the rear of the common stalls on the main floor is a gutter, 19 in. wide and 8 in. deep at the deepest part, the bottom slanting to 4 different traps in it to carry to the main drain which conveys everything to the cesspool, when it will be pumped in a sprinkler and drawn out and sprinkled on the land.

The cows in the common stalls are secured by the Watters patent fire escape and labor saving fasteners by which animals, whether two or fifty, occupying stalls in a row, can be set loose instantaneously by pulling a lever attached at the end of each row 1½ in. A child can do it; the chain drops to the floor and releases the cow; a single animal can be released with greater ease than when fastened in the usual way. The cows have constantly before them fresh water in iron buckets, supplied with the Buckley device, which has been provided with wooden covers, to prevent hay and feed from getting in. The furniture and iron work in the barn is perhaps the best that could be had for its several uses. The barn door hangers are the Coburn patent rollers, and it has been decided that they are the best roller in the market. The fastenings for doors are mostly of the Worthip box stall door latch, with brass cup handles inside and out. The fastenings for stall doors are Conray's extra heavy refrigerator door fasteners, which are used on the doors of the ventilator chutes. All fastenings and hinges are galvanized, to prevent rusting. Behind the common stalls is Stewart Bros. self-cleaning stable grating, which covers over the gutter and makes the cows stand on a level. These