part of the investigators. First, MM. Evrard and Beaumetz tell us that the head was placed on a table covered with compresses, so as to show the amount of blood which would be obtained. The face was then bloodless, of a pale and uniform hue; the lower jaw had fallen and the mouth was gaping. The features which were immovable, bore an expression of stupor, but not of pain. The eyes were open, fixed, looking straight before them; the pupils were dilated; the cornea had already commenced to lose its luster and transparency. Some sawdust still stuck here and there to the face, but there was no vestige of any either on the inner surface of the lips or on the tongue. This is an important fact.

The opening of the ear was then carefully cleansed, and the experimenters applying their lips as closely as possible to the orifice, called out three times in a loud voice the name of the criminal. Not a feature moved; there was no muscular movement, either of the eyes or on the face. A piece of charpie, saturated with ammonia, was next placed under the nostrils; there was no contraction of the alæ nor of the face. The conjunctiva of each eye was deeply and several times successively cauterized with nitrate of silver; the light of a candle was brought within two centimeters distance of the cornea, and yet no contraction was observed either in the eyelids, eyeball, or the pupils.

Electricity was then resorted to as a more powerful means of excitement of the nervous system. One of Legendre's electric piles, with a current of moderate intensity, determined vivid contractions in such of the muscles of the face as were directly subjected to its influence. But was this evidence, say the investigators, of a feeling of pain expressed by the physiognomy? Certainly not: and this for two reasons; first, because, whilst the experiment affected the left side of the face, the muscles of the right side retained their expression of stupor, even when the opposite side was the most convulsed; next, because the electrized parts themselves resumed their cadaveric impassibility as soon as the electric current ceased to animate them.

The integuments of the cranium were then incised from the nape of the neck to the root of the nose; the bones of the skull were uncovered down to the zygomatic arches. In performing these incisions, say the investigators, many nerves were cut, of which the section would have been most painful; the muscles of the neck and temple were still alive, since they retracted energetically under the knife; notwithstanding, no contraction of the face, no reflex action was observed. At that time three-quarters of an hour had not yet elapsed since the execution. The skull was then sawn through, and the brain removed; the muscles of the face and those of the jaws continued to obey the electric current, as when the brain was unimpared. The integuments had then begun to get cold, and yet, with an intense electric current, the same muscular contractions were obtained half an hour after the extraction of the brain. Nobody will say that the brain still continued to act and think, though the muscles still responded to electric excitation. Beyond doubt the brain was as lifeless during the first part of the experiment as during the second. Indeed, at the very moment of the execution, through the sudden interruption of circulation, and consequent syncope, the brain was quite as unable to feel as to express its sensations.

This view MM. Evrard and Beaumetz base on the condition of the brain and its envelopes when examined. There was no fluid in the large arachnoid cavity; the vessels of the pia mater were almost bloodless, and filled with aëriform fluid; the lateral cavernous sinuses were absolutely bloodless. The ventricles contained scarcely a teaspoonful of fluid, and in no situation was the brain injected. These facts entirely overthrow what has been advocated by some with regard to the persistence of the cephalo-spinal liquid, and of cerebral nutrition.

The thoracic viscera were also examined. The heart was found to be enormous, and was seen to beat under the pericardium; the lungs shrunken, and of a blackish hue. There was an enormous dilatation of the right auricle, and the ventricle of the same side was also dilated and tense. The left auricle was remarkably small, hard, and retracted. The right auricle and ventricle were filled, not with blood, but with an airy fluid. Pressure reduced their volume to three-fourths of their apparent size. Whilst the contraction of the auricles persisted, those of the ventricles became less frequent. A quarter of an hour after, the auricle and ventricle were once more swollen and distended, and it seemed that air, solicited by the contraction of the auricle, came from the vena cava (which was bloodless and dilated), as well as from the brachio-cephalic venous trunks. An hour and a half after the execution, the contractions of the right auricle were still perceptible, though rare and weak; the right ventricle was then wrinkled, shrunken, and could not contract in the least.

