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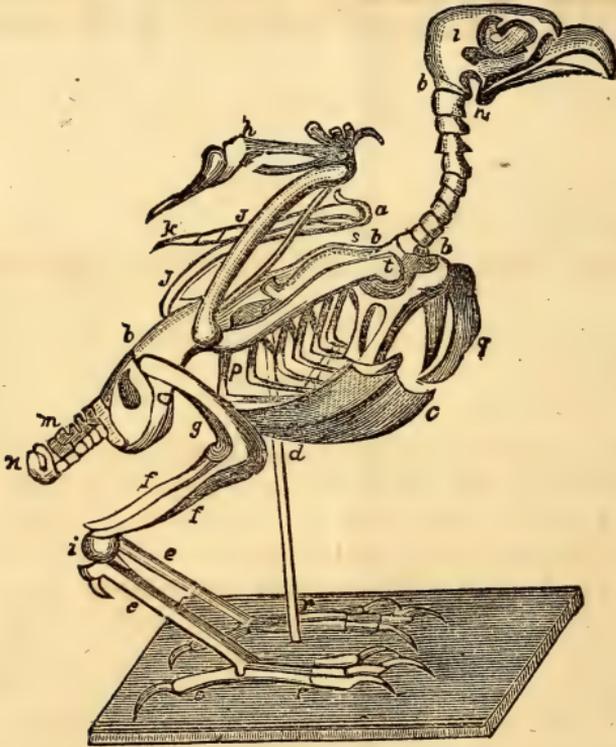
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The Skeleton of the *Falco Palumbarius*, or Goshawk, showing the manner in which it is supported by a small iron rod; and also the names of the bones.



a. Ball of the Ulna.—*b, b, b.* The vertebræ of the neck, or cervical vertebra.—*c* and *d.* The Sternum.—*e, e.* The Tarsus.—*f, f.* The Fibula.—*g.* The Tibia.—*h, h.* The metacarpal bones.—*i, j.* The Ulna.—*m.* The Pelvis.—*n.* The Os Coccygis.—*q.* The Clavicle.—*s.* Vertebræ of the back.—*t.* The Os Humeri.

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*John Doughty, Jr.
Harvard University,
Cambridge,
Mass.*

THE TAXIDERMIST'S GUIDE.

CHAP. I.

SKINNING, PREPARING, AND MOUNTING THE MAMMALIA, OR QUADRUPEDS.

SKINNING.

WHEN a quadruped is killed, and its skin intended for stuffing, the preparatory steps are to lay the animal on its back, and plug up its nostrils, mouth, and any wounds it may have received, with cotton or tow, to prevent the blood from disfiguring the skin. The fox will serve admirably our purpose as an example. Therefore, Reynard being procured, we need not say how, lay him on his back in the same position as before recommended; and, having first stuffed the mouth with cotton and tied it up, and measured his neck and body with rule and calipers, and noted them, proceed. Make an incision from the last rib nearly to the vent, but not quite up to it. Having done so, proceed to raise the skin all round the incision as far as the thighs, first skinning one side and then the other, using the flat end of the knife in preference to the blade to raise the skin. Having reached the hind legs, separate the latter at the femur or thigh-bone, close to the back-bone, leaving the legs attached to the skin. Now skin the head-quarters close up to the tail, and separate it from the body at the last vertebræ, taking care not to injure the skin. Pull the skin over the heads of the hip-joints, and now the carcass may be

suspended by the hind-quarters, while the skin is stripped by pulling it gently and cutting towards the fore-quarters. The fore legs are separated from the body, as the hind ones had been, close to the shoulder-bone, and the skin fairly pulled over the head and close to the nose, when the head is separated from the body by cutting through the last vertebræ of the neck. Reynard is now skinned, the head, legs, and tail being all attached to the skin, from which the carcase is separated.

The flesh is now cut entirely away from the cheek-bones, the eyes removed, the brains taken out by enlarging the occipital opening behind the cranium, the whole cleaned and supplied with a coating of arsenical paste, and stuffed with tow or wool, to the natural size.

The legs are now successively skinned by pushing out the bones and inverting the skin over them until the foot-joint is visible ; every portion of flesh and tendons must be cut away, and the bone cleaned thoroughly, and a coating of arsenical soap laid over it as well as the skin. Wrap tow, or cotton, or any other suitable material, round the bone, bringing it to its natural shape, and draw the skin over it again. Do this to each leg in succession, and the body itself is ready for stuffing and mounting.

The utmost care will not prevent accidents ; the fur and plumage will get sullied, and before stuffing it is well to examine the skin, for stains and spots are calculated to deteriorate its appearance. Grease or blood-spots may be removed by brushing over with oil of turpentine, which is afterwards absorbed by dusting plaster of Paris over. Macgillivray recommends that all skins, whether they are to be put away in a cabinet or stuffed, should receive a washing of spirits of turpentine sprinkled on, and gently brushed in the direction of the feathers or fur. Not to trust too much to memory, it is desirable to measure and note the proportions of the animal before skinning, first taking the muzzle to the tail. Afterwards, from the junction of the tail to the tip. Secondly, from the middle of the shoulder-blade, or scapula, to the articulation of the femur, or thigh-bone. Thirdly, the animal being placed on its side, measure from the upper part of the scapula to the middle of the sternum—that is, to the spot where the two sides meet above, and finally from the socket of the scapula to the socket of the articulation of the femur, or thigh.

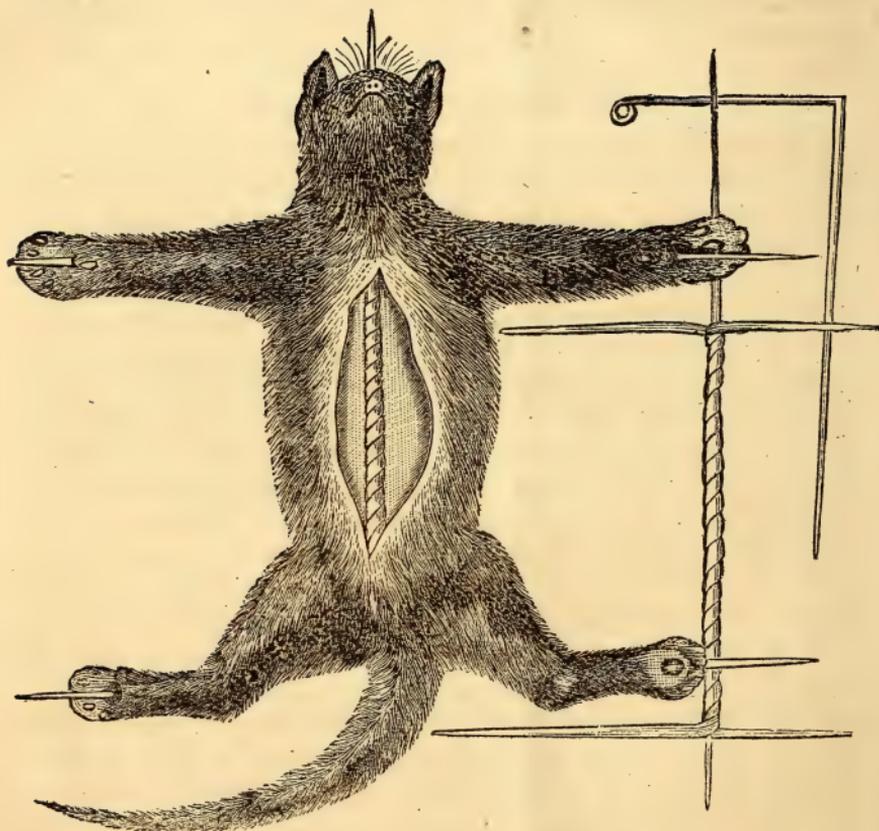
bone. In addition to these, note, by measurement with caliper compasses, the size of the head, the neck, the tail, and other points which affect the shape of the animal. These measurements will serve as a guide in stuffing, and for the size of the case and length of the mounting wires. In the process of skinning, it is important to avoid penetrating to the intestines, or separating any of the abdominal muscles which lead to the intestines; any such accident would be very disagreeable, as well as injurious to the skin.

STUFFING QUADRUPEDS, ETC.

Let us suppose the animal which we intend to stuff, to be a Cat. Wire of such a thickness is chosen as will support the animal by being introduced under the soles of the feet, and running it through each of the four legs. A piece of smaller dimensions is then taken, measuring about two feet, for the purpose of forming, what is termed by stuffers, a tail-bearer. This piece of wire is bent at nearly a third of its length, into an oval of about six inches in length; the two ends are twisted together, so as to leave one of them somewhat longer than the other; the tail is then correctly measured, and the wire is cut to the length of it, besides the oval. The wire is then wrapped round with flax in a spiral form, which must be increased in thickness as it approaches the oval, so as to be nearly equal to the dimensions of the largest vertebrae, or root of the tail. When finished, it should be rubbed thinly over with flour paste, to preserve its smooth form, which must be allowed to dry thoroughly, and then the surface should receive a coating of the preservative. The sheath of the tail must now be rubbed inside with the preservative. This is applied with a small quantity of lint, attached to the end of a wire, long enough to reach the point of the tail-sheath. The tail-bearer is then inserted into the sheath, and the oval part of the wire placed within the skin of the belly, and attached to the longitudinal wire, which is substituted for the vertebrae or back-bone.

Four pieces of wire, about the thickness of a crow-quill, are then taken, which must be the length of the legs, and another piece a foot or fifteen inches longer than the body. One end of

Fig. 1.

*Manner of inserting the wires in mounting a Cat.*

each of these is sharpened with a file, in a triangular shape, so that it may the more easily penetrate the parts. At the blunt end of the longest piece a ring is formed, large enough to admit of the point of a finger entering it ; this is done by bending the wire back on itself a turn and a half, by the assistance of the round pincers. On the same wire another ring is formed in a similar manner, consisting of one entire turn, and so situated as to reach just between the animal's shoulders. The remaining part of this wire should be perfectly straight, and triangularly pointed at the extremity.

Another method of forming the supporting wires, as practised by M. Nichols, is to take a central wire, which must be the length of the head, neck, body and tail of the Cat, as in fig. 1, that is, from *a* to *b*, but the tail at *b* is shortened owing to want of room in the plate ; two other pieces are then taken and twisted round the centre piece, in the manner represented in fig. 1, *c*, *d*, *e*, *f*, these extremities being left for the leg wires. After the wires are thus twisted together, the central one is pulled out ; and the feet wires of one side are pushed through the legs of one side from the inside of the skin, and the other two leg pieces are bent and also forced through the legs, and afterwards made straight by a pair of pincers ; the centre piece, having been previously sharpened at one end with a file, is now forced through the forehead and down the neck, till it enter the centre of the twisted leg wires which it formerly occupied, and pushed forward to the extremity of the tail, leaving a small piece projecting out of the forehead, as represented in fig. 1. After which, the completion of the stuffing is proceeded with.

This mode is unnecessary for the smaller animals, and it should only be adopted for quadrupeds the size of Deer, &c. These wires are besides much more difficult to insert by this than by the other method.

All the wires being adjusted, the operation of stuffing is next proceeded with. The skin of the Cat is now extended on a table ; and the end of the noose seized with the left hand, and pushed again into the skin, till it reaches the neck, when we receive the bones of the head into the right hand. The skull is now well rubbed over with the arsenical soap, and all the cavities which the muscles before occupied, are filled with chopped tow, flax, or

cotton well mixed with preserving powder. The long piece of wire is now passed into the middle of the skull, and after it is well rubbed over with the preservative, it is returned into the skin. The inner surface of the neck-skin is now anointed, and stuffed with chopped flax, taking care not to distend it too much. Nothing like pressure should be applied, as the fresh skin is susceptible of much expansion.

Observe that it is always the inner surface which is anointed with the arsenical soap.

Take care that the first ring of the wire, which passes into the head, is in the direction of the shoulders, and the second corresponding with the pelvis, or somewhat towards the posterior part. One of the fore-leg wires is then inserted along the back of the bone, and the point passed out under the highest ball of the paw. When this is accomplished, the bones of the leg are drawn up within the skin of the body, and the wire fastened to the bones of the arm and fore-arm with strong thread, or small twine. Brass wire, used for piano-forte strings, makes it more secure, and is not liable to rot. These are well anointed, and flax or tow *slivers* wrapped round them, so as to supply the place of the muscles which have been removed. To give the natural rise to the larger muscles, a piece of silver should be cut off the length of the protuberance required, and placed in the part, and the silver wrapped over it. This gives it a very natural appearance.

The mode of fixing the legs, is by passing one of their pieces of wire into the small ring of the horizontal or middle supporting wire. Pursue the same plan with the other leg, and then twist the two ends firmly together, by the aid of a pair of flat pincers. For an animal of the size of a Cat, the pieces left for twisting must be from five to six inches in length. After being twisted, they are bound on the under side of the body wire, with strong thread: the two legs are then replaced, and put in the form in which we intend to fix them. The skin of the belly and top of the shoulders is then anointed, and a thick layer of flax placed under the middle wire. The shape is now given to the scapulæ on both sides, and all the muscles of the shoulders imitated. These will be elevated or depressed, according to the action intended to be expressed. The anterior part of the opening is now sewed up, to retain the stuffing, and to enable us to complete the formation of the

shoulders and junction of the neck. This part of the animal is of great importance, as regards the perfection of its form; and much of its beauty will depend upon this being well executed.

If the animal has been recently skinned, the best plan possible is to imitate, as nearly as possible, the muscles of the carcase; by which many parts will be noticed which might otherwise have been neglected. As a rule, COPY NATURE WHENEVER YOU HAVE IT IN YOUR POWER.

It must be observed as a general rule, that the wires for the hind legs of quadrupeds should always be longer than those of the fore legs.

The next thing is to form the hind legs and thighs, which must be done, as above described for the fore legs; but with this difference, that they must be wound round with thread, drawn through the stuffing at intervals, to prevent it slipping up when returned into the skin of the leg. They are then fixed, by passing the leg wires into a second ring of the centre body wire, which is situated at or near the pelvis; the two ends are then bent, twisting them to the right and left around the ring: and to make them still more secure, they should be wound round with small brass wire or packthread; the tail-bearer is then attached in the manner formerly described.

Having completed this part of the iron work, the skin of the thighs is coated inside with the preservative, and the stuffing completed with chopped flax or tow. The whole inner parts of the skin which can be reached are again anointed, and the body stuffing completed with chopped flax. Care must be also paid not to stuff the belly too much, as the skin very easily dilates. The incision in the belly is now closed by bringing the skin together, and then sewed within and without; while attention is paid to divide the hairs, and not to take any of them in along with the thread; but should any of them be inadvertently fixed, they can be picked out easily with a point. When this is completed, the hair will resume its natural order, and completely conceal the seam.

The seam should now be well primed, on both sides, with the solution of corrosive sublimate, to prevent the entrance of moths.

The articulations of the legs are then bent, and the animal placed on its feet; and pressure used at the natural flat places, so as to make the other parts rise where the muscles are visible.

A board is now prepared, on which to place the Cat. But before fixing it permanently, the animal should be set in the attitude in which it is intended to be preserved, and the operator, having satisfied himself, then pierces four holes for the admission of the feet wires, which must be drawn through with a pair of pincers till the paws rest firmly on the board. Small grooves are then made for the reception of the pieces of wires which have been drawn through, so that they may be folded back and pressed down in them, and not be beyond the level of the back of the board ; wire nails are now driven half in, and their heads bent down on the wires to prevent them from getting loose, or becoming movable.

The stuffer next directs his attention to the position and final stuffing of the head and neck. The muscles of the face must be imitated as correctly as possible, by stuffing in cotton at the opening of the eyes, as also at the mouth, ears, and nostrils. To aid in this, also, the inner materials may be drawn forward by the assistance of instruments, and also small pieces of wood formed like small knitting meshes.

