

turn over and weave a slight tissue of silk around themselves and the cell, then, resuming their old position, they close the opening of the cell with a thicker silk, and remain quiet for several days. At the end of that time the larvæ have become nymphæ, which are the complete wasp, covered with a thin skin, through which can be seen the three divisions of the body, with their developed organs folded under the abdomen. These nymphæ are at first white, and then gradually become colored, commencing always with their black eyes; and for several days after they have broken their coverings the wasps are less yellow than they become afterwards. When fully grown the wasp tears the silk tissue and breaks open its cell with its mandibles and flies out of the nest.

A third species, less known, is the red wasp, which frequents only the woods and builds its nest underground. The nests are small and not populous. These underground nest-builders may be distinguished from the common wasp by their abdomens, which are not all yellow and black, but are either red or striped with red. These wasps have numerous enemies, among whom the volucellis are the most formidable, as they are colored somewhat like the wasp, and consequently can easily penetrate into the nests and eat the larvæ, thus rendering us a great service in those warm dry seasons when the wasps' nests are overflowing with their intolerable breed.

The hornets' nest is much larger than all other varieties, and is usually built in hollow trees or under large roots on the ground, or in old walls, chimneys, etc. These nests, which are composed of a sort of pulp of decomposed wood, are very friable. They have a single envelope, and are always placed in some hole for an additional covering and protection. Hornets are very irritable and will attack in crowds any one who they think will hurt their nest. They seek to attack the places where the body is unprotected by clothes, and as their repeated stings are very dangerous, it is best always to rush to the nearest water and completely submerge one's self.

Strange to say in spite of the hornet's peculiarities and carnivorous instincts, it has one friend in the insect world. It is a large black coleoptera, the *Velleius dilatatus*, distinguished by the peculiarity that, when disturbed, it drops its body and trains it on the ground like a little lizard. This insect follows the wasp in the evening into the nest, of which it makes itself the protector. It furiously attacks all insects that are hurtful to the young wasps, especially the centipedes, which they continue to shake long after the insect has been torn to death by their powerful mandibles. It is also possible that the strong odor of muck about the *Velleius* may be pleasant to the hornets and agreeably perfumes their nests. In return, the hornets permit it to eat some of the honey, of which it is very fond.

Though this insect is very timid at first, it soon becomes accustomed to any one who will properly nourish it, and can be easily domesticated in order to observe its habits. It can be taught to take honey from the end of a fine brush, and it will cling so tightly to its food that it is difficult to make it let go.

There are a few wasps that build their nests entirely uncovered, simply attached to the branch of a tree. These nests are made of woody fibers, torn from decayed wood or plants, and are very flexible and elastic.

The concentric envelopes on the outside of the nest have such a great resemblance to gray filtering paper, that it would seem as if the wasps had preceded man in the invention of paper. This species is the wood wasp, Fig. 3. It is a little smaller than the common wasp; the female has a more velvety body, and the nenter is quite smooth. This species is spread all over Europe, except perhaps in Lapland.

There is another group of wasps that are distinguished by the inferiority of their nests, which are never provided with an envelope to protect them from the weather. These nests are simply a comb supported on a strong stand; the cells are oblique or recessed, and more or less numerous according to the size of the brood.

These wasps are more slender than the ordinary wasp, fewer in number, less irritable, and much less destructive to fruits and plants. In the month of April this wasp (Fig. 2) can be seen commencing his little nest in some warm spot exposed to the sun but well sheltered from the rain. These wasps are so gentle that even if the nest is carried away the mother wasp will not offer to sting, but clings to the nest or flies close to it. If the branch with the nest on it is carried into a house she will still follow and continue to feed her eggs. When these are hatched they readily become accustomed to the presence of man, and it is possible to observe, at home, the habits and development of these curious insects.

PROBABLE CAUSE OF THE LONGEVITY OF TURTLES.—So far as we are aware, no attempt has been made to explain the unusual longevity of turtles, whose lives, as is well-known span over a century. There appears to be no longer-lived animals than these beings of slow gait and slow manner of life. The following facts may throw light on the cause of their great age. In the first place they are protected by their solid shell from the attacks of snakes, fishes and birds; young turtles, we are informed by Prof. J. W. P. Jenks, are sometimes carried off by herons, but in adult life they are probably rarely eaten by other animals. Has any one ever found any empty turtle shells? As some turtles lay but two or three eggs a year, nature seems to have counted upon an immunity from the ordinary evils of childhood in these animals. It is probable that the larger proportion of, indeed most, young turtles when hatched survive, and when two or three years old, are fitted to resist successfully ordinary fish and avian enemies. They are not exposed to vicissitudes of weather; the fact that the period of egg laying (in New England from June 10-20) is so constant, and varies so little at different seasons, shows that they are hardy and tough. Finally, the persistence of the type of gigantic tortoises on the Galapagos islands, indicate the wonderful vitality of this type of life in resisting prolonged climatic and geological changes.—A. S. Packard, Jr.

TOOL DRESSING.

There are few jobs in the machine shop that make so much general annoyance as that of tool dressing. The machinist has his own personal notion of the style and shape, the hardening and temper of the tool he uses, and the tool dresser in the smithy must ignore all his experience and observation, for the time being, to cater to the machinist's whim. In short, the forger becomes only a helper to the fancy of the machinist. On the other hand, the machinist has frequently to encounter the obstinate peculiarities of the forger, who insists on teaching the machinist about work he alone understands. Good forgers dislike the job of tool dressing because of its annoyance, and so it frequently happens that this work is bandied about in the smith shop until it rests at last with the least careful man. Some machinists also insist in dabbling at the forge and greatly annoy the smith by their meddling. Indeed, this interference is carried much too far for the benefit of good order, proper work and reasonable profit. It is too much the custom to consider the tool dresser as a man at call for the machinist, and where every lathe and planer hand has his own whims they make it somewhat lively for the smith.

To such an extent is this personal whim carried that there are few machine shops where there is a uniformity in shape of alterable tools; at every lathe and planer the tools differ in form or vary in temper—the workman is known by this peculiarity as much as by his personal name. There is no proper reason why this should be, any more than that each workman should alter the size and change the shape of rule or gauge. There are determinate and exact forms for turning and planing tools adapted to cast iron, wrought iron, steel and brass, and these forms, once ascertained, should be kept and used as standards for the shop. Models of tools should be kept for exemplars and no departure from these should be allowed except for special cause and for particular work.

One of the most common faults with the ordinary turning and planing tools in use in our machine shops is the excessive clearance—they are not made and ground to the right angle to keep down to the work, but are so constructed that the point and cutting edge alone offer resistance, as well as alone do the cutting. There is no sense in this except that with a tool so constructed the workman can plow, and gouge, and dig, and make great pretense of work, and then blame the iron in the casting and the iron in the shaft for the irregularities of surface when it comes from planer or lathe. The cutting portion—point or edge—of a tool for such rigid material as iron or steel, should be as nearly on the moving plane of the work as possible, and the heel of the planer tool should be raised as slightly as possible above the level of the cutting point. To be sure, such a construction necessitates more frequent grinding, perhaps, when the work is rough and demanding; but it gives better results, and when there is after-finishing to be done it will pay the proprietor, if it does not please the piece operator.—Ex.

M. Bigourdan has made a series of observations of Eucke's comet. The comet will be in perihelion on the 15th of November.