The results of these experiments are in entire accordance with those which had already been obtained in 1803 by the Medical Association of Mayence, which had been led to investigate the subject by the same motives as had actuated MM. Evrard and Beaumetz. The experiments then made, such as calling out the names of the criminals in the respective heads, were much the same as those which I have just related.

The falling of the lower jaw, which takes place instantaneously, serves to explain (to a certain extent), according to MM. Evrard and Beaumetz, all the extraordinary stories of the heads biting each other which have recently been propagated as coming from Sanson and other executioners. The fact would be a mere coincidence, due to the position of the various heads in the basket. Besides, the experimenters assert that Heindrich, the present executioner, has positively assured them that he has never noticed this fact, nor indeed, any sign whatever of persistent life in the heads of *guillotinés*.—*Lancet.*

## A TRIP OVER THE CENTRAL PACIFIC RAILROAD.

A contributor to the *American Churchman* thus graphically describes a trip over the Central Pacific Railroad:

The real difficulty in the way of engineering, in connecting the two oceans, occurs on the western side. It is all plain sailing on the eastern, till the road descends by a steep grade and through a pair of long tunnels into the Salt Lake Basin by Weber and Echo Cañons. The level plains of Nebraska, and the high table land of the Laramie Plains, by which the road ascends and crosses the Rocky Mountains, at an altitude of 8,000 feet, offered no difficulty to the engineer. The trouble on the Union Pacific was from the Indians—the warlike Sioux and Cheyennes—and from the fact of the great distance from supplies and material. But on the western side, the engineering problem was the great one from the start.

Immediately after leaving Sacramento the ascent begins, and the problem was to ascend the Sierra Nevada range to a hight of 7,000 feet within a distance of 80 miles.

There was no getting round the thing. The mountains stood there barring the way eastward. They would not get out of the way for a railroad, and the "passes," by which travelers in the old time surmounted the obstacle, are all from 5,000 to 8,000 feet at their hight above the sea level.

It was, indeed, the common talk in California that it was impossible to carry a railroad up the western face of the Sierra. Even good engineers considered the undertaking preposterous.

It is easy enough to mount it from the east, for the high table land of the "great desert" comes up to its eastern side from 4,000 to 5,000 feet. In fact, the Sierra Nevada is the western face of an embankment—the embankment being half a continent—and this, the guttered and storm-washed front of it towards the Pacific.

The point was to get up this rocky face to the table land it bounded, and to do that in a very short space, for the continent breaks off short and comes down sheer.

But California energy, using 10,000 patient Chinamen, solved the problem, and took the track up and over, along the mountain side, through deep and long tunnels, across rifted chasms in the rocks, over headlong torrents and by the dizzy edges of abysses thousands of feet down, and "around Cape Horn."

But even when the work was done, the snow avalanche, or the earth slide from the mountain round whose side, half up, the iron path winds twisting upward, might sweep the work away, or overwhelm the track, and make it useless for weeks or months.

There was a remedy also for this in the skill and determination of the men who did this work. They just roofed in their road for fifty miles!

They took the giant stems of the pines and braced them against the mountain side, framing them and interlacing them beam with beam. They sloped the roof sustained by massive timbers, and stayed by braces laid into the rock, and covered with heavy plank, up against the precipice, so that descending earth or snow would be shot clean over the safely housed track into the pine tops below; and so they run their trains in security under cover, and have conquered the snow in its own domain.

There is one drawback. These "snow sheds" shut out forty odd miles of the most magnificent scenery on the whole trip—notably Donner Lake, and the deep valley inclosing it, which lies straight down below the passing trains.

It was up this slope I traveled yesterday afternoon and evening. It takes two locomotives to persuade the trains to ascend. I found a place just after leaving Sacramento, on the foremost, and had a mountain ride, which I think must be unequaled considering the mountains and the horse.