Our next care is the insertion of the eyes, which must be done while the eyelids are yet fresh. Some dexterity and skill are required in this operation, and on it will depend most of the beauty and character of the head. The seats of the eyes are supplied with a little cement, the eyes put in their place, and the eyelids properly drawn over the eyeballs ; but if rage or fear are to be expressed, a considerable portion of the eyeballs must be exposed. The lips are afterwards disposed in their natural state, and fastened with pins. If the mouth is intended to be open, it will be necessary to support the lips with cotton, which can be removed when they are dry. Two small balls of cotton, firmly pressed together, and well tinctured with the arsenical soap, must be thrust into the nostrils so as to completely plug them up to prevent the air from penetrating, as also the intrusion of moths ; and besides, it has the effect of preserving the natural shape of the nose after it has dried. The same precaution should be adopted with the ears, which, in the Cat, require but little attention in setting.

We must again recommend the stuffer to see that he has sufficiently applied the preservative soap ; and the nose, lips, eyes,

and paws, being very liable to decay, must be well imbued with spirits of turpentine. This is applied with a brush, and must be repeated six or eight times, at intervals of some days, until we are certain of the parts being well primed with it; and, after all, it will be advisable to give it a single coating of the solution of corrosive sublimate.

The methods of stuffing, which we have pointed out in the preceding pages, are applicable to all animals, from a Lion down to the smallest Mouse. Animals of a large description require a frame-work suited to their dimensions; these we will point out in their order. There are also some animals whose peculiarity of structure requires treatment differing a little from the ordinary course.

APES AND MONKEYS.

One of the chief difficulties to contend with, in setting up Monkeys and Apes, is the preservation of their hands and hind hands, or what we commonly call their feet; because we must not attempt to deprive these limbs of their flesh, as we never could again supply its place anything like what is in nature. The hands must therefore be dried, and then well imbued with turpentine and the solution of corrosive sublimate, repeated eight or ten times at least, at intervals of four or five days. The other parts of the stuffing should be exactly similar to that recommended for quadrupeds generally. The paws of several will require to be colored with the different varnishes, and, when dry, slightly polished with fine sand paper to remove the gloss. The callosities, on the hinder parts of many of them, will also require to be colored, and treated in the same way as the face.

BATS.

The wing-membranes of this varied and numerous tribe do not require either wire or parchment to set them. They are very easily dried by distension. They are laid on a board of soft wood, the wings extended and pinned equally at the articulations, and, when dry, they are removed from the board.

HEDGEHOGS.

When it is wished to preserve Hedgehogs, rolled into a ball, which is a very common position with them in a state of nature,

there should be much less stuffing put into them than is usual with quadrupeds, so that they may the more easily bend. No wires are required in this case. The head and feet are drawn close together under the belly ; then place the animal on its back in the middle of a large cloth, and tie the four ends firmly together ; suspend it in the air till thoroughly dry, which finishes the operation.

If Hedgehogs are wished with the heads and limbs exposed, the usual method of mounting is adopted. The skins of Mice, Moles, &c., having a very offensive smell, it will be necessary to add a considerable portion of the tincture of musk to the solution of the corrosive sublimate with which the skins are imbued. The same applies to Badgers, Wolverenes, Polecats and Skunks, all of which are strong smelling animals.

BEARS.

The structure of the wires requires to be different in these larger animals from any we have before described.

Procure a bar one inch thick, two inches broad, and as long as to reach horizontally from the shoulders to the connection of the thighs, or *os pubis*. A hole is bored four inches distant from one of its ends, from which a connecting groove must be formed, extending on both sides to the end of the plank next the hole ; this groove must be cut out with a hollow chisel deep enough to receive the wire. The wire is then passed through it, one end of which is just long enough to be twisted with the other at the end of the plank. The wire on both sides is now pressed down into the grooves and twisted firmly together by the aid of a pair of strong pincers. Pierce some holes obliquely into the groove and insert some wire nails into them, which must be firmly driven home, and then bent over the wires to keep them firm. The longest end of the wire should be at least eighteen inches beyond the bar so as to pass through the skull of the animal.

The use of this bar, it will be observed, is a substitute for the central or supporting wires of the body. Two other holes are now bored into it, the one two, and the other three inches from the end which we first pierced ; these are for the reception of the wires of the fore legs ; and two similar holes must be made at the other extremity of the bar for receiving the wires of the hind legs.

Bears always support themselves on the full expansion of their dilated paws, so that it is necessary to bring the leg-wires out at the claws. The leg-wires are bent at right angles for a length of five inches from the upper end. These are put through the holes in the bar, and when they have passed through they are curved again. Two small gimlet-holes are then made for the reception of smaller wire, by which the leg-wires must be bound together close to the bar. The fore leg wires are fixed in the same manner, which completes the framework.

No other means are used for middle-sized animals, such as the Lion, Tiger, Leopard, &c. The stuffing is completed as in other quadrupeds.

The Walrus, Seals, and other amphibious animals of this order, are treated in the manner of quadrupeds generally, only that leg-wires are unnecessary, except in the fore-feet; the tail, which represents the hind feet, has merely to be dried and kept properly stretched in during this process, which precaution also applies to the fore-feet. They are the easiest stuffed of all animals, only the skins are very oily; they should be well rubbed with the arsenical soap, and also with the preserving powder.

The stuffing of the Walrus, and other large animals of this family, should consist of well dried hay for the interior parts and tow for the surface next the skin.

BEAVER, ETC.

The Beaver, Musk Rat, Common Rat, and other animals whose skins have a strong smell. These require to be plentifully supplied with the preservative. The tail of the Beaver should be cut underneath, and all the flesh removed, then stuffed with tow or chopped flax, and afterwards thoroughly dried and well primed with the arsenical soap to prevent putrefaction, to which it is very liable. It should also have repeated washings with oil of turpentine. The back should be round and short.

THE PORCUPINE.

In stuffing this animal considerable and varied expression may be given, both from the attitude and disposition of the quills. Great attention is therefore required in giving these a proper set during the process of drying. They will require to be looked at

several times during the first and second day after they have been stuffed, and any of them that may have fallen out of the position required, to be adjusted.

HARES AND RABBITS.

A very pretty attitude for the Hare or Rabbit, is to have it seated in its form in an upright position, as if alarmed at the noise of dogs, &c. An oval is formed of wire and attached to the interior framework, after having passed one end of it through the anus, which must be passed through a hole in the board on which the animal is to be fixed. The wires of the hind legs must be forced through the posterior part of them, and also fixed into holes formed for their reception in the board.

DEER, ANTELOPES, GOATS, ETC.

These animals should be mounted on the same principles as recommended for the Bears. A different mode must, however, be adopted in skinning the animals, which the horns render necessary. It is performed in the ordinary manner until the operator reaches the neck. After cutting as near the head as possible, another incision must be made, commencing under the chin, which is continued to the bottom of the neck, or from eight to ten inches in length. By this opening, the remainder of the neck is separated from the head; the tongue is cut out, and the occipital orifice enlarged, and the brain extracted thereby. The lips are now cut as near as possible to the jaw bones, and the operator must continue progressively ascending towards the forehead, and in this manner all the skin will be separated from the head, except at the nose, or point of the muzzle. All the muscles are next removed by the scalpel, and the skull well anointed with arsenical soap. The muscles which have been cut out are then imitated with chopped flax or cotton, which may be attached to the bones with cement. When this is done, the head must be replaced within the skin. The orifice under the neck must now be sewed up with fine stitches, so that the hair may spread over them to conceal the seam. The whole other parts of the mounting is completed as directed for the Bear.

THE DOLPHIN, PORPOISE, ETC.

The structure of these animals, as well as of the other species of the first family of this order, differs but little in general structure.

In skinning these, an incision is made under the chin, and continued to the extremity of the tail; the skin is then detached right and left with the scalpel, or a sharp knife. When the skin has been cut back as far as possible, disengage the vertebræ at the tail, and this will enable the operator to detach the skin from the back; the vertebræ are now cut close to the head, and the whole carcase removed.

All this tribe have a thick layer of fat under their skin. In the operation of skinning it requires considerable dexterity to leave this fat, or blubber, adhering to the carcase. Practice alone will obviate this. When this has not been properly managed in the skinning, the only thing to be done afterwards is to scrape it thoroughly with a knife. The oil which flows from it, during its operation, must be soaked up with bran, or plaster of Paris.

There being no muscular projections in the skin of the Porpoise, there is no use for wires in mounting it. A narrow piece of wood the length of the body is quite sufficient to keep the skin stretched, and stuffed either with tow or hay. Some months are necessary to render it perfectly dry and stiff, from its greasy nature. The grease almost always leaves some disagreeable looking spots on the skin. To remove these, and prevent a recurrence of them, powdered pumice-stone steeped in olive oil, is rubbed thickly on the skin with a hand-brush. It is then gone over a second time with emery and oil. It is rubbed in this way till the skin has a glossy appearance, when it may be rubbed dry with a woollen cloth; and to complete the polish, a clean woollen cloth may be applied with some force to complete the gloss, which is natural to the skin in a living state.

Where a very glossy appearance is wished, varnishes become necessary, but some difficulty has been experienced in getting these to remain attached to the skin in all weathers, because the humidity of rainy seasons melts gum-arabic when it is used as a varnish, and when white varnish is applied, both it and the gum-arabic fall off in pieces. To prevent the gum from falling off in

this way, by its contracting, the solution should have about an eighth part of ox-gall mixed with it, and the surface of any body to be varnished should be washed with ox-gall and water before the varnish is applied, which will, almost to a certainty, prevent it from cracking and falling off. It must, however, be thoroughly dried before the varnish is applied.

We may here state, that an animal the size of a Fox or a Cat, may be skinned, prepared, and finally set up, in the space of four or five hours, by a person who has had a little practice in the art of Taxidermy, and that from ten to fifteen minutes are all that will be required to skin an animal of the size just mentioned.

CHAPTER II.

SKINNING, PRESERVING, AND MOUNTING BIRDS.

SKINNING.

IMMEDIATELY after a Bird is killed, the throat and nostrils should be stuffed with tow, cotton, or fine rags, and a small quantity wound round the bill, to prevent the blood from staining the

Fig. 2.



Manner of holding the hands in skinning a Bird.

plumage; but should any get on the feathers, notwithstanding this precaution, the sooner it is removed the better, which should be effected by a sponge which has been merely moistened in water. Too much dispatch cannot be used in removing the skin, if the bird is shot in a warm climate; but, in temperate regions, the bird may be allowed to cool.

In proceeding to skin the Bird, it should be laid on its back, and the feathers of the breast separated to the right and left, when a broad interval will be discovered, reaching from the top to the bottom of the breast-bone. (See fig. 2.)

Fig. 2.



Bird Suspended for Skinning.

(See fig. 2 for the manner of separating the feathers and using the scalpel.) A sharp penknife, or scalpel, must be inserted at the point of the bone, and cut the outer skin from thence to the vent, taking care not to penetrate so deep as the flesh, or upon the inner skin which covers the intestines. The skin will then easily be separated from the flesh; in larger specimens, by the fingers, or, in smaller ones, by passing a small blunt instrument betwixt the skin and body, such as the end of the scalpel handle; with this you may reach the back. The thighs should now be pressed inwards, as in the common method of skinning a rabbit, and the skin turned back, so far as to enable you to separate the legs from the body, at the knee-joint. The skin is then pulled downwards, as low as the rump, which is cut close by the insertion of the tail, as shown in fig. 2, but in such a manner as not to injure its feathers. The skin is now drawn upwards the length of the wings, the bones of which must also be cut at the shoulder-joints; it is then pulled up, till all the back part of the skull is laid bare, when the vertebræ of the neck are separated from the head, and the whole body is now separated from the skin. You next proceed to remove the brain, through the opening of the skull, for which purpose it may be enlarged by a hollow chisel, or other iron instrument. The eyes must then be taken out, by breaking the slender bones which separate the orbits from the top of the mouth, in which you may be assisted by pressing the eyes gently inwards, so as not to break them. In skinning the neck, great care must be taken not to enlarge the opening of the ears, and not to injure the eyelids. The whole of the flesh is next to be removed from the under mandible.

Several species will not admit of the skin being thus pulled over their heads, from the smallness of their necks; some Woodpeckers, Ducks, &c., fall under this description; in which case a longitudinal incision is made under the throat, so as to admit of the head being turned out, which must be neatly sewed up before stuffing. The flesh from the head, wings, legs, and rump, must then be carefully removed with a knife, and the cavities of the skull filled with cotton or tow. The whole inside of the skin, head, &c., must be well rubbed with arsenical soap, or preserving powder, or spirit of turpentine, or the solution of corrosive sublimate. When it is wished to stuff the bird, it may now be imme-

diately done, as it will easily dry, if in a warm climate ; but in low, damp countries, it will require artificial heat to do it effectually.

When the skins are merely wished preserved, the bones of the legs and wings should be wrapped round with cotton or tow, so as to supply the place of the flesh ; the skin is then inverted and hung up to dry, after using the arsenical soap, as above directed ; before doing which, in larger birds, a thread or small string may be drawn through the rump, and passed up the inside of the neck, and drawn through the bill, to prevent the head from stretching too much by its own weight. In larger specimens, where cotton or tow is not easily to be met with, well dried hay may be used.

The incision for removing the skin is frequently made under the wings. This may be done with marine birds to advantage. The Penguins and Divers may be skinned, by making the incision in the back.

The tongue should either be kept in the mouth, or sent home separately with the birds.

The greatest care must be taken to prevent the fat and oily matter, so common to sea-birds, from getting on the feathers : pounded chalk will be found an excellent absorbent for applying to these birds.

In sending home specimens of birds, they should be each wrapped in paper, and closely packed in a box ; and camphor, preserving powder, and strong aromatics, strewed amongst them, to prevent them from being attacked by insects ; and they ought to be kept in a very dry part of the vessel.

It is of the utmost consequence to know the color of the eyes and legs of birds, and these things should be carefully noted the moment they are killed ; and it should also be mentioned whether they are male or female ; such a memorandum ought to be attached to the birds by a ticket. The season of the year in which the bird is killed, must also be mentioned. It is also of much consequence to have good skeletons, and, for this purpose, the carcasses may be sent home in a barrel, either in spirits or a strong solution of salt and water.

Mr. Salt, while in Abyssinia, packed his bird-skins between sheets of paper, in the same manner as a *hortus siccus*, or herb-

arium, and they reached England in perfect safety, and made excellent specimens when set up. In warm climates, the boxes should be well closed, and the seams filled with warm pitch on the outside, to prevent the intrusion of insects; and the inside should be supplied with camphor, musk, or tobacco-dust, which will prevent the attacks of the smaller insects.

Till practice has given facility to the operator, it will assist in keeping the feathers clean, if, as he opens the skin of the breast, he pins pieces of paper or linen cloth on the outside; but, after a few trials, this will be unnecessary.

Some of the marine fowls are so fat that there is much trouble in separating it from the skin, and, in warm weather, great attention will be required to prevent it from running on the feathers. As much as possible should be scraped off, in the first place, with a blunt table-knife or palate-knife, and a quantity of powdered chalk applied, to absorb what remains, which, when saturated with the oily matter, should be scraped off, and a fresh supply used; after which, a much larger proportion of the preserving powder should be applied than in other birds which are not fat.

When shooting on the sea coast, if the Ornithologist is not provided with these requisities for absorbing the oil, which flows quickly from any wounds of the skin, he will find dry sand a tolerable substitute.

If, however, after every precaution, the oily matter should get on the feathers, the sooner it is removed the better, as, in birds where the plumage is white, if it is allowed to become hardened it will produce a very disagreeable appearance; and, besides, render that part particularly liable to the attack of insects. There are several effectual methods of removing the greasy stains; the first, safest, and best, is, by taking a quantity of diluted ox-gall—or, where it cannot be commanded, sheep's-gall, or that of any other animal—mix it with about double the quantity of water, and apply it with a sponge to the place which the fatty matter has touched, when it will immediately remove it. The next is by using a solution of salt of tartar, or potash, or soda. This must be made very weak, not exceeding half a teaspoonful to a cup of water, which will have the same effect as the gall. Whichever of these are used, the place must be immediately

afterwards washed in pure water, so as to leave none of the gall or alkaline substance remaining. The gall has a gummy tendency, and will glue together the fibres of the feathers, and, besides, it has a great attraction for moisture, and, in humid weather, will become damp, and therefore produce mould; the other alkaline substances must also be used with much caution and quickness, because they have the power of changing the colors of the plumage, so that they are most useful in white plumage, and therefore should only be used on colored feathers, where gall cannot be procured.

