or, as we might say, under the chin. Succeeding this is another piece, at the outer angles of which are attached two curved triangular jaw-like pieces articulated to it by one of their angles, and capable of folding inwards till their saw-like edges exactly meet, when the front part of the apparatus forms the bowl of the ladle. When closed, the basal joint is bent backwards, showing as a bluntly-pointed projection, reaching to the base of the

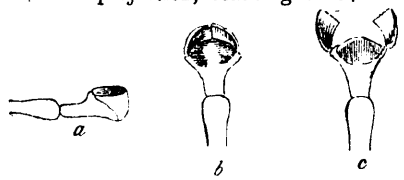

Fig. 2.—Mask of Dragon Fly. *a.* Side View. *b.* Viewed from Above. *c.* The Same, with Jaws Open.

second pair of legs; the next piece is folded back upon this, and the bowl-like part is thus brought close up to the face, which fits into the hollow. When the mask is extended, the real jaws are seen beneath in the usual position. The mask is used somewhat like the raptorial legs of the water-scorpions—viz., to seize a passing insect at a little distance. To accomplish this, it is very rapidly unfolded, darted out with unerring aim, and brought back again into position, thus holding the prey close up to the true jaws.

Dragon-flies do not alter much during their earlier stages. The traces of wings soon appear, even after the first moult or two. When a moult is about to take place, the creature fixes its claws into some support to obtain leverage for its coming struggle, and then, by strong muscular effort, the back of the thorax is split, and the insect crawls out of its case. The cast skins may frequently be seen floating about in ponds. The insects are very voracious, and when other food fails, will not scruple to adopt cannibalism.

(To be continued.)

IMPROVED SAWS.

An account of a new kind of saw for cutting stone, originally described in *La Semaine des Constructeurs*, which seems to have advantages over those now commonly in use, appeared in a recent issue of the *American Architect*. In place of the ordinary long steel blades, supplied with sand to enable them to grind their way into the stone, the new machine presents only a slender endless cord, composed of three steel wires twisted together, which is stretched over pulleys in such a way as to bring the lower portion horizontally over the stone to be cut. The frame carrying the pulleys is movable, so that the cord can be brought into contact with the stone or lifted away from it at pleasure, and the whole is kept in rapid motion, while water falling in drops from a reservoir above serves to moisten the stone. The three wires which form the saw differ form the ordinary kind in being square in section, and by twisting into a cord they are so turned as to present a succession of oblique cutting edges, which act, when set in motion, in nearly the same way as so many small chisels, while the rapidity with which the blows follow each other probably adds to their effect. It is not said what proportion the work accomplished by the new machine bears to that effected by the expenditure of the same amount of energy in the old form of apparatus, and the invention is probably in too rudimentary a stage to make such comparisons practicable; but the idea seems to be a good one, and with wire of suitable temper and form the cutting effect should be very considerable; while, as every one will observe, the wire saw ought to be available for use in a verticle line, like a hand-saw for cutting wood, and, if operated in this way, could be made to saw mouldings of the most difficult sections as readily as the same forms are cut in wood.

Again, too much care cannot be taken to give each saw its proper amount of lead. This, like speeding the saw, must be done to conform to the adaptability of the same. After once getting the proper lead there are difficulties, often very troublesome, that have to be overcome in some way. A saw is seldom filed and put in order twice alike. After it is first regulated any deviation or alternation in filing is equivalent to a change in the running of a saw. Of course, a sawyer that is apt at the business will make less deviation than an inexperienced one, and will correct the defect with the guide-pins without any perceptible difference in the running of the saw. Where there is a want of experience in handling the saw, the better way is to correct the lead by throwing the mandrel back or forth as the case may require. In no case should there be an attempt to make a saw run with the guide-pins where it is not inclined to. The attempt will not only be futile, but an everlasting vexation, to say nothing of the loss of time waste of power, and badly cut lumber. It never pays a man to attempt to run unless things are in proper condition. Better shut down and put things in order, and then go head.

To be a successful sawyer it is also necessary to be a good judge of different classes of wood. Some kinds are of very firm hard grain, and require to be cut on a much slower speed than others. Other kinds may not appear so hard, yet there is a tendency to spring, causing the saw to heat, which sometimes leads to the conclusion that the saw is at fault.

There are always new difficulties arising that must be met, understandingly, or otherwise. They are stubborn, everyday facts, that have to be dealt with.

THE ANTHRACITE BURNING LOCOMOTIVE OF AMERICA.

Anthracite coal, used for locomotive purposes since 1838 with increased success, is now burned exclusively on water grates formed of wrought iron tube, 2 in. external and 1½ in. internal diameter, spaced so as to give a maximum clearance between water tubes of 1 in. to 1⅛ in., set longitudinally with the fire-box, and having a rising inclination backwards, varying from ¾ in. to 1½ in. per foot of length. This sloping of grate is chiefly to secure the perfect and rapid circulation of water, thus preventing accumulation of mud and scale in the tube, keeping it cool and lengthening its effective life.

Transversely to fire-box, the water tubes are usually set in a horizontal line, but there is a tendency to lift the side tubes a little higher, giving the cross section a basket form, removing the fire further above the solid foundation bar and slightly increasing the area of air opening through the grate.

To increase the amount of air opening without increasing the space between each water tube, the transverse setting of them in corrugated or rigid outline (thus *******) has been tried, but with partial success, as the fire naturally got then at high points and all the air supply passing through such thin spots, the fire became dead and steam pressure fell too low.

To clear the fire, two (and in case of wide gates three) of the water tubes are replaced by long 2 in. wrought iron bars, carried by ferrule through the water space out and beyond back of fire-box, so that the fireman can withdraw them—in whole or in part—leaving an opening four inches wide through which all foreign matter is raked into hopper ash-pans having a depth of from 2 to 2½ feet, this depth preventing the accumulation on ash-pan from burning out the grates from underside.

It is often found advisable to line these hoppers with scrap plate, the narrow air space left between the plates saving the hopper from being warped or otherwise injured from the hot ashes.

Compared with fire-boxes burning bituminous coal, excessive grate surface is required, and each engine bar-frame (and such frames are found best suited to the condition of our road-bed, &c.) being from 3 in. to 3½ in. wide, the available space between them is found too narrow, and it has resulted in fire-boxes being stopped off short of the top of the frame and made as wide as will just clear driving wheel flanges; in fact, fire-boxes designed to burn Anthracite "dirt" are stopped off