First there was the Sacramento valley—oak opening all, which, to most of your readers needs no description. Only the oaks are a species not seen in Michigan or Wisconsin. California is rich in oaks, and these, scattered about as thickly as apple trees in an old orchard, are the live oak, small-leaved evergreen.

Then came the "foot hills" and a gradual change in the wood growth. The Manzanilla wood, with its shining stem and dark green glistening leaf, mingled with the oaks and the buckeye, which, in California, is a many stemmed bush, springing from a common root hung heavy with its pear-shaped fruit, filling up the space beneath the taller oaks and the nut pines.

Finally, we came into the realm of the *coniferæ*, and the tall stems sprang up smooth, branchless, and tapering, rearing their green coronals to the sky.

We are going up the mountains! In a valley on one hand lay a mining village—the most beautiful villages in the State are these mining villages now. Down the mountain side, on the other, ran the water, led in sluices like a mill race, around a point here and a bend there, and across a gorge yonder—the water to be used, under the mighty power its descent gives it, to tear the hill side down and wash the rocks to pieces in "hydraulic mining"—mining, that is, which consists in discharging a stream of water, with a head of a few hundred feet, full in the face of a hill side till it is knocked into bits!—bits which contain gold, of course, or are supposed to.

But these too are left, as we go clanking on through pitch-dark tunnels, and over trestle works that look like spiders' webs, and along the maze of dingy precipices; the engine, coughing and straining in the tug up the steepest grade yet ventured by any engineer.

The day died out before we reached the summit, but died into a cloudless moonlight so brilliant, so silvery white in the flood of light it poured across land and sky, that one sent no regrets after the sunset.

Moonlight in the mountains, and such a moonlight is something to be remembered for life. I lost all sense of the poor, every-day world, forgot so vulgar a thing as a railway car, even the clank of the engine seemed to come softened as from far away; and I was sailing over pine-clad mountains, silvery white, in an air of balm and fragrance, and, in fact, I think was about half asleep when my friend, the engineer, plucked my sleeve—we were doubling Cape Horn!

Round the jutting mountain wall, so called from its bold advance into the valley, and its precipitous face, the road winds like a ribbon. No human foot had ever trodden this hight, as far as man may judge, till the first "hand" was lowered down to lash himself to a tree and begin, with pick and spade and crow, to cut a shelf along the dizzy hight! Not even an Indian trail had ever passed where the long train was passing now. The foot-sure savage had never ventured here. Three thousand feet sheer down lay the valley, in the moonlight like a lake, the mist slowly rising and swaying, silvered by the descending light. The feathery tops of the rock-anchored pines rose out of the mist far below. Across the valley the other mountain face frowned darkly, shaggy with bristling pines from base to summit.

That was one side.

On the other rose the almost perpendicular wall of the mountain, round which we were rushing on a shelf cut into the rock wide enough for the rails, of course—what need of anything more, when they are treble-spiked, and the rolling stock of the best, and the engineer the safest man to be found?

If we went off? If a broken rail should be ahead, if a rock should have rolled down beyond the curve yonder? Well, I suspect it would not make much difference, in that case, whether one was on the engine or in a car yonder. It would amount to the same thing, I think, when we all reached the valley together.

But there has never been an accident, and it is just such places as this that are most carefully guarded, and where all prudence and forethought and skill are engaged to be active.

I do not know that I have been able to give you half an idea of the magnitude of this undertaking, which has annihilated these weary desert spaces, and brought East and West together. If I have said much about it, it is because, after all, looking at it as I have, it seems to me the railroad across the continent, the double iron bands that tie Omaha and Sacramento each together, over the mountains, across vast deserts where human life finds nothing to sustain it, through the territories of tribes, too, a few years ago a terror to the whole border—it seems to me the railroad is really the most wonderful thing one sees, after all.

### New Attractions for the Central Park.

The New York Historical Society is about to give the most gratifying proof of being alive to the interests of art and of the public improvement. According to the *Evening Post* it proposes to establish in the Central Park a Museum of History, Antiquities, and Art.