One general observation applies to the preservation of all animal skins, which is, they must be made perfectly dry, so that the sooner they are exposed to a free current of air the better; and unless they are speedily and thoroughly dried, the skin will become putrid and rotten, and the hair or feathers will consequently fall off. If a skin is properly dried, soon after it is killed, it will keep a considerable time without any preservative whatever, only it will be the more liable to be attacked by insects afterwards.

The following excellent general directions for skinning are given by Mr. Waterton:—"While dissecting, it will be of use to keep in mind, that in taking off the skin from the body, by means of your fingers and little knife, you must try to shove it, in lieu of pulling it, lest you stretch it.

"That you must press as lightly as possible on the bird, and every now and then take a view of it, to see that the feathers, &c., are all right.

"That when you come to the head, you must take care that the body of the skin rest on your knee, for if you allow it to dangle from your hand, its own weight will stretch it too much.

"That, throughout the whole operation, as fast as you detach the skin from the body, you must put cotton immediately betwixt the body and it, and this will effectually prevent any fat, blood, or moisture, from coming in contact with the plumage.

"As you can seldom get a bird without shooting it, a line or two on this head will be necessary. If the bird be still alive, press it hard, with your finger and thumb, just behind the wings,

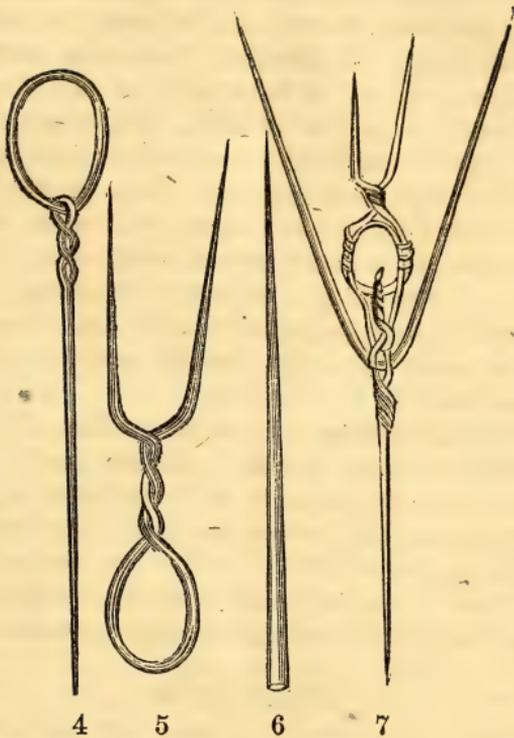
and it will soon expire. Carry it by the legs, and then, the body being reversed, the blood cannot escape down the plumage and through the shot-holes. As blood will have often issued out, before you have laid hold of the bird, find out the shot-holes, by dividing the feathers with your fingers, and blowing on them; and then, with your penknife, or the leaf of a tree, carefully remove the clotted blood, and put a little cotton on the hole. If after all, the plumage has not escaped the marks of blood, or if it has imbibed slime from the ground, wash the part in water, without soap, and keep gently agitating the feathers with your fingers, till they are quite dry. Were you to wash them, and leave them to dry by themselves, they would have a very mean and shriveled appearance.

“ In the act of skinning a bird, you must either have it upon a table, or upon your knee; probably you will prefer your knee, because, when you cross one knee over the other, and have the bird upon the uppermost, you can raise it to your eye, or lower it, at pleasure, by means of the foot on the ground; and then your knee will always move in unison with your body, by which much stooping will be avoided, and lassitude prevented.”

STUFFING BIRDS.

The first thing to be done in stuffing is to replace the skull, after it has been well anointed with the arsenical soap, and washed with the solution of corrosive sublimate inside. The thread, with which the beak is tied, is taken hold of by the left hand, and the head is repassed into the neck with the forefinger of the right hand, while the thread is pulled on the opposite side; and we are careful that the feathers, at the margin of the opening, do not enter with the edges of the skin. The bird is now laid on the table with the head turned towards the left hand, and the legs and wings adjusted to their proper situation. A flat piece of lead, about a pound in weight, is laid on the tail, while the feathers of the margins of the opening are raised by the fore finger and thumb of the left hand, to prevent their being soiled. The inside of the neck is now coated with the arsenical soap; flax is stuffed into it, but not too tightly. The back and rump are anointed, and the body should then be stuffed with tow, to about a third of the thickness required, so that the wire may have a sort of cushion to rest on.

Fig. 4 to 7.



4, the oval and head-wires of a bird separated; 5, the tail-bearers separated; 6, a leg-wire separated; 7 the body-wire, the head-wire, the tail-bearer and legs connected.

Four pieces of wire are then prepared, of the thickness proportionate to the size of the bird to be stuffed. The centre-piece should be somewhat longer than the body of the bird. At about a fourth of its length a small ring is formed, by the assistance of the round pincers or pliers, and the other end is pointed with a file. This wire is oiled, and introduced across the skull, and passed into the neck, through the centre of the flax or tow with which it is stuffed, the ring being situated toward the anterior part of the skull, for the purpose of receiving the points of each of the wires that are passed through the feet and thighs.

The following is the mode in which this performance is effected: A hole is bored with a brass awl, the calibre of the wire

which it is intended to use. The wire, which is to continue in the leg, is passed across the knee, and brought out interiorly, and, placing it into the ring above mentioned, the same operation is performed on the other side. The extremities of the wires of the legs, and the end of the central wire beyond the ring, are all twisted together with flat pincers, and then bent towards the tail. The tail-bearer is next formed, which consists of the fourth piece of wire, with which an oval is formed, by twisting the two ends two or three turns, so that they may form a kind of fork, with the oval nearly the length of the body of the bird; the two points of the fork must be sharpened with a file, and near enough to enable them to enter the rump, through which they must pass, and their points will be concealed by the rectrices, or large straight tail feathers, while the oval is within the body of the bird. If the bird is large, the tail-bearer must be firmly attached to the interior wires, by twisting a small wire several times round both. But unless the bird be large, it may remain quite free.

All the parts of the skin at which we can come must be thoroughly rubbed with preserving soap, the rump in particular, which should besides be soaked with the solution of corrosive sublimate. The stuffing is now proceeded with, by inserting chopped flax or tow, till it has attained its proper dimensions. The skin is brought together and sewed up, while we take the greatest care to separate the feathers at every stitch.

The orbits of the eyes are next finished, by inserting, with small forceps and a short stuffing stick, a small quantity of chopped cotton, while attention is paid to round the eyelids properly. The glass eyes are now inserted, taking care to place them properly under the eyelids. But, before fixing the eye, a little calcareous cement must be used, to prevent them from coming out. If any part of the nictitating membrane is visible below, it must be pushed up with the steel point.

The stuffing of the bird being now completed, the next thing is to place it either on a branch, or, if a bird which does not sit on trees, on a piece of plank; whichever of these it is, two holes are bored for the reception of the wires, which have been allowed to protrude from the soles of the feet, for fixing the bird. (See fig. 8.) These, of course, are pierced in such situations as are necessary for the attitude or position of the legs. The wires are put through

these holes, and twisted so as to secure the bird in its position. The attitude of the bird will, of course, depend upon the fancy and taste of the operator, and ought to be in conformity with the manners of the bird in a living state.

The wire frame-work, above described, is the most simple of any in its construction, and is better adapted for small than large birds. Indeed, it will hardly suit those of the larger species. The following is another method of constructing the framework, which may be used either in large or small birds :—

Like the former it is constructed of four pieces of wire. The centre piece should be double the length of the bird ; it is bent at a third of its length of an oval form, and twisted two turns, the shortest end being passed into the oval, and then raised against the longer end, so as to produce a ring at the end, outside of the oval, large enough to admit the two wires which pass from the feet to the inside of the bird. It is now twisted a second time, and firmly united to the longer end, which ought to be straight, with a sharp point, effected by means of a file. As before directed, it is rubbed with oil, and forced through the stuffing of the neck. It ought to be so constructed, by measurement, that the oval part of the wire shall be in the centre of the body inside. The wires of the feet and legs, as before directed, ought to be straight and pointed, and passed through the soles of the feet as before. When the point has penetrated, the other end of the wire may be bent, so that by means of it we may be able to assist in forcing up the remainder of the wire. The two internal ends of the foot-wires are twisted together, and curved within, so as to pass through the small circle or ring of the middle branch above the oval, to each side of which they are now attached with a piece of small string.

The tail-bearer is constructed on the same principles, and attached in the same manner, as before described, and the latter apparatus is introduced after the neck and back are finished in the stuffing.

This practice of introducing the neck-wire, after the neck is stuffed, was first adopted at the Jardin des Plantes at Paris, and is now invariably adopted in that establishment in preference to introducing it before the neck is stuffed. The neck of a swan or other long-necked and large birds, are even done so. It is unquestionably the best plan which has hitherto been discovered, as it preserves the cylindrical shape of the neck.

MR. BULLOCK'S METHOD OF STUFFING BIRDS.

Mr. Bullock, of the London Museum, Egyptian Hall, had another method of arranging the wires which, after what we have already said, will be easily comprehended by a reference to fig. 8, where we have given a figure of his mode. After the skin is taken off and prepared, different sized, nealed, iron wires are procured, according to the size of the bird they are to support. The skin is laid on its back without stretching it; cut two pieces of wire, the one rather longer than the bird, and the other shorter, so as not to reach to the head of the bird; twist them together, sharpen the ends of the longer by means of a file, and pass one

Fig. 8.



Mr. Bullock's method of inserting the wires in setting up a bird.

end through the rump and the other through the crown of the head, near the base of the bill. Care must be taken not to extend the neck beyond its ordinary length—a very common fault in most preservers. Lay a little tow along the back of the skin for the wire to rest on, then take two other pieces of strong wire and file them to a point at one end; these are passed through the soles of the feet and up the centre of the leg-bone, or tarsus. When within the body, they are to be fastened to the first wires by twisting them together, which, when accomplished, may be supposed to represent the back bone. The wire should be left two or three inches out of the soles of the feet, to fasten them in a standing position, as before directed. Two smaller wires are then passed through the wings, as in the legs, and afterwards fastened to the back-wires a little higher up than the leg-wires, taking care that no part of the skin is to be extended beyond its natural position.

A NEW AND EASIER METHOD OF BIRD SKINNING AND STUFFING.

A fair specimen being obtained, take common cotton wadding, and with an ordinary paint-brush stick plug the throat, nostrils, and, in large birds, the ears, with it, so that when the skin is turned no juices may flow and spoil the feathers; you must then provide yourself with the following articles:—A knife of this kind, which is very common; a pair of cutting pleyers, a pair of strong scissors, of a moderate size; a button-hook, a marrow-spoon, and a hand-vice. With these, a needle and thread, and a sharpener of some kind, to give your knife an occasional touch, you are prepared, so far as implements go. Then provide yourself with annealed iron wire of various sizes; some you may buy ready for use, some not; but you can anneal it yourself by making it red hot in the fire, and letting it cool in the air. Common hemp is the next article, cotton wadding, pounded whitening, and pounded alum, or chloride of lime; as to the poisons which are used, they will be spoken of by and by. You should also have a common bradawl or two, and some pieces of quarter-inch pine whereon to stand the specimens when preserved, if to be placed as walking on a plane; if not, some small pieces of twigs or small branches of trees should be kept ready for use, of various sizes

according to the size of the bird; something of the form of Fig. 9. Cedar, or common laurel cut in December, will be found to answer best, but this must be regulated by fancy and the require-

Fig. 9.



BRANCH FOR MOUNTING A BIRD.

ments of the case ; oak boughs are sometimes of a good shape.

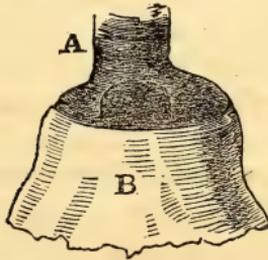
The best time for preserving specimens is in Spring, because then the cock birds are in the best feather, and the weather is not too warm. In mild weather three days is a good time to keep a bird, as then the skin will part from the flesh easily. If a specimen has bled much over the feathers, so as to damage them, wash them carefully but thoroughly with warm water and a sponge, and immediately cover them with pounded whitening, which will adhere to them. Dry it as it hangs upon them slowly before the fire, and then triturating the hardened lumps gently between the fingers, the feathers will come out almost as clean as ever. To test whether the specimen is too decomposed to skin, try the feathers about the auriculars, and just above the tail, and if they do not move you may safely proceed.

Lay the bird on his back, and, parting the feathers from the insertion of the neck to the tail, you will find in most birds a spare space. Cut the skin the whole length of this, and, passing the finger under it on either side, by laying hold of one leg and bending it forward, you will be able to bring the bare knee through the opening you have made ; with your scissors cut it through at the joint ; pull the shank still adhering to the leg till the skin is turned back as far as it will go ; denude the bone of flesh and sinew, wrap a piece of hemp round it, steeped

in a strong solution of the pounded alum, and then pull the leg by the claw, by which means the skin will be brought again to its place.

After having served both legs alike, skin carefully round the back, cutting off and leaving in the tail with that into which the feathers grow, that is, the "Pope's nose." Serve the wing bones the same as the leg, cutting them off close to the body, and turn the skin inside out down to the head. The back of the skull will then appear, and you will now find it of advantage, as soon as you have got the legs and tail free, to tie a piece of string round the body, and hang it up as a butcher skins a sheep. Make in the

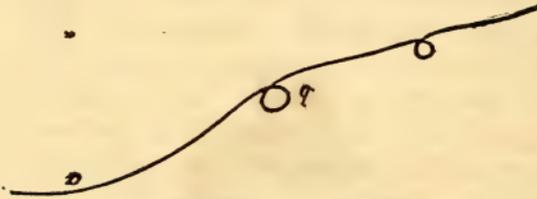
Fig. 10.



back of the skull a cut of the annexed form, with your knife, which you can turn back like a trap-door, and with the marrow-spoon entirely clear out the brains ; A representing the neck, and B the skin turned back. Having done this, wash the interior of the skull thoroughly with the alum, and fill it with cotton wadding. The next operation requires care and practice—namely, to get out the eyes. This is done by cutting cautiously until the lids appear, being careful not to cut the eye itself, and you can then, with a forceps, which you will likewise find useful, pull each from its socket ; wipe the orifice carefully, wash it with the alum solution, and fill it with cotton wadding. Cut off the neck close to the skull, wash the stump, and the whole of the interior of the skin with the alum, and the *skinning* is done. Now comes the stuffing. The ordinary mode used by bird-preservers is a simple one, and answers very well ; there is a French method, however, which has its advantages, and will be adverted to hereafter. Take a piece of the wire suitable to the size of the bird—that is, as large as the legs will carry—and bend it into the following form, a

representing the neck, *b*, the body, and *c*, the junction of the tail, allowing sufficient length of neck for the wire to pass some distance beyond the head, and being sharpened at each end, which may be done by obliquely cutting it with the piers. Wind upon this wire hemp to the size of the bird's body, which you should have lying by you to judge from, and it will present something of this appearance. You can shape it with the hand, but be careful not to make it the least *too large*; and, after you have finished it to your satisfaction, you may singe it, as the poulterer would singe a fowl, which will make all neat; but be particular to wind the

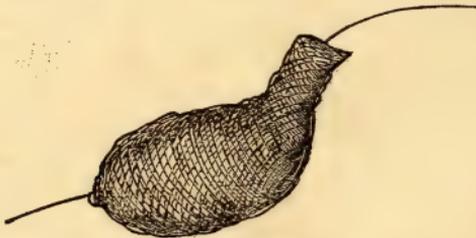
Fig. 11.