By an act of the legislature of the state of New York, the Central Park Commissioners are authorized to set apart, and appropriate to the Historical Society such portion of the grounds lying near the Fifth avenue, between Eighty-first and Eighty-fourth streets, as may be required for the erection of suitable buildings for this museum.

The plan contemplates the removal of the rich treasures of the society from the building in the Second avenue, which has long been too small for their proper disposition and display, to a new and larger building in the Park, where, under proper restrictions, they shall be readily accessible to the public.

In the department of history the collections of manuscripts, maps, charts, newspapers, coins, and medals, will make a most conspicuous and interesting feature.

In the department of antiquities the Abbott collection of Egyptian memorials, the Nineveh sculptures presented by Mr. James Lenox, and the numerous relics of the aborigines of the American continent, will attract great attention. These valuable curiosities have long remained packed in the society's present buildings, for want of space to open them for exhibition.

The department of art is that which will prove the most popular with the visitors in general, and this will contain, at the very beginning, the well-known collection of the New York Gallery of the Fine Arts, the Bryan collection, and the Audubon collection, constituting the nucleus of a gallery which, in time, we may confidently hope will be worthy of the city, and of the beautiful pleasure ground in which it will be placed.

The New York Historical Society, in taking this step, has entitled itself to the hearty suppport of this community and to the thanks of the lovers of art throughout the United States.

GLASS FOR WINDOWS.—A window glazed with ground glass is almost always unsatisfactory. The vitrified surface being removed, the smoke and dust discolor it, and make it difficult to be kept clean. White enamelled glass, having a semi-opaque figure upon a transparent ground, is more satisfactory. If the windows of a dining-room were filled with clear light pink glass, the effect of the room would always be pleasant and comfortable. The greatest care should be taken to avoid introducing dark colors.

THE first bar of tin ever made in the United States has been presented to the Secretary of the California Pioneers. It is eight inches long, four inches wide and two inches thick. The bar is appropriately inscribed.

**Turning Irregular Forms.**

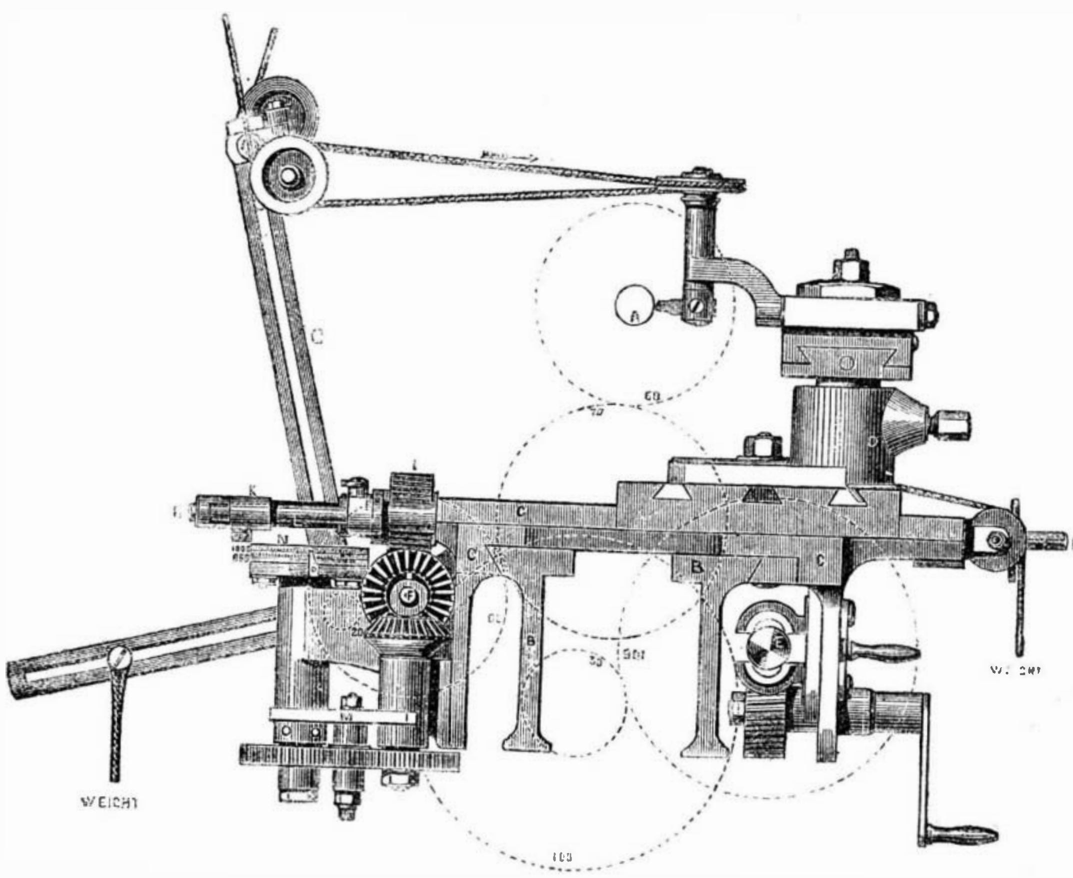
We illustrate from the *Engineer* an ingenious slide rest, designed by Mr. W. H. Northcott for turning articles of irregular sections. This system differs from the Blanchard and other lathes, because it is applicable to ordinary slide and screw-cutting purposes, as well as to turning irregular forms.

A is the center line of lathe spindle; B is the lathe bed, which carries a pair of ordinary headstocks; C is the saddle of the slide rest, which is caused to travel along the lathe-bed in the usual manner by the leading screw, E; D is a rest-holder, bolted down on the surfacing slide, for receiving and carrying any convenient form of tool-holder and slide; an ordinary short slide and Willis' holder is shown in place and carrying a light fly-cutter. This cutter is driven from overhead by means of a cord or gut, which is kept strained in every position of the slide by means of the lever, G. The shaft, F, and the leading screw, E, are driven from the lathe head by suitable change wheels which of course vary according to the relative speeds required, but generally the shaft, F, at the back of the lathe bed runs at the same speed as the lathe spindle. The surfacing slide carrying D, is caused to move across the saddle by means of the screw, H, either by a handle in front or automatically by means of a worm-wheel, I, driven by a worm on the shaft, F, the motion of the worm, I, being commumnicated at will to the screw through a sliding clutch. The surfacing-screw, H, is continued past the worm-wheel and clutch, and at its end is fitted with a bearing and adjusting nuts, to run in a cross head, K, which cross head slides on guides, L, one each side of the screw. The shaft, F, carries a small wrought iron miter wheel which rotates with the shaft, but, by sliding along it, is enabled to follow the saddle anywhere along the bed. This miter wheel gears with a similar wheel below it, attached to a short stud or shaft, having its bearings in a casting fastened to the slide rest saddle. At the lower end of the vertical shaft is a spur wheel, one of a series of changes any of which may be used to obtain the required speed. There is also another longer vertical spindle placed at the back of the saddle, and which rotates in a long boss forming part of the same frame. At its lower end this spindle is also fitted to receive a change wheel, driven either directly from a wheel on the other spindle or through double or single intermediate carriers by the short, radial arm, M. The top of the long spindle has a large collar or disk, to which is fastened another disk or receiving plate, N. The fastening is made with two small bolts with T heads fitted into a circular undercut groove in the top plate, and passing through the collar below. The edge of one plate is graduated, and the other has a pointer attached to it, so that the top plate may be moved round any distance, and fastened by tightening the small nuts below. The top surface of the upper plate has a number of holes in it which are tapped to receive screws, and also a larger hole in the center. These holes serve for fastening the various shaper plates or cam plates to the disk. The sliding cross head, R, carries a suitable rubber, O, placed just below the bearing of the surfacing screw, and the shape of this rubber depends upon the shape of the copy-plate, being sometimes a flat bar, at others a roller, and sometimes an angular point. The surface screw, H, has its usual bearings in the metal of the rest saddle, but the collars to the front bearing are formed by four nuts which allow of any end play being taken up. The inside pair of nuts, however, must be screwed back when the irregular mechanism is in use, as the screw has to slide endwise in its bearings. On the lathe being started, the bevel-wheel on the shaft, F, drives the first vertical spindle, and this motion is communicated by the change wheels to the copy plate attached to the top of the long spindle. The shaper plate in rotating being pressed against by the rubber, O, causes the cross head, K, and screw, H, to reciprocate or slide endwise, and the reciprocating motion of the screw is of course partaken of by the surfacing slide and cutting tools carried by the slide. The velocity of this reciprocating movement will vary according to the shape of the copy-plate, and its shape will therefore govern the shape of the work produced. The rubber is kept in contact with the copy by a weight attached by a cord to the surfacing slide, passing over a small pulley in front. With the tools point-level with the center, with an eccentric circle for the copy-plate, and with equal rotations of copy and work, when the tool's point describes a figure much smaller than the copy-plate the shape produced is cardoid, or heart-like, and this shape becomes more decided, and finally becomes looped as the tool gets near the center. When the figure is of the same size of the copy plate, its shape is also the same, namely, an eccentric. When the figure is made much larger than the copy-plate its shape is still somewhat the same as the copy, but its eccentricity is not increased.