Wire Bent for Inserting.

hemp very tight. Then take the skin, lay it on the table on its back, and pass the wire at the head into the marrow where the

Fig. 12.



The Hemp Wound on the Wire.

neck is cut off, through above the roof of the mouth, and out at one nostril, and draw it up close to the skull; turn the skin back, and draw it down over the hemp body, and pass the wire spike, protruding at the lower end, through the flesh upon which the tail grows, about the centre, and rather below than above. The skin may now be adjusted to the hemp body, and sewn up, beginning from the top of the breast, and being particularly careful

always to take the stitch from *inside*, otherwise you will draw in the feathers at every pull. At first sew it very loose, and then, with the button-hook, draw it together by degrees.

With the plyers cut two lengths of wire, long enough to pass up the legs and into the neck, and leave something over to fasten the bird by to the board or spray upon which it is to be placed. The next operation requires some address and great practice, namely, the passing the wire up the legs. This is done by forcing it into the centre of the foot, and up the back of the legs, into the hump body, through it obliquely, and into the neck, until it is pretty firm. In doing this, you must remember the ordinary position of a bird when alive, and, therefore, instead of passing the wire the whole way *within* the skin of the leg, when you get to the part where you have cut off the bone, that is, the knee-joint, pass it through the skin to the outside, and in again, through the skin, from the outside, where the knee would come naturally in the attitude of standing or perching—it makes little difference which. This is essential, because, if the wire be passed the whole way *inside* the skin, it produces a wrong placing of the legs. Fig. 13 will illustrate this, a repre-

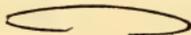
Fig. 13.



senting the line in which the wire should run. The bird is now stuffed, and you may at once place it upon a spray or board, as the case may be. In placing a bird upon a spray, the first joint should be bent almost on a level with the foot; and, in placing a bird on a board, one leg should be placed somewhat behind the other. If the wings are intended to be closed, as is usu-

ally the case, bring them into their place, which may be done by putting the fingers under them, and pressing them together over the back; you may then pass a needle, or large pin, of which you should have a good supply by you, through the thick part of the upper wing into the body, and so by the lower wing, and if you allow these to protrude, you may fasten to one of them a piece of thread, and wind it carefully and lightly round the body, which will keep the feathers in their places, and this thread should be kept on for a fortnight or three weeks, until the bird is dry. The tail should be kept in its place, also, for the same time, by a piece of thin wire bent over it, thus :

Fig. 14.



The only thing now to do is to put in the eyes. The color, of course, depends on the bird, and these you may buy at any fishing-tackle store. If you do not use eyes too large, you will find little difficulty; the juice of the lids will act as a sufficient cement. As to the mounting, I shall say nothing about that now, but shall only advert shortly to a French method of preserving, which is more difficult, but has the advantage of superior firmness. It is this: Measuring from the insertion of the neck to the tail, make a wire frame of this form, the measure taken being from A to B.

Fig. 15.

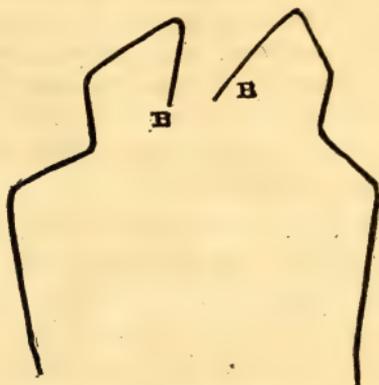


Wire Used in French Method.

Upon this wind hemp for the neck only, and place in the skin in the same way as before directed, only that, instead of one wire being passed through that in which the tail grows, it is a fork that is passed through it. Having formed this frame, fit on to it two legs, thus: and after the frame itself is in the skin, pass these from the *inside* down each leg, instead of from the outside, and fasten them on to the frame with the plyers, by twisting the ends, B B, round the frame, c, in the first figure. This will make all firm, and you can then fill the body with cut hemp, and sew up. One word

as to the other preparations used by bird preservers. These are either corrosive sublimate or regulus of arsenic, which is yellow and of a consistence like butter. As I have said before, in cold weather, when there are no flies about, alum will do perfectly

Fig. 16.



The Wire Legs.

well; in warm weather either of the two others may be used. I should prefer the former—corrosive sublimate—as the other is “messy,” and the chief object is to dry up anything which can be attacked by flesh-seeking insects. When you have finished your bird, you can lay the feathers with a large needle—it is as well to have one fixed in a handle and kept for this purpose—and, tying the two mandibles of the bill together with a piece of thread until the whole specimen has hardened and dried, the work is done.

CHAPTER II.

THE ART OF MOUNTING BIRDS, DRIED SKINS, FEATHERS, ETC.

MOUNTING IN GENERAL.

We will suppose that a proficiency, from practice, has been attained in the art of bird-preserving, according to the instructions given. The proficiency in preserving may apply only to the preservation and the form, great and necessary things, no doubt,

as preliminaries ; but, like matter without manner, of little avail alone. For attitude, I would say, as has been said to many a young artist, go to Nature, and there you will find an original in perfection. Would you make a willow-wren look like a willow-wren, watch him as he there hangs upon the weeping birch, or stands on a bough peering in quest of food ? Each bird has its own manner, and if you cannot hit the manner, or make your stuffed skin so far amenable as to assume the attitude, it is either ill-stuffed, or you want the requisite knowledge of that which you should copy.

BIRD PINNED UP.

Having fixed on the attitude, it now only remains to put the feathers into their natural order as smoothly and regularly as possible ; and to keep them in this state

they should be bound around with small fillets of muslin fastened with pins, as represented in fig. 17. The bird should then be thoroughly dried, by placing it in an airy situation, if in Summer ; or if in Winter, near the fire, but not so close as to affect the natural oil contained in the feathers. The want of proper attention in drying ruins many a fine specimen ; if long kept damp putridity ensues despite all preservatives, when the skin will become rotten, and the feathers will soon fall off ; besides, the mold and long-continued damp change the chemical properties of the preservatives used.

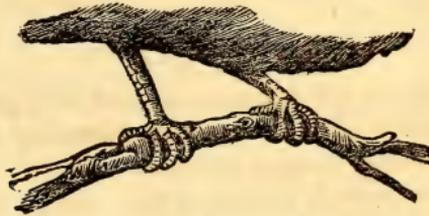
Fig. 17.



After the bird has been thoroughly dried, the fillets are removed ; the wire which protruded from the head is cut off as close to the skull as possible, with the wire-cutting pincers elsewhere shown. It must then be attached to a circular, or other shaped piece of wood, with the generic and specific name and sex, as well as its country and locality attached to it, on a small ticket, when it may be placed in a museum.

Young hands commonly suppose that a bird should stand bolt upright, with the legs almost perpendicular, or at right angles to the perch. This is a great mistake, and never to be found in

Nature. Do *we* stand rigid, like a foot-soldier on drill? Does not a bird, as well as ourselves, accommodate itself to the thing on which it rests? Assuredly it does; for birds do not, as a young bird-stuffer endeavors to do, find always a perch to rest upon in the plane of the horizon. It therefore follows that, as he keeps himself upright, his legs must accommodate themselves to his perch. So in the ground-birds there is a gentle slope backwards from the hind toe, the balance being preserved in both



Position of the Legs on the Perch.

cases by throwing the body forward in proportion. It is not uncommon to see birds preserved with wings and tail spread. Now, ordinarily speaking, this is very objectionable, because very unnatural. A bird preserved is supposed to represent a bird in a state of repose, that is, not in flight; the only modification allowable being with regard to those birds whose manner it may be to have the wings more or less open on occasions; thus the falcon tribe, supposing they are represented as devouring a quarry, or two birds toying with each other. It may be that a bird essentially aerial, like the wift, or perhaps some of the terns or the frigate bird, may be represented as actually on the wing. In this case, of course, the wings must be spread; and this is best done by passing a wire, not too thick, from the base of the quill-feathers on the under side, alongside the bone into the body, where it should be carefully and coaxingly inserted towards the

Fig. 19.



Fig. 20.



Fig. 21.



Fig. 22.



Proper positions of Birds.

tail until you feel that you have a pretty good hold. You may then pass it carefully under the longest quill-feather, and through the back of the case, and fasten it by bringing it back again through and clinching it, concealing it so by the oblique position of the bird that it is not detectable. It is obvious that by passing the wire alongside the bone, you may bend the wings to any angle you please. With regard to the case there are two methods: one a bell-glass, which, glass being now so reasonable, is certainly a very pretty and reasonable way of mounting, but inapplicable to birds which are to be placed on a wall, or to be represented flying; although this may be managed by attaching one wire from the point of the wing to a twig sufficiently firm, which it will scarcely appear to touch, if managed adroitly. It is likewise indispensable that a bird for a shade should be stuffed so well as to look nicely in all positions. One thing must always be remembered, *do not have your case a shade too large*, just clear the object so as not to stint it for room; and in flat cases this applies chiefly to depth, for it should have sufficient light, or it will not look well. Wooden cases should be made as slight (in thickness) as is consistent with firmness; well-seasoned white deal is best; and the case should be formed of back, top and bottom, open at the front and sides, and at each corner of the front two slight deal supports, rabbited on their inner edges, and presenting on the whole this appearance.

Having the case prepared, it should be papered with ordinary demy paper on the top and back within, and, when the paste is dry, washed over carefully with size and whitening, tinted with a little stone-blue; some add some touches of white subsequently to represent clouds, the ground representing the air; some also paste a landscape on the back, but this must be good, or you had better have plain color. The bird to be placed in this case is either perching, standing, or flying. For the latter, directions have been given. As to the two former, the perch must be firmly fixed in the small piece of flat wood upon which it previously stood, and put in upon it, the wood being fastened to the bottom of the case, either by screwing from below, from above, or gluing with stout glue, or by passing wire through two holes in the bottom of the case and the wood, and clinching above. In this case, or in screwing from below, let the wire or the screw into

the wood, and putty over, and so if the bird is represented standing. The bird being fixed, the next thing is the decorating or "weeding," as it is technically called, and here we enter upon a subject so entirely of taste and fancy, that no fixed rules, as to the disposition, can in all cases be given. One rule applies equally to this as to landscape painting, viz., that there should always be a compensation of objects. That is, if you have a tuft of grass on one side which rises towards the top of the case, there should be something in the lower opposite corner to strike the eye, but not to rise above midway up at furthest, and the ground, or floor, should not be over-furnished with moss, &c. After the bird is fixed, the whole bottom should be carefully glued over with thin glue, taking care, where the bird's feet are on the bottom, not to touch the toes with the glue. Some fine-sifted sand or gravel should then be sifted over it, and it will adhere wherever the glue has touched; for this purpose a small tin shovel is best, something in this form, and about two inches wide by four long, with a handle in proportion, which can be made to order at any tin-man's for a trifle.

Everything used in "weeding" should be baked in a slow oven, otherwise spider's eggs and minute creatures, which are pretty sure to be contained in it, will make their appearance after the case is closed in the disagreeable form of destroying your specimen. Moss, &c., by being slowly dried, will also keep its color better. Yellow moss, found on the roofs of old barns, and dark gray of the same species, are very generally useful; and where yellow moss cannot be had, the white or gray may be colored with chrome, and looks as well. Water plants fade, being more or less succulent, and hence a little common water-color with gum will be used with advantage and look less artificial than oil paint, which is often used. Fern looks very pretty as an adjunct for heath-birds, but it should be dried gradually and carefully, when *quite* full grown, and a small touch of light green, permanent white forming a portion of it, will give it a freshness and more natural appearance. Grass in seed (not in flower) of various kinds is also a very pretty addition; but bird preservers have a habit of using dyed grass, and yellow and red *Xeranthymum*, or Everlasting, which is certainly to be avoided, and indeed anything which is unnatural. If it is wished to introduce a lump of earth, or an

apparent bank, a piece of thick brown paper, bent to the requisite shape, and glued over and covered with sifted sand or gravel, has a very good effect ; but insects and butterflies, or artificial flowers, unless they are extremely natural, should certainly be avoided. Regard should also be had to the season at which the bird is usually seen. For instance, Summer birds are, of course, surrounded by green and living objects, but Autumn or Winter visitants by decaying or dead herbage. It has often been made an experiment to represent snow, but it is difficult to obtain anything white enough, and at the same time of a crystalline character, which, of course, it should be. Potato farina nicely dried, mixed with Epsom salts pounded very fine, does not make a bad substitute ; but the real difficulty lies behind, namely, in fixing it, and, more than all, the least damp takes very much from its appearance, if it does not destroy the effect, and hence we must have recourse to mineral aid, and any very white mineral powder mingled with pounded glass is perhaps best. It is unnecessary to say that the herbage upon which it is meant to rest should be touched all over with paste, not glue, and the white mixture shaken over and left to dry. What will heighten the effect very much, if prettily executed, is a black landscape with a dark leaden sky and nearly black earth mingled with moss. To represent water, a small piece of looking-glass, surrounded with moss, etc., answers very well. The bills and legs of birds should be always varnished, and where the natural color fades after death it should be restored by a thin coat of oil-color of the required shade. The bird being fixed and the case garnished, nothing remains but to put in the glass ; this is in three pieces, one for the front and a piece at each end. This can be pasted in with very strong paper round the edge, advancing sufficiently over the glass to hold it. In doing this it is not necessary to be very particular to avoid pasting the glass, as after it is dried it can be wiped clean with a damp cloth. The last operation is a very simple one, and done in a few minutes. You must procure some black spirit-varnish, which you can make yourself by dissolving the best black sealing-wax in spirits of wine, and should be kept corked ; when this is good it acts as paint and varnish at the same time, and dries as fast as it is put on. One or two brass rings screwed on at the top of the back of the case will finish the bird,

and if the case be nicely and closely made, there is no limit of time to which the preservation of the specimen may not extend.

METHOD OF MOUNTING DRIED SKINS.

We must now say something respecting the setting up of skins which have been preserved by travelers, and sent home from distant parts.

The general method is exactly the same as in stuffing recent specimens. There are, however, some preliminary steps, which it is necessary to know.

If the specimen sent home has been partially stuffed, our first business is to undo the stitches, if it has been sewed—which was an unnecessary process. We then remove the whole cotton or tow from the inside, by the assistance of forceps, and from the neck with a small piece of wire, twisted or hooked at the end. Having finished this, small balls of wet cotton are placed in the orbits of the eyes, and the legs and feet are wrapped round with wet cotton or linen rags. A *damp* cloth is then thrown over the bird, and it is allowed to remain in this state till next day. The neck and body are then filled with wet linen or cotton, and it will be ready for commencing setting up in four or five hours.

The eyes are now put in, as directed in the recent subjects, and then stuffed in exactly the same manner. Some difficulty will, however, be experienced with respect to the leg-wires, and it will require more time and care, from the dryness of the legs, to get the wire to penetrate. Having proceeded so far as to get the bird generally formed, the wings are next adjusted; this also is frequently difficult, owing to the stiffness of the tendons, and want of proper attention in skinning and drying them at first. Indeed, with some of the South American birds, a proper adjustment of the wings is found impracticable, owing to the attempts of the native Indians of Guyana, who seldom dispose them properly.

When these skins—frequently exceedingly valuable from their rarity—are undone, to be remounted, it is oftentimes found utterly impossible to get the wings to take a natural set, in which case there is no other remedy but cutting them off close to the body, and fixing them anew. The scapulars are separated, they are softened with damp cloths, and then wrapped up with bands of sheet lead, to give them a proper set. When we have got them in

their natural shape, they must be fixed to the sides by cement and cotton, and a long pin through each, with the head concealed amongst the feathers. The scapulars, which we have cut off, must then be cemented on, and they will effectually cover the joining of the wings. The bird being now arranged, and all the feathers adjusted, it is wrapped round with small bands of fine linen or muslin, and set aside till thoroughly dry.