It will be understood that when articles of irregular transverse section only have to be turned, the work and copy-plate generally make equal rotations; when the position of the shape has to vary there must be some slight difference between their speed. But by giving the copy a very slow motion compared with the work, instead of the article being turned of irregular transverse section, it is turned circular, but of irregular longitudinal section. For example, by having a shaper-plate formed of a portion of a true spiral, tapering shafts can be produced. If the spiral copy have a rise of ½ inch, the large end of the shaft will be ½ inch larger in diameter than the small end, and the length of the taper will be equal to the distance traveled by the tool while the rubber has traversed the edge of the spiral copy-plate.

The drawing rollers of spinning machinery, handles for starting levers, bolts with countersunk heads, and many other articles frequently required in large numbers, can also be produced from suitably formed copy-plates; while for cabinet-making and for ornamental turning the applications of the mechanism are almost endless.

The device is interesting as its capacity is more extended than the Blanchard lathe, familiar to American mechanics.



SLIDE REST FOR TURNING IRREGULAR BODIES.

**BORING INSECTS.**

Many of the lower forms of animal life possess powers of boring which, considering the soft materials of which they are made, seem very surprising. It is hard for us to understand how such animals are naturally provided with tools adequate in some cases for penetrating into the densest timber, or in others even into the solid rock.

We find no difficulty in understanding how shellfish can bury themselves in the sand—the common cockle is an excellent burrower in this yielding material. The razor-shell dwells in a long tube in the sand which he has formed by his own labors, from which he can only be extracted by darting down it a long barbed rod. This penetrates his shell and he is withdrawn; but if this be not done with great rapidity he is enabled to escape, as he can move very quickly in his hole. There is another shell belonging to the same tribe as the razor-shell, which excavates for itself a hole in the solid rock. This animal has no English name; its Latin one is *Pholas*. It is to be met with in limestone rocks on the sea coast, into which it bores holes to a depth of several inches.

It is still a disputed point among naturalists as to how this boring is effected. Some think that the animal is enabled to secrete some acid which softens or dissolves the limestone, while others think that it is by the mechanical process of grinding that it is accomplished.

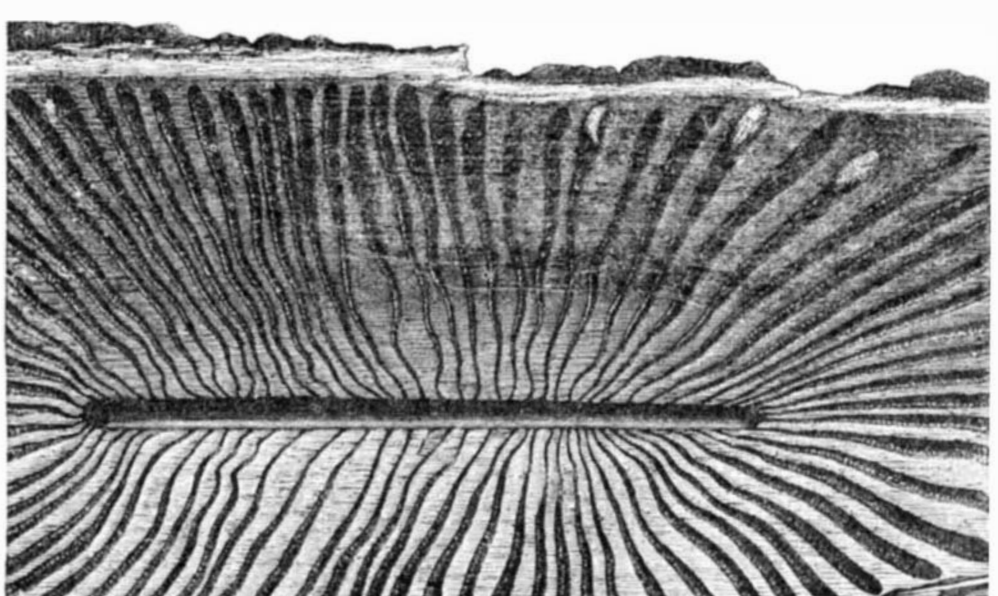
The preponderance of opinion seems to lie now with the latter view. Another boring shell is the well-known ship-worm or teredo. This burrows into wood to a great depth, and many an otherwise good ship has been rendered unseaworthy by the attacks of this indefatigable borer. Of course a metallic coating to the vessel is a complete preservative against their attacks.

Our illustration represents a borer of a very different kind. The animal that accomplishes these excavations in the trunk of a tree is not a shell-fish, but an insect. The parent, when about to deposit her eggs, selects a tree of suitable size, and commences her operations on the bark. At the bottom of the illustration will be observed a small inclined hole, and at the end of this a beetle is to be seen; this is the little architect who, by the joint exertions of herself and her progeny, has so wonderfully penetrated the tree in every direction. Another hole, running horizontally across, will likewise be seen at the right of the figure, and in the end of this another beetle may be seen similarly engaged. When the exertions of the insect have prepared a sufficiently large hole she then commences to lay her eggs. But before proceeding to this subject, let us just dwell for a moment upon the magnitude of the work she has accomplished.

The hole bored into the heart of solid wood is about fourteen or fifteen times longer than the body of the beetle, and the animal must, by the help of its jaws, tear away and remove a bulk of timber more than twenty times its own bulk. We shall gain some idea of the amount of labor necessary for this, by considering what would be the corresponding work that should be executed by a man, were he to be equally adapted with the beetle for this kind of work. He would have in a few days to bore into a mass of solid timber a cylindrical hole, about eighty or ninety feet long, and about three feet in diameter.

The central part of the illustration shows another stage in the history of these tunneling operations. We will suppose that a beetle has finished the hole of which the two already described are the commencements. All along each of these will be seen little white spots; these represent the eggs which she lays as she proceeds. The long line in the center of the figure represents a part of the completed hole, along the sides of which the eggs are laid.

When the eggs of the beetle are hatched, the little animal that comes from them is at that stage of its existence utterly unlike its parents. It is at first a little grub without legs, and quite as unlike a beetle as an earth-worm is unlike a house-fly; this is called the larva condition of the beetle; and it is equally true of every other insect, that in the early stages of its existence it is utterly unlike in appearance, in food, and habits, to the parents from whom it has sprung. Thus the dragon-



THE RAVAGES OF THE WOOD-BORING BEETLE.