Should any feathers be disengaged during the mounting, they must be kept, and, when the bird is dry, we can replace them in their proper situations with a pair of forceps, after they have been touched on their shafts with the cement; the feathers around the place in which we intend to insert them, must be held up with the probing-needle.

If any of the feathers are deranged in mounting, and have got a wrong set, the only way to remedy the defect is to pull them out with forceps, and re-insert them with cement.

OF MOUNTING BIRDS, FEATHER BY FEATHER.

Rare birds are frequently received from foreign countries, the skins of which are in such a state of decay, that it is impossible to mount them by the ordinary processes above described. The only way in which they can be preserved, is to mount them feather by feather, which, however, is a very tedious method. It is as follows:

Procure a piece of soft pliable wire, such as is used by bell-hangers; or take some of the ordinary wire used, and make it red-hot in the fire, and allow it to cool gradually, when it will become quite pliable. Take five pieces of this, of different lengths, and form them into the skeleton of a body; namely, two for the back, one on each side, and one to represent the breast bone. Imitate the shape of the bird's body, as nearly as possible. The wires must be roughened with a file, at the place where all the wires meet, at the neck and rump; and first wrap the place next the neck round with strong thread or fine brass wire. Two pieces intended for the back must bend gently downwards, and be gradually separated from each other towards the centre, and brought together again at the place intended for the rump, whither they must intersect each other, and be twisted two or three times, to keep them in their place; they are then spread out as supports for

the tail ; the side pieces are next formed, so as to represent the natural bulge of a bird's body, and attached to the rump ; the piece representing the breast is then formed, joined at the rump, and afterwards continued as long as the other tail-pieces, to support the centre of the tail ; while at the front extremity a piece is left, for the purpose of forming a neck to which to attach the head. Two leg-wires are attached to the side-wires, being rolled round them for several turns, making a framework the shape of the bird.

After this body has been properly formed, it must be wrapped round with tow-silver, and the neck thickened to its required dimensions. When this is accomplished, the head, legs, wings and tail are softened in the usual manner ; the eyes are then fixed in with some cotton introduced into the orbits, with a little of the cement. The wings and tail are now placed on a table, with a flat leaden weight above each, to restore them to their natural shape. The leg-wires are then passed through the legs, commencing at the top, and bringing them out at the soles of the feet, and left with a piece extending beyond the claws.

The tail is now fixed on, by first attaching to it a quantity of cotton with the cement, and, when dry, it is fixed to the part intended as the rump.

The feet of the bird must be fixed into a piece of wood, as a perch, the ends of which must be left some inches beyond the body. The end next the tail is fixed into a table-vice, with the belly upwards, and the head pointing towards the operator. The feathers are now put on, commencing, under the tail, or crissum, with what are termed the under-tail coverts ; a coating of cement must be previously laid on, to attach the feathers with. It is proceeded with upwards to the breast, and finally the length of the neck, taking care to put the proper feathers on their respective sides, as the side-feathers have all an inclination to one side. The bird is now turned with the back up, still keeping the head towards the stuffer ; and the wings are fixed on with cement, and pins forced through the beards of the feathers to conceal the heads. When this is done, put on the feathers of the rump, and proceed upwards, as has been done with the belly. After reaching the top of the neck, the head is then fixed on with some cotton immersed in the cement, and allowed to dry before attempting to put on the feathers.

In this mode of mounting a bird there are several things which must be attentively adhered to ; these are—first, not to put the feathers too thick, for there is a danger of running short ; secondly, all the shafts of the feathers must have a small bit cut off the tip, so as to admit the cement and to give them a firmer hold ; and thirdly, that the feathers should all occupy their respective parts ; and fourthly, that they should be arranged as they are in nature on these parts, as the disposition of every part of the body is peculiar to itself.

At first, this mode of setting up birds will be found a difficult task, but, by a little practice and experience, it will become familiar and comparatively easy, although it will always be found a tedious process. We have seen some specimens set up in this way, which we could hardly detect from those mounted in the ordinary manner.

Besides what we have already said concerning the stuffing and preparing of birds, there are many details connected with particular species which demand our attention, and which can only be described as regarding that species. It will, however, be impossible for us to enter into all these minutely, but only give a few examples as general guides. We shall take these in systematic succession.

PRESERVATION OF COLORS.

In the preservation of the feathers of Birds, little else is required to prevent the dissipation of their colors than to keep them as much as possible from air and light. These two agents, which were indispensable to their beauty and perfection in a living state, now exercise their influence as destroyers, and that influence will sooner or later work its ends according to the quality, texture, or color of the object with which it is contending. The feathers are now deprived of two agents, which in a living state contributed to their vigor and their beauty, namely, the internal circulating juices which they received from the body of the animal, and the external application of oil by the bill of the bird, supplied from a gland which is placed over the rump of all birds.

The colors of the rapacious tribes are not so evanescent as those of many others, as they, for the most part, are composed of

intense browns and blacks, which are not so easily absorbed by light or air, so that they continue for a very long period without any sensible difference. There are, however, certain other points which are liable to almost immediate change of color after the death of the animals, and these are the cere and skin of the legs and feet, and the naked skin on the heads and necks of Vultures and their congeners. We shall treat of these individually.

Now, as all these colors which we have described are liable to change, immediately after death, it is evident that considerable nicety will be required to give the preserved specimen the appearance of nature. These must, therefore, be supplied artificially with the varnish colors, which we have particularly described in their proper place, as also the combinations for the formation of compound colors. The reddish-brown color mentioned, of which the fold is composed, must be touched by a mixture of the scarlet varnish, with a little powdered burnt umber, and the blue streaks with which it is traversed, colored above with cobalt blue. All the varnish colors have a tendency to shine, which, it will be evident, is not the character of any part of the skin, or earuncle of the bird described. As soon, therefore, as it is thoroughly dry, which will be in about an hour, the whole surface must be gently rubbed with very fine sand paper, which will completely remove the gloss and give the appearance of nature.

Some nicety will be required in painting betwixt the hairs, but it can be easily managed with a little caution. Sometimes these hairs are liable to become brown, in which case they can be touched with the black varnish.

As these birds are inhabitants of warm climates, some care is requisite, after killing them, to prevent decay; the tendons of the legs should be extracted to prevent their being attacked by moths, and their place supplied by some cotton and preservatives. The tendons are extracted by means of a longitudinal incision made behind the tarsus. The edges of this incision can easily be brought together when the bird is under the process of preparation.

CHAPTER III.

COLLECTING AND PRESERVING BIRDS' EGGS AND NESTS.

Few objects of Natural History are more interesting than the nests of birds. To the reflecting naturalist, they open up a wide field for inquiry. Speaking of the examination of birds, in the exercise of their mechanical arts of constructing nests, Professor Rennie says: "This work is the business of their lives—the duty which calls forth that wonderful ingenuity which no experience can teach, and which no human skill can rival. The infinite variety of modes in which the nests of birds are constructed, and the exquisite adaptation of the nest to the peculiar habits of the individual, offer a subject of almost exhaustless interest." The number and variety of the eggs of birds are curious subjects of contemplation, and should be carefully noted whenever opportunity offers. They are as essential to the personal history of the species, as any other part of our inquiries.

The eggs are emptied of their contents by making a very small hole at each end with a point. By blowing at one of the ends, the contents will escape by the other, unless the young has been already formed; in which case a larger hole must be made in the side of the egg, and the contents removed with a small hook. The hole should then be stopped up by pasting a little gold-beater's leaf over it. The eggs are then either returned to their nest, in which they ought to be cemented, or should be fixed down by one side to cards, with the name and locality attached.

The best manner of conveying loose eggs to a distance, is to put some cotton at the bottom of the nest, and then another layer above them. The nests should all be put in separate boxes, if possible, and so packed that the pressure of the lid may not injure the eggs, or a box with several compartments should be used, taking care that each is carefully marked. It would also be of consequence to have the nests attached to the branches, with those species which build on trees, which will enable us to trace the ingenious means employed by those little animals in constructing their habitations. In sending home specimens from a foreign country, the seams of the box should be covered by pitched cloth, to protect them from the influence of moisture.

To preserve the shells of eggs, first take care to clear them of their contents; get a small, fine-pointed common syringe, such as is sold in toy-shops for a penny or twopence, and inject the specimen with water until it comes out quite clean. When an egg has been partly hatched or addled, the removal of the contents generally includes that of the internal membrane or pellicle; this makes the shell weaker. When the specimens are quite clean internally, and have become dry (which will be in a day or two), take the syringe and inject them with a strong solution of isinglass (with a little sugar-candy added to prevent its cracking); blow this out again whilst warm. Let the shell get dry, and then wash the outside with a soft wet cloth to remove saline particles, dirt from the nest, &c. This method varnishes the inside, and the first specimen on which it has been tried was the before-mentioned hedge-accentor's egg, which is to this day as bright in color as a fresh specimen.

Also in a pair of nightjar's eggs, of which species the delicate grey tint is particularly evanescent, one was injected in the manner described, and the other was not; in the first the grey is still perfectly defined, in the other it has entirely disappeared. Eggs which have lost their internal pellicle become strengthened by this process, and those which have not lost their color greatly improved.

CHAPTER IV.

SKINNING, PRESERVING, AND SETTING UP REPTILES, FISHES, AND MOLLUSCOUS ANIMALS, ETC.

TORTOISES AND TURTLES.

SKINNING.—The first operation is to separate the back and breast shells with a strong short knife, or chisel. If the force of the hand is inadequate, a mallet may be used, taking care not to strike so hard as to crack the shell.

These two bony plates being covered by the skin, or by scales, the scapula, and all the muscles of the arm and neck, in place of being attached to the ribs and spine, are placed below, from which cause the tortoise has been termed a retroverted animal. The vertebral extremity of the scapula is articulated with the shield, and the opposite extremity of the clavicle with the breast-plate in

such a manner that the shoulders form a ring for the passage of the windpipe and gullet.

After the turtle is opened, all the flesh which adheres to the breast-plate, and also to the upper shell, is removed, while attention is paid to the parts as above described. The head, fore-feet, and tail are skinned as in quadrupeds; but none of these must be removed from the upper shell, but left attached.

All the fleshy parts being removed, the shells are washed out with a sponge, and carefully dried. They are then slightly rubbed with the arsenical soap.

STUFFING.—Wires are now passed through the middle of the legs, after the skin has been rubbed with the preservative. The skull is returned to its place, and the whole of the head, neck, and legs stuffed with chopped flax or tow. The parts of the skin which have been cut are then sewed together. The back and breast plates are then united by four small holes, being bored at their edges, and united by strings or small wires. The junction of the bones may then be attached with the cement, colored so as to correspond with the shell.

If the calipash is dirty, it may be cleaned with a slight solution of nitric-acid and water; afterwards clean washed, oiled, and then rubbed hard with a woollen rag, to give it a polish.

CROCODILES AND LIZARDS IN GENERAL.

SKINNING.—All this tribe are skinned in the same manner as quadrupeds. Care is, however, required in skinning the tails of the smaller species, as they are very liable to break. The skins being of a dry nature, require but little of the preservative. After they are thoroughly dried they will keep a very long time without decay.

STUFFING.—Stuff them as directed for quadrupeds. They admit of but little variety of attitude. The small species are exceedingly apt to change color in drying; which must be imitated with the colored varnishes, and afterwards dimmed with sand paper. To keep them in their natural colors, they should be preserved in spirits.

The skins of such as are glossy should be varnished after they are perfectly dry.

SERPENTS IN GENERAL.

SKINNING.—In skinning serpents there is some nicety required, to cut them so as not to disfigure the scales; the opening should be made in the side, commencing at the termination of the scales; and they should on no account be divided, as upon their number the species is mostly determined.

It is a very frequent practice to send home serpents without the head, which renders them quite unfit for any scientific purpose. This proceeds from the fear of receiving poison from the fangs. But there is not the slightest danger of being affected, as these can easily be cut out by means of pincers. The head should be cleaned and the brain removed, in the same manner as recommended for birds and quadrupeds, the skull anointed and then returned into the skin.

When the skin is removed, it may be rolled up and packed in small space. The simplest way to preserve small species is to put them in spirits, which must not be too strong, as it will destroy the colors.

Mr. Burchell, in his four years' journey through Africa, glued the skins of the smaller serpents perfectly flat on paper, which preserved the size of the animal, and the skin retained all the beauty of life.

STUFFING.—The skin, if not recent, must be first softened in the manner recommended for birds. A piece of wire is taken, the length of the animal, which must be wrapped round with tow till it is of a proper thickness, and above the whole a spiral band of silver should be carefully wrapped. It is then placed inside of the skin, and sewed up. The eyes are placed in, as directed for quadrupeds and birds. When dry, give the serpent a coat of varnish, and then twist it into any attitude wished. A favorite and striking one is to have it wound round some animal, and in the act of killing it.

FROGS AND TOADS.

SKINNING.—The mouth is opened, and the first vertebræ of the neck is cut. The whole inside of the mouth is cut out with scissors. The two jaws are next raised up and the skin is pushed back with the fingers of the right hand, while the body is drawn

back in a contrary direction with the other hand, and the whole body is then drawn out at the mouth. The legs are then returned to their proper place.

STUFFING.—The simplest method of stuffing these animals, is with sand. A small funnel is placed into the mouth, and pour in well dried sand. When full, a small piece of cotton is pushed into the throat, with some of the cement, to keep the sand from escaping on moving the animal.

The Frog is then placed on a board, and in an attitude. When quite dry, give it a coat of varnish. When this has perfectly dried, very small perforations are made under the belly with the point of a needle, and the sand allowed to escape, leaving the body in its natural form.

These animals are liable to change of color from drying, and should, therefore, be painted with the varnish to their natural hues. There is less difficulty with Toads in this respect, as they are usually of a brown color, and not liable to much change.

They may be perfectly preserved in spirits.

FISHES.

The best method of securing the scales and colors of Fish, is, as soon as they are caught, to apply cambric or tissue paper to them, which will soon dry and adhere firmly; the body may be then taken out and the skin dried. When the skin is to be stuffed, roll it in a moist cloth, which will not only render it pliable, but also soften the tissue paper, so as it can be removed, when the colors will be found to be much brighter than by any other method with which we are yet acquainted.

LAMPREYS, EELS, AND OTHER FISH OF SIMILAR FORM.

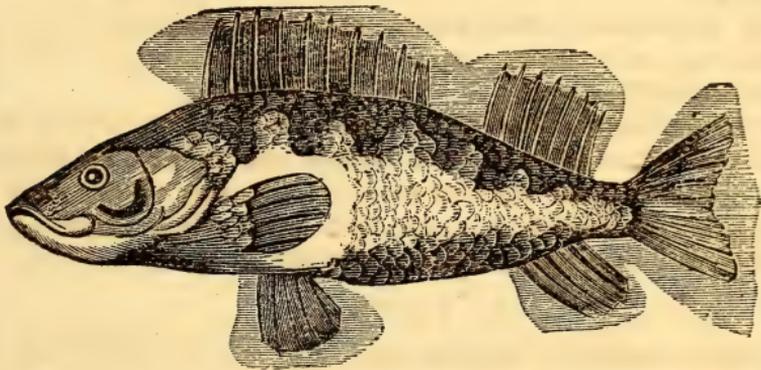
These species may be skinned in the same manner as Frogs and Toads, by drawing the body through the mouth.

OF SKINNING FISH IN GENERAL.

The fish should be procured as fresh as possible, more particularly if it is one of those on which the scales are loosely attached. Lay it on one side and cut the gills with a pair of scissors; then introduce a little tow or a piece of sponge into the place to prevent the blood from flowing during the process of skinning; let the fins be raised and gently extended, and two pieces of paper,

something the shape of each, be placed under them, only extending a little beyond them. Coat the paper with a weak solution of gum-arabic, and put a piece of similar size on the top of the fin; by pressing these gently they will adhere and dry in a few minutes; these will keep the fins extended, and preserve them during the operation of stuffing. When these are dry, take a piece of tissue paper or thin silk, and press it gently on one side of the fish. The natural glutinous matter which

Fig. 23.



The Perch, showing the manner in which the paper is attached for the purpose of extending the fins.

covers the scales will be sufficient to make it adhere firmly; it will soon dry and form a strong protection to the scales during the skinning. Without this precaution the skin could not be removed from mullet, sea beaver, &c., without the scales being much disfigured, and losing many of them. Indeed, in such fishes, it is not amiss to put on an additional coating of paper with gum-water. This will not only secure the scales, but will also assist in keeping the proper form of the fish, by preventing distention.

When these papers are thoroughly dry, turn the fish on a soft cloth, with the uncovered side upwards, and open it with sharp scissors from the bottom of the tail-fin to nearly the point of the snout, keeping as correctly on the lateral line as possible, which can be seen in most fishes. The cheek should be afterwards cut open, so that the flesh may be removed from it; cut also the flesh from the opposite cheek, and supply its place by cotton. The skin must now be detached from the flesh, which will require

some care at first. It must be commenced at the head, and separating it downwards with the assistance of a knife, and the fin-bones must be cut through with scissors. The spine must now be cut through close to the head, and also at the tail, and the body removed.

All the animal matter having been completely removed from the skin, the inside must be wiped dry, and the preservative applied in the same manner as directed for birds and quadrupeds. Great care is necessary to prevent it from being too much distended.

In SHARKS and LARGE FISHES, an incision is made below the head, and extended to the fin of the tail; the skin is then separated on each side with a scalpel, cutting back as far as possible, so that the vertebræ may be cut close to the head. The tail is then skinned. The head is pushed inwards, and the skin passed over it above, and all the cartilage cut carefully away. Care must be taken not to enlarge the branchial openings too much, which would render it necessary to sew them up again, and it is not easy to hide a seam in a fish's skin.

DIADON, TETRADON, and BALISTES, and their congeners, are opened by the belly. The ostracion is enveloped in a skin, which consists of a single piece, the tail of which only is free and flexible. The opening in the belly must not be large; the tail must be opened, the flesh cut away, and stuffed with cotton.

STUFFING.

The skins, being properly anointed, are filled with tow or cotton. This must be so managed that there will be no prominences on the outside of the skin, which, in fishes, is smooth and even for the most part. When properly filled, they must be sewed up, and set aside to dry in the air, but not exposed to the rays of the sun. In a few days, the papers with which the fins were extended are taken off, by damping them with a sponge. The glass eyes are now introduced, after filling the orbits with cotton and a little cement to secure them in their places. The skins may then be coated with turpentine varnish.

SHARKS.—In stuffing these large fishes, it is necessary to use a stick for a centre support. This must also enter the head, through the opening of the throat. If it is intended that the specimen

shall be suspended from the ceiling, wire-hooks must be fastened into the wood. From these must be placed upright wires, so that they penetrate the skin, and pass through the back. Let the whole internal surface of the skin be well rubbed with the preservative. The body is then stuffed to its full size, and afterwards sewed up. The stuffing of the head must be completed through the orbits of the eyes, and also by the mouth. This finished, the glass eyes are inserted, as in other animals, and fixed by means of cement.

Many species of fish have semi-transparent cartilages connected with the eyes. These must be imitated with gumarabic and powdered starch, as well as the cornea of the eyes.

The skins of all fish, which are similar to that of sharks, must be well supplied with spirits of turpentine, after they are mounted, more particularly the head and fins; but as they are not glossy they do not require to be varnished.

When the fins are strong, it is necessary to keep them extended by means of a wire introduced through them.

In the Diadons, the chief thing to be attended to, beyond what we have stated, is, to take care that the spines, with which their skins are beset, are not broken or depressed in any way.

Salmon, Trout, Tench, Carp, Pike, &c., are very easily preserved, as the scales are firmly attached to the skin; and although they become somewhat dim from drying, their colors and brilliancy are considerably restored by means of varnish, if applied before they are thoroughly dried.

After a lapse of time, the varnish will rise into little scales; to remove these, nitric acid, diluted in water, must be applied to the whole external surface, which has the effect of completely taking off the varnish, or at least of raising it from the skin, which, when allowed to dry, can be wholly removed by rubbing it with a small brush. It may then be varnished again; when dry, it will ever afterwards continue quite solid.

What is above recommended will apply to almost all fishes.

LOBSTERS, CRABS, &c.

In this class are included Crabs, Lobsters, and their congeners. These animals are all protected by a coriaceous covering, or shell, which is easily preserved, although there is considerable difficulty in preserving the colors of some species.

The flesh must be extracted from the large claws of Lobsters and Crabs, by breaking the smallest possible piece from their points and introducing a small crooked wire; in the smaller claws the flesh must be allowed to dry, and to facilitate this, extremely small perforations should be made in opposite sides of the shell, by means of a sharp triangular awl, so as to allow the air to pass through it.

In Lobsters, the branchiæ and all the intestines must be cut away; the latter is effected by separating the body from the lower parts, and then extracting the internal parts with any sharp instrument; it should then be dried and cemented together, after being well anointed with the preservative. In Crabs, the body, with all the limbs attached, is pulled separate from the back shell, and the whole fleshy matter carefully picked out, and preserving powder and the solution of corrosive sublimate applied to the different internal parts. In drying Lobsters, Crabs, &c., they should be exposed to a free current of air, but not to the sun's rays, as it reddens the shells of crustaceous animals.

It need hardly be mentioned, that before applying the preservatives, the shells should be well washed with cold water.

The Hermit-Crab always takes possession of the shell of some turbinated Univalve as its domicile. These are easily preserved by pulling out the animal after it is dead. An incision is made in the soft tail of the animal, and the contents allowed to run off; it is then filled with cotton and imbued with the preservative; some cement is then put on the tail, and the animal returned to its shell, which completes the operation of preserving.

In sending home crustaceous animals, the larger species should be emptied of their fleshy matter, which, however, is not necessary with the smaller species; they should be packed in middling sized cases, and each wrapped in separate papers, with a thick bed of cotton or flax between each. In Lobsters, and the species which are allied to them, great care must be exercised in preserving the tentacula or feelers which emanate from their heads, as these become very brittle after they are dried. In proceeding to set up specimens which have been sent home, they should be immersed in *cold* water for some time, to give pliability to the tentacula and other parts, without which it will be impossible to set them up in any way without their breaking.

Mr. Bullock recommended that Crabs and all other crustaceous animals, should be immersed in corrosive sublimate and water for an hour previous to their being put into attitudes.

When the joints become loose they are in general attached by glue, but the cement is much better.

N. B.—On no account whatever use warm water in cleaning crustaceous animals, as it is certain to change their colors.

CHAPTER V.

PRESERVING SPIDERS, GALLY-WORMS, AND INSECTS.

SPIDERS.

The general directions which we shall give respecting insects, hold good as to Spiders, only we must mention there is considerable difficulty in preserving the bodies of Spiders, which generally, in a very short time, shrink into a shapeless mass. To prevent this, the body should be pricked with the triangular awl and the contents pressed out; it should then be stuffed with very fine carded cotton or down, which can be pushed in by a pricker, blunted a little at the point. When properly distended, the small aperture should be filled up with a little cement, or a solution of gum-arabic. The legs of the larger species, such as the Bird-catching Mygale and the Scorpions, are also liable to shrink, and should be stuffed in the same manner as that of the body.

In those species of Spiders which we have thus prepared, and whose colors are rich and likely to be affected by the action of the atmosphere, we must endeavor to arrest its progress by immediately imbuing the animal, after it is set up, with the solution of corrosive sublimate, and in an hour after with a thin coating of a very weak white-spirit varnish; for this purpose, take a teaspoonful of the ordinary white-spirit or elastic varnish, and add to it two teaspoonfuls of spirit of wine; apply this wash with a fine camel hair brush, which will quickly dry, and have a strong tendency to preserve the color. The varnish, being thus reduced in strength, will not leave any glass on the insect, nor will it be at all perceptible.

Mr. Samouelle, author of "The Entomologist's Useful Compendium," in speaking of preserving Spiders, says: "The best

preserved specimens that I have seen are those where the contents of the abdomen have been taken out and filled with fine sand. I have preserved several in this way, and find it answer the purpose."

Mr. Donovan makes the following observations on the preservation of Spiders :

"To determine whether some species of Spiders could be preserved with their natural colors, I put several into spirits of wine ; those with gibbous bodies soon after discharged a very considerable quantity of viscid matter, and therewith all their beautiful colors ; the smallest retained their form, and only appeared rather paler in the other colors than when they were living.

"During the course of last Summer, among other Spiders, I met with a rare species ; it was of a bright yellow color, elegantly marked with black, red, green, and purple ; by some accident it was unfortunately crushed to pieces in the chip-box wherein it was confined, and was, therefore, thrown aside as useless ; a month or more after that time I observed that such parts of the skin as had dried against the inside of the box, retained the original brightness of color in a considerable degree. To further the experiment, I made a similar attempt, with some caution, on the body of another Spider, and, though the colors were not perfectly preserved, they appeared distinct.

"From further observations I find, that if you kill the Spider and immediately after extract the entrails, then inflate them by means of a blow-pipe, you may preserve them tolerably well ; you must cleane them on the inside no more than is sufficient to prevent mouldiness, lest you injure the colors, which certainly, in many kinds, depend on substance that lies beneath the skin."

Scorpions, and all the Spider tribe, may be sent home in spirits, which will preserve them perfectly, and when taken out and dried, they will be found to have suffered nothing from their immersion. We have seen some specimens sent up, after being sent home in spirits, which rivalled any which have been preserved in a recent state. The animals of this class are particularly liable to the attacks of insects, particularly in warm countries, on which account the mode of transporting them and keeping them in spirits is, perhaps, superior to all others. If, however, they are set up in a warm climate, they should be well soaked with the

solution of corrosive sublimate, made according to the recipe of Mr. Waterton

For the setting up of this class, see the directions for preserving insects.

INSECTS.

Every country of the world is replete with this extensive and interesting class of beings, whose forms are infinitely diversified, and whose species are the most numerous of any class in the animal kingdom.

Before any attempt is made to collect insects, certain apparatus must be provided, not only to enable us to secure them, but also to preserve them after they are caught.

First, then, we must be provided with a quantity of wooden boxes, from 18 to 20 inches long, 15 to 17 inches wide, and two inches deep. These should have well-filled lids, with hinges, and fastened by a wire catch, or small bolt. The bottom should have a layer of cork, about the sixth of an inch in thickness, which should be fixed down with very strong paste, made according to our recipe; and also some wire nails, to prevent it from springing. Over the cork should be pasted white paper. The box should be anointed inside with oil of petroleum. If that cannot be procured, make an infusion of strong aromatic plants, such as cinnamon, aloes, thyme, laurel, sage, rosemary, or cloves, and wash the inside with it. A small packet of camphor should be rapped in a piece of rag, and deposited in a corner of the box.

We must also be provided with a quantity of *Insect pins*, of different sizes, corresponding with the size of the insect. The pins used for setting should be longer than those which are taken to the field.

Bottles, with mouths from an inch and a quarter to two inches in diameter, must also be procured, and these must be three-fourths full of spirits, such as weak brandy, rum, gin, or whisky.

HUNTING-Box.—We must besides have what is termed a hunting box, for carrying in our pocket, when seeking after insects. This should be made of strong pasteboard or chip, for lightness, or, if this is no consideration, of tin. It must be of an oblong-oval shape, rounded at the ends, for the convenience of the pocket. It should be from eight to ten inches long, four to five

inches wide, and two-and-a-half to three inches deep. It must have a layer of cork both in the bottom and top of the lid, inside, for attaching insects to, when caught during the day. The larger insects are placed at the bottom, and the smaller ones on the lid.

THE ENTOMOLOGICAL.—We next procure a net, as in fig. 26, constructed similar to a bat-fowling net. This is either made of fine gauze or coarse muslin; it may either be green or white—the latter is the best for observing small insects which may be caught; the green, however is better adapted for catching Moths. The net-rods should be made of hickory, beech, hazel, or holly; they ought to be five feet in length, quite round, smooth, and tapering to an obtuse point, as at fig. 24; the oblique cross-piece at the point should be of cane, and fitted into the angular ferrule; the rod must be divided into three or four pieces, so that it may be taken asunder and carried in the pocket; the upper part of each joint must have a ferrule affixed to it, for the purpose of articulating the other pieces. Each joint should have a notch or check to prevent the rod from twisting.

The net itself, fig. 31, must have a welting all around it, doubled so as to form a groove for the reception of the rods. In the centre of the upper part or point it must have a small piece of chamois leather, so as to form a kind of hinge; this must be bound round the welting, and divided in the middle, so as to prevent the cross pieces from slipping over each other; it shows about four inches of the gauze turned up, so as to form a bag; there are strings for the purpose of passing through the staple, to which the net is firmly drawn on each side. When the net is used a handle is to be held in each hand.

If it is intended to take insects on the wing, by means of this net, for which it is admirably adapted, it may be folded together in an instant. If the gauze is fine enough, and preserved whole, even the smallest insect cannot escape. It may be also applied in catching Coleopterous Insects, which are never on the wing, as well as Caerpillars. When used for this purpose the Entomologist must hold it expanded under trees, while another must beat the branches with a stick. Great numbers of both insects and larva will fall in the gauze, and by this means many hundreds may be captured in a day.

Another method is to spread a large table-cloth under trees and bushes, and then beat them with a stick. An umbrella reversed has frequently been used for the same purpose. Bose, the celebrated naturalist, used this last method—he held the umbrella in the left hand, while he beat the bushes with the other.

THE HOOP OR AQUATIC NET, fig. 26.—This net is used for capturing Aquatic Insects, which are either lurking at the bottom, swimming through the liquid element, or adhering to plants. It may also be successfully used in sweeping amongst grass and low herbage, for Coleopterous Insects, and others which are generally to be found in such situations. The socket, for the handle, may be made of such dimensions as will answer the second joint of the Entomological net-rod, which will save carrying another handle; or a walking-stick may be made to fit it.

A PHIAL, fig. 33.—This may either be made of tin or crystal, and used for collecting Coleopterous and other Creeping Insects. The mouth should be nearly an inch wide, and a cork exactly fitted to it, in the centre of which must be inserted a small quill, to afford air, and inserted about an inch beyond the cork, to prevent the insects from escaping. If the bottle is made of tin, and of a larger size, a tin tube must be introduced into its side, and terminating externally at the surface.

A DIGGER, fig. 28.—The instrument is either made of iron or steel, and is about six or seven inches in length, fixed into a turned wooden handle. It is used for collecting the pupæ of Lepidopterous Insects, at the roots and in the clefts of the bark of trees; and also for pulling off the bark, particularly from decayed trees, under which many curious and rare insects are frequently found. It is most useful with an arrow-headed point.

SETTING NEEDLES, fig. 29.—Fitted into a small wooden handle, the needle itself should be about three inches long, and about the thickness of a small darning-needle, slightly bent from about the middle. Fig. 30 is a straight needle, which is used for extending the parts of insects; at one end of the handle is the needle, and at the other a camel-hair pencil, which is used for removing any dirt or dust which may be on the insects. The pencil may be occasionally drawn through the lips, brought to a fine point, and used for disposing the antennæ and palpi of insects of the minute kinds.

BRASS PLIERS, fig. 25.—These are used for picking up small insects from the roots of grass, &c. They may also be used for laying hold of small insects, while they are yet free and not set up.

FAN FORCEPS.—This very useful instrument to the Entomologist, must be made of steel or iron, and about eight or ten inches in length ; its general construction is like that of a pair of scissors, and it is held and used in the same manner. Towards the points are formed a pair of fans, which may either be square, oval, hexagonal, or octagonal in the edges, and the centres covered with fine gauze. The general size of the fans is from four to six inches. These are used for capturing Bees, Wasps, and Muscæ. They are also used for catching Butterflies, Moths, and Sphinges. If an insect is on a leaf, both leaf and insect may be inclosed within the fans ; or if they are on a wall or the trunk of a tree, they may be very easily secured by them.

If a Butterfly, Sphinx, or Moth, are captured by the forceps, while yet between the fans, they should be pressed pretty smoothly with the thumb-nail, on the thorax or body, taking care, however, not to crush it. It may then be taken into the hand, and a pin passed through the thorax, and then stuck into the bottom of your hunting-box.

QUILLS.—These are of great use in carrying minute insects. They should be neatly stopped with cork and cement, at one end ; the other end should be provided with a small moveable cork, for a stopper. Each end should be wrapped carefully round with a silk thread waxed, to prevent them from splitting.

POCKET LARVÆ-BOX.—For collecting Caterpillars, this box is very essential : it consists merely of a chip-box, with a hole pierced in the centre of the top and bottom, and covered with gauze, for the admission of air. It will be necessary to put into the box some of the leaves on which the larvæ feed, as they are very voracious, and cannot long exist without food.

PILL-BOXES.—No Entomologist should be without five or six dozen of these useful articles. They are of great value in collecting the smaller species of Lepidopterous Insects, such as the Tinea, &c., and only one specimen should be put in each box, as, if more than one, they are apt to injure each other's wings, by beating against each other.

SETTING-BOARDS.—These must be made of deal board, from a foot to fifteen inches long, and eight or ten inches broad, with a piece of wood run across the ends, to prevent them from warping. They are covered with cork, which must be perfectly smooth on the surface, with white paper pasted over it. Several boards will be required, by persons who are making collections, as some of the insects take a considerable time to dry, so that they may be fit for introducing into a cabinet.

The boards should be kept in a frame made for the purpose. It should consist of a top, bottom, and two sides; the back and front should have the frames of doors attached by small hinges, and their centers covered with fine gauze, for the free passage of air; the sides should have small pieces of wood projecting from them, for the boards to rest on; which should be at such a distance from each other that the pins may not be displaced in pushing the boards in or drawing them out. The frame should be placed in a dry, airy situation.

BRACES.—These are merely small pieces of card, cut in the form exhibited, fig. 36, attached to the butterfly and other insects; and also at fig. 39. They are pinned down on the insects, to keep their wings, &c., in a proper state, till they acquire a set.

SETTING AND PRESERVING INSECTS.

Of the orders COLEOPTERA, ORTHOPTERA, and HEMIPTERA. These are easily preserved.

They are killed by immersing in scalding water, and then laid upon blossom or blotting paper, for the purpose of absorbing as much of the moisture as possible; or they may be placed in a tin box, with a little camphor in it, near the fire, which soon kills them. This is besides of considerable effect in their preservation.

Insects of the genera *Gryllus* (Cricket), *Locusta* (Locusts), &c., have tender bodies, and are sure to shrivel in drying. The intestines should therefore be extracted, while they are yet moist, and skin filled with cotton, as directed with some of the spiders.

When Coleopterous insects are set with the wings displayed, the elytra should be separated, and the pin passed through their body near the middle of the thorax, as in fig. 35. The wings are exhibited as in the act of flying, and are retained in this situation until they are quite dry, by the cord braces. The insects of

this order should always have the pin passed through the right elytra on the right side, as shown at fig. 37, that is, it should pass underneath, between the first pair of feet and the intermediate ones.

The legs, palpi, and antennæ, should be displayed in a natural order on the setting board, and retained in the position by means of pins and braces, as shown in plate IV, figs. 35, 37. These must be kept in that state, either longer or shorter, according to the insect and the state of the weather, as, if placed in a cabinet before they are quite dry, they are sure to get mouldy, and will ultimately rot.

Minute insects should be attached to cards with gum, as shown, plate IV, figs. 34 and 39, with the legs and other organs displayed. Entomologists generally adapt triangular cords as at fig. 38, as less liable to hide the parts of the insects.

ORDER LEPIDOPTERA.—Mr. Haworth, in mentioning the tenacity of life in the Goat Moth, states, that “the usual way of compressing the *thorax* is not sufficient to kill this insect. They will live several days after the most severe pressure has been given there, to the great uneasiness of any humane entomologist. The methods of suffocation by tobacco or sulphur are equally inefficacious, unless continued for a greater number of hours, than is proper for the preservation of the specimens. Another method now in practice is better, and however fraught with cruelty it may appear to the inexperienced collector, is the greatest piece of *comparative mercy* that can, in this case, be administered. When the larger Moths must be killed, destroy them at once by the *insertion of a strong, red-hot needle* into their thickest parts, beginning at the front of the *thorax*. If this be properly *done*, instead of *lingering through several days, they are dead in a moment*. It appears to me, however, that insects, being animals of *cold and sluggish juices*, are not so susceptible of the sensations we call pain, as those which enjoy a warmer temperature of body, and a swifter circulation of the fluids. To the philosophic mind, it is self-evident that they have not such acute organs of feeling pain as other animals of a *similar size*, whose juices are endowed with a quicker motion, and possess a constant, regular, and genial warmth.

Butterflies are soon killed by passing a pin through the thorax. The pin passed through the thorax of small Moths generally proves almost instantly fatal to them.

The best manner of preserving the minute species of Moths is by pill-boxes, as above stated, each moth being kept in a separate box. We have found the following the best mode of destroying them :

A piece of flat hard-wood is taken, and a circular groove cut in it, sufficiently deep to admit the mouth of a tumbler being placed within it. In the centre of the wood, pierce a hole about a third of an inch in diameter in its centre : place the pill box under this tumbler, with the lid off, and the insect will soon creep out : but whether it does so or not, a match well primed with sulphur is lighted and placed into the hole under the centre of the tumbler, which will suffocate the insect in a few seconds. I have also found this an effectual method of killing the larger species of Butterflies, and Moths. In piercing them, the pin should be quite perpendicular, that no part of their minute frame should be hidden by its oblique position.

The larger insects of this order are set by braces chiefly. A single one should in the first place be introduced under the wing, near the thorax, as shown in fig. 36, and a longer brace extending over the wings. These should not bear upon the wings, but be ready to rest gently on them, when required. The wings are now elevated to their proper position by the setting needle, and other braces are used as necessity dictates. The feet and antennæ are extended and kept in their places by means of pins; in which operation small braces are also occasionally used.

The French Entomologists set Butterflies, Moths, and Sphinges, on a piece of soft-wood, in which they have excavated a groove for the reception of the body, as deep as the insertion of the wings. They are otherwise preserved as above directed.

In the larger Butterflies, Moths, and Sphinges, the abdomen should be perforated, its contents extracted, and then stuffed with fine cotton, after having been washed internally with the solution of corrosive sublimate. Indeed, the cotton should also be rubbed with arsenical soap before being introduced, as these insects are particularly liable to the attack of smaller insects, such as the Mite.

Several of the Moth tribe are extremely liable to change their color some time after they have been placed in a cabinet. This change is frequently occasioned by an oily matter which is common to many of them. This first makes its appearance in small spots on the body, but soon spreads itself over the abdomen, thorax, and wings; and ends in a total obliteration of all the beautiful markings. A method which has been sometimes successfully adopted is to sprinkle all the wings with powdered chalk, and holding a heated iron over it; the chalk absorbs the grease, and may then be blown off by means of a pair of small bellows. Another way of applying the chalk, and perhaps the better of the two, is to throw some powdered chalk on the face of a heated iron, and then put it into a piece of linen cloth, and apply it to the body of the insect; the heat of the iron will soften the grease, and the chalk will absorb it.

Another method is to hold a heated iron over the insects for a few minutes, and then to wash the spotted or greasy places with ox gall and water, applied with a camel-hair pencil, and afterwards wash it with pure water, and dry it by an application of blotting paper, and when perfectly dry imbue it with the solution of corrosive sublimate. But grease seldom appears where the contents of the abdomen have been removed.

ORDERS NEUROPTERA, HYMENOPTERA, and DIPTERA.—The Dragon-Flies (*Libellula*) are frequently very difficult to kill, being powerful and nervous animals. When caught they should be transfixed through the sides, and it sometimes becomes necessary to put braces on their wings to prevent them from fluttering while in the hunting box. They may also be killed sometimes by placing them under a tumbler and suffocating them. Some Entomologists put them in scalding water for an instant.

The contents of the abdomen should always be removed from Dragon Flies, otherwise it will become black and shining through the skin, and destroy the beautiful bands with which they are ornamented. They can be stuffed with cotton or a small roll of paper introduced. If these precautions are attended to, the insect will preserve the perfect beauty of its living state.

The other species of these Orders soon die after being trans-fixed. They may be set by braces and pins, as represented in figures 35 and 37.

Some of the *Dipterous* insects are very perishable in point of color after death, particularly in the abdomen, the skin of which is very thin. The only way of remedying this is to pierce the abdomen, and after taking out the contents the cavity should be filled with a powdered paint the same color as the living subjects, which will shine through and give it all the appearance of nature.

METHOD OF RELAXING DRIED INSECTS.

Insects frequently get stiffened before the Entomologist has leisure to get them set; and it usually happens that those sent home from foreign countries have been ill set, and require to be placed in more appropriate attitudes after they have fallen into the hands of the scientific collector. They may be relaxed and made as flexible as recently killed specimens by the following simple process, from which they can receive no injury; pin them on a piece of cork and place the cork in a large basin or pan of tepid water, and cover the top tight with a damp cloth, taking care that it is sufficiently high not to injure the insects. In most cases a few hours is sufficient to restore them to their original flexibility, so that they may be easily put in their proper positions. In some instances, three or four days are necessary to relax them thoroughly, so as to set the wings without the risk of breaking them; no force whatever must be used with any of the members. When set up, after being relaxed, they must be treated in exactly the same manner as recent specimens.

We must again caution the Entomologist to be careful that he applies the solution of corrosive sublimate to all his species, otherwise there is little chance of their continuing long without being attacked by the Mite; they ought to be frequently imbued.

Mr. Waterton, who has studied deeply the subject of preserving animal substances, and applied them not only in our own country, but also under the influence of a tropical climate, makes the following observations on the preservation of Insects:—"I only know of two methods," says he, "to guard preserved insects from the depredations of living ones. The first is, by poisoning the atmosphere—the second is, by poisoning the prepared specimens themselves, so effectually, that they are no longer food for the depredators. But there are some objections to both these modes; a poisoned atmosphere will evaporate in time if not attended to,

or if neglected to be renewed ; and there is great difficulty in poisoning some specimens on account of their delicacy and minuteness. If you keep spirits of turpentine in the boxes which contain your preserved specimens, I am of opinion that those specimens will be safe as long as the odor of the turpentine remains in the box, for it is said to be the most pernicious of all scents to insects. But it requires attention to keep up an atmosphere of spirit of turpentine ; if it be allowed to evaporate entirely, then there is a clear and undisputed path open to the inroads of the enemy ; he will take advantage of your absence or neglect, and when you return to view your treasure you will find it in ruins. Spirits of turpentine poured into a common glass inkstand, in which there is a piece of sponge, and placed in a corner of your box, will create a poisoned atmosphere and kill every insect there. The poisoning of your specimens by means of corrosive sublimate in alcohol, is a most effective method. As soon as the operation is properly performed, the depredating insect perceives that the prepared specimen is no longer food for it, and will for ever cease to attack it ; but then every part must have received the poison, otherwise those parts where the poison has not reached will still be exposed to the enemy, and he will pass unhurt over the poisoned parts till he arrives at that part of your specimen which is still wholesome food for him. Now, the difficulty lies in applying the solution to very minute specimens without injuring their appearance ; and all that can be said is, to recommend unwearied exertion, which is sure to be attended with great skill, and great skill will insure surprising success.

I am convinced that there is no absolute and lasting safety for prepared specimens in Zoology from the depredations of insects, except by poisoning every part of them with a solution of corrosive sublimate in alcohol.

Mr. Waterton is of opinion that tight boxes with aromatic atmospheres are not to be depended upon in the preservation of insects. He says : " The tight boxes and aromatic atmospheres will certainly do a great deal, but they are liable to fail, for this obvious reason, viz. : that they do not render for ever absolutely baneful and abhorrent to the depredator that which in itself is nutritious and grateful to him. In an evil hour, through neglect in keeping up a poisoned atmosphere, the specimens collected by

industry and prepared by art, and which ought to live, as it were, for the admiration of future ages, may fall a prey to an intruding and almost invisible enemy, so that, unless the solution of corrosive sublimate in alcohol is applied, you are never perfectly safe from surprise. I have tried a decoction of aloes, wormwood and walnut-leaves, thinking they would be of service on account of their bitterness. The trial completely failed.

Many Entomologists are satisfied with possessing the insect in its perfect or image condition. But it is exceedingly interesting to be able to trace these through their different states of existence from the egg to the perfect insect. Besides, we are certain to produce the insects in the highest state of preservation when we breed them ourselves, and it is besides very interesting to have the eggs of the different species as well as the Caterpillar and pupa.

THE EGGS OF INSECTS.

The eggs of insects preserve their form and color in a cabinet, in general, without much trouble. Swammerdam had a method of preserving them when they appeared to be giving way. He made a perforation within them with a fine needle, pressed out their contents, afterwards inflated them with a glass blow-pipe, and filled them with a mixture of resin and oil of spike.

THE LARVÆ, OR CATERPILLARS.

The easiest way of destroying the Caterpillar is by immersion in spirits of wine. They may be retained for a long time in this spirit without destroying their color.

Mr. William Weatherhead had an ingenious mode of preserving Larvæ. He killed the Caterpillar, as above directed, and having made a small puncture in the tail, gently pressed out the contents of the abdomen, and then filled the skin with fine dry sand, and brought the animal to its natural circumference. It is then exposed to the air to dry, and it will have become quite hard in the course of a few hours, after which the sand may be shaken out at the small aperture, and the Caterpillar then gummed to a piece of card.

Another method is, after the entrails are squeezed out, to insert into the aperture a glass tube which has been drawn to a very fine

point. The operator must blow through this pipe while he keeps turning the skin slowly round over a charcoal fire ; the skin soon becomes hardened, and, after being anointed with oil of spike and resin, it may be placed in a cabinet when dry. A small straw or pipe of grass may be substituted for the glass pipe.

Some persons inject them with colored wax after they are dried.

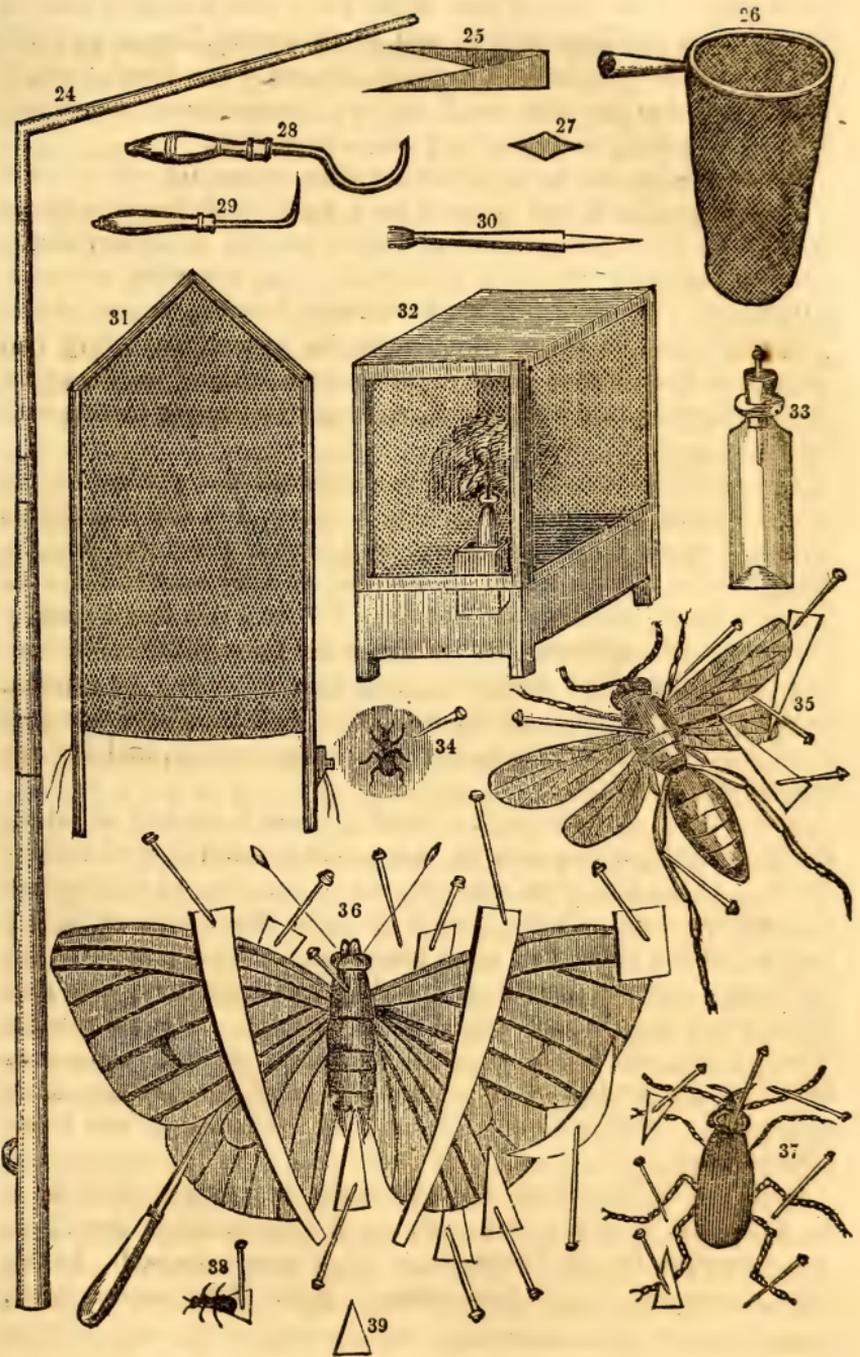
THE PUPA.

When the insects have escaped from their Pupa skin, the skin usually retains the shape and general appearance it did while it contained the insect. It is therefore ready for a cabinet, without any preparation whatever. But if the animal has not quitted its envelope, it will be necessary either to drop the Pupa into warm water, or to heat it in a tin case before the fire ; the former mode, however, is the best, and least liable to change the colors of the Pupa.

METHOD OF BREEDING INSECTS.

BREEDING CAGES.—These must be made of oak, or other hard wood, as pine is apt to kill the Caterpillars, from its strong smell of turpentine. The best form for these is represented in fig. 32. The sides and front are covered with gauze; *a* is a small square box, for the reception of a phial of water, for placing the stalks of plants in, on which it is intended the Caterpillars are to feed. The most convenient size for a breeding cage is, eight inches in breadth, four deep, and one foot in height. It is not proper to place within a cage more than one species of Caterpillar, as many of them prey upon each other. Indeed animals of the same species will devour each other, if left without food. The Caterpillars of insects, for the most part, will only eat one particular kind of food, so that it is better to have no more than one sort in a cage.

There must be at the bottom of the cage earth to the depth of two inches ; this should be mixed with some fine sand and vegetable earth, if possible, to prevent it from drying. The cages should be kept in a cool cellar or damp place, because many insects change into the Pupa condition under the earth ; so that it would require to be somewhat moist, to prevent the destruction of



the animal. The shell or case of the Pupa also becomes hard, if the earth is not kept moist ; and, in that event, the animal will not have sufficient strength to break its case at the time it ought to emerge from its confinement, and must consequently die, which but too frequently happens from mismanagement.

Some seasons are more favorable than others for the production of Caterpillars, and to keep each kind by themselves would require an immense number of cages, as well as occupy much time in changing the food, and paying due attention to them. To obviate this, some persons have large breeding cages, with a variety of food in them, which must be cleaned out every two days, and fresh leaves given to the Caterpillars ; as, on due attention to feeding, the beauty and vigor of the coming insects will much depend.

The Larvæ of insects, which feed beneath the surface of the earth, may be bred in the following manner : Let any box that is about three or four feet square, and two or three feet deep, be lined internally with tin, and a number of very minute holes be bored through the sides and bottom. Put into this box a quantity of earth, replete with such vegetables as the Caterpillars subsist on, and sink it into a bed of earth, so that the surface may be exposed to the different changes of the weather. The lid should be covered with brass or iron net-work, to prevent their escape, and for the free admission of air.

The young Entomologist should obtain a cabinet of about thirty drawers, arranged in two tiers, and covered in with folding doors. There is a great convenience in this size, as the cabinet is rendered more portable, and at the same time admits of having another of the same size, being placed above the top of it, as the collection increases, without injuring the uniformity, and thus the drawers may be augmented to any extent. It is immaterial whether the cabinet is made of mahogany or oak ; sometimes they are constructed of cedar, but seldom of pine, or any other soft wood. Small cells must be made in the inside of the fronts for camphor.

CORKING OF DRAWERS.—The simplest way to get the cork is to purchase it of a cork-cutter, ready prepared, but it will be much cheaper for the Entomologist to prepare it himself. In this case, it should be cut into strips of about three inches wide,

with a cork-cutter's knife, to smooth the surface and to divide it. The strips should be fixed in a vice, and cut to the thickness required with a fine saw ; but grease must not be used in the operation, as it will not only prevent the cork from adhering to the bottom of the drawer, but will also grease the paper which should be pasted on its surface. The black surface of the cork should be rasped down to a smooth surface. After having reduced the slips to about three quarters of an inch in thickness, the darkest, or worst side of the slip should be glued down to a sheet of brown, or cartridge paper ; this should be laid on a deal board, about three feet in length, and the width required for a drawer or box ; a few fine nails, or brads, must be driven through each piece of cork to keep it firm and in its place until the glue be dried ; by this means, sheets of cork may be formed the size of the drawer. All the irregularities are filed or rasped down quite to a level surface, and then polished smooth with pumice-stone. The sheet, thus formed and finished, is glued into the drawers. To prevent its warping, some weights must be equally distributed over the cork, that it may adhere firmly to the bottom of the drawer. When quite dry, the weights are removed, and the cork covered with fine white paper, but not very thick. The paper is allowed to be quite damp with the paste before it is placed on the cork, and, when dry, it will become perfectly tight.

Insect cabinets should be kept in a very dry situation, otherwise the antennæ, legs, &c., will become quite mouldy. The same evil will ensue if the insect is not perfectly dry before it is placed in the cabinet. Should an insect be covered with mould, it can be washed off with a camel's hair pencil, dipped in camphorated spirits of wine ; in which case, the insect must be dried in a warm airy situation, before being placed in the cabinet.

There should always be plenty of camphor kept in the drawers, otherwise there is great danger to be apprehended from mites : where these exist, they are easily discovered by the dust which is under the insects by which they are infested. In which case, they must be immediately taken out, and rubbed clean with a fine camel's hair pencil, and well imbued with the solution of corrosive sublimate, and then placed near a fire, taking care, however, that too great a heat is not applied, as it will utterly destroy

the specimen. The Butterfly, Sphinx, and Moth tribes are extremely liable to the attack of mites, and should, therefore be frequently examined.

CHAP. VI.

SHELL FISH, TO PRESERVE—AND THE ART OF POLISHING SHELLS.

CUTTLE FISH, and all other Molluscous animals, can only be preserved in spirits. The same observation applies to the animals which inhabit that numerous tribe called Testaceous Shells. They must be detached from the shells, and put into spirits, while the shells themselves must be preserved, independent of the animal.

Shells naturally arrange themselves under three distinct heads; Marine, Land, and Fluvial, or Fresh Water.

Marine Shells are only to be expected perfect, when procured in a living state. The way to extract the animal, is to pour some warm water on it; but, if made too hot, it is liable to crack the shells. When the animals are dead, they can easily be pulled out with any hooked instrument, or fork, or if the animal is small, by a common pin. This applies to all Marine Shells, whether Univalve, Bivalve, or Tubular. It is of great consequence to preserve the ligament of Bivalve shells entire, so that the valves may not be separated. The animals of Land and Fresh Water shells are killed by the same means, only that the water requires to be very hot.

Unless the shells are covered with any extraneous matter, it is not necessary to clean them. Marine Shells are, however, very liable to be incrustated with other marine bodies, particularly with Serpula and Balani, &c. These must be started off by means of a sharp instrument: an engraving tool is well adapted for this purpose. This must be done with great caution, in species which have spines and other excrescences, as they are very liable to be broken. Should any of the calcareous matter still adhere, this must be removed, by applying to it a *very weak* mixture of

muriatic acid and water, applied with the point of a quill, and then plunged into water, and allowed to remain till the acid is quite extracted. But on no account whatever, attempt to eradicate these parasitic bodies by means of acid, or acid and water alone, as the chances are that the shell will be completely destroyed by their application. We have seen many fine and valuable shells destroyed by an injudicious application of acids—they should never be used when it can possibly be avoided. We have, on the other hand, seen shells which were so completely enveloped in calcareous crust, that it was impossible to trace their external surface, most thoroughly cleared of all this, without being touched at all by acids, the whole being removed by a small knife or other sharp instrument; and these, in many cases, having long and tender spines externally.

Nothing can be more monstrous than the application of pumice-stone, which some recommend, for polishing shells; as is also the use of tripoli, rotten-stone, and imry. Neither do we approve the application of varnishes, as such shells never have their natural lustre.

If a shell is found dead upon the beach it is probable that it will have undergone a certain degree of decomposition, that is, it will have parted with part of its animal matter, and consequently the colors will have faded and the surface present a chalky appearance. To remove this take a small proportion of Florence oil and apply it to the surface, when the colors, which were invisible, will appear. When completely saturated with oil let the shell be rubbed dry and placed in a cabinet. Oil may also be applied after acid has been used, and it will be found extremely useful, when applied to dry the epidermis, which it will prevent from cracking or quitting the shell entirely, which it frequently does.

Whether Marine Shells are procured in a living or dead state, a very necessary precaution is to immerse them in pure tepid water after the animal has been extracted, and allow them to continue in it for an hour or two so as completely to extract any salt or acid which may be in them.

Fresh water Shells are liable to a calcareous or earthy incrustation, which must be removed by immersing them in warm water, and afterwards scraping and brushing them with a nail or tooth-

brush. Much nicety is necessary in cleaning these, as their great thinness renders them, in general, liable to be broken. A little Florence oil will improve the appearance of the epidermis and render it less liable to crack.

Land Shells seldom require any cleaning except washing in water, as they are not liable to incrustations of any kind.

When shells are perforated by marine animals, or otherwise broken, if the specimen is rare, it is desirable to remedy these defects as far as possible; they may therefore be filled up, or pieces added to them with the cement, which may be colored, when dry, to its original state.

OF POLISHING SHELLS.

Many species of Marine and Fresh water Shells are composed of mother-of-pearl, generally covered with a strong epidermis. When it is wished to exhibit the external structure of shells, the epidermis is removed and the outer testaceous coatings polished down till the pearlaceous structure becomes visible. It has been a common practice to remove the strong epidermis of shells by means of strong acids, but this is a hazardous and tedious mode of operating. The best method is to put the shells into a pan of cold water with a quantity of quicklime and boil it for two to four hours, according to the thickness of the epidermis. The shells afterwards must be gradually cooled, and some strong acid applied to the epidermis, when it will easily peel off. Two hours are sufficient for the common muscle being boiled. The shells are afterwards polished with rotton-stone and oil, put on a piece of chamois leather.

The epidermis of the *UNO MARGARITIFERA* is so thick that it requires from four to five hours boiling. After the epidermis has been removed, there is beneath it a thick layer of dull calcareous matter which must be started off with a knife or other sharp instrument; this requires great labor, but, when accomplished, a fine mother-of-pearl is exhibited which adds an agreeable variety as a specimen.

Various Turbos and Trochuses are also deprived of their epidermis and polished with files, sand-paper, pumice-stone, &c., till the pearly appearance is obtained; but all these modes are invented for disfiguring rather than improving the shells in the eye

of the naturalist, and should never be resorted to except where the species is very common, in which case it is well enough to do so with one or two specimens to show the structure of the shells.

After the operation of polishing and washing with acids, a little Florence oil should be rubbed over to bring out the colors and destroy the influence of the acid.

CHAPTER VII.

PREPARING SKELETONS.

CLEANING AND PREPARING BONES IN GENERAL.

As much of the fleshy parts should be removed from bones intended for preparation as possible with the scalpel, but it is not required that they should be separated from each other more than is necessary for placing them in a vessel for the purpose of maceration. The bones are to be entirely covered with water which should be changed every day for about a week, or as long as it becomes discolored with blood, after which, allow them to remain in water without changing till putrefaction has thoroughly destroyed all the remaining flesh ; this will require from three to six months, according to the season of the year or temperature of the atmosphere, but in warmer climates putrefaction will take place more rapidly. In tropical climates, fourteen day will be sufficient to disengage the flesh completely from the bones.

The large cylindrical bones of the thighs and arms should have holes bored in their extremities of the size of a goose quill to give the water access to their cavities and a free exit to the medullary substance.

As the water will gradually diminish in quantity, from evaporation, more should be added from time to time, so that none of the bones, or any part of them, may remain uncovered, as by exposure to the atmosphere they will become of a dirty color and have a disagreeable appearance. To be free from such stains is considered a great beauty in skeletons.

In towns the macerating vessels should always be closely covered, as from neglecting this the water is apt to get mixed with particles of soot and other impurities which have a strong tendency to blacken the bones. When the putrefaction has destroyed the ligaments, the bones are then fit for cleaning, which is done by scraping off the flesh, ligaments and periosteum. When this is effected, the bones should be again laid in clean water for a few days and well washed; they ought then to be placed in lime water or a solution of pearlash for a week, when they may be taken out to dry, after having soaked them five or six hours in



pure water to remove the solution of pearlash which would act upon their surface when exposed to the atmosphere.

In drying bones they should not be exposed to the rays of the sun, or to a fire, as too great a degree of heat brings the remaining medullary oil into the compact substance of the bones, and gives them a disagreeable oily transparency. This is the great objection to the process of boiling bones, for the purpose of making skeletons, as the heat applied in that way has the same effect, unless they are boiled in a solution of pear-ash, which some are of opinion is one of the most effectual methods of whitening them by its effectually destroying the oil. But there can be but little doubt that bleaching is, of all methods, the most effectual where it can be done to its greatest advantage, namely, in a pure air, and more especially on a sea shore.

It is much more difficult to clean the bones of animals that have died in good condition than those that are lean and reduced by disease.

NATURAL SKELETONS.

Natural skeletons are made without separating the bones from each other, in which case all animal ligaments are allowed to remain entire. This plan is generally adopted, with young and small animals, because the ligaments when dry, being divested of their natural flexibility, occasion an inconvenience, as the different extents and varieties of motion cannot be shown in the different articulations.

In making these, we are first to remove from the bones the skin, muscles, tendons, and viscera, and, in short, everything except the connecting ligaments and cartilages, which ought to be carefully preserved. This is done without any regular order of dissection; neither in this part of the process need any attention be paid to making the bones clean. The brain may be removed through an opening in the large fontanel, if the subject is very young, if not, a perforation may be made with the trephine for that purpose. Some separate the head from the spine, so that the brain may be the more easily removed by the occipital hole. The skeleton is put in water and allowed to remain for several days, it is then taken out and more thoroughly cleaned by a knife, forceps, and scissors, and replaced in fresh water. This is repeated from day to day, constantly changing the water, the object being to preserve the ligaments fresh and transparent. It is of great consequence to work hard by daily scraping and scrubbing until the bones are deprived of their blood and oleaginous matter and become white and clean, then remove them into clean lime water, or solution of pearl-ash, for two or three days, to take off any greasiness, and give a more beautiful white. When they have lain long enough, wash them with clean water; they are then placed in a position, by the assistance of a frame or piece of wood and wire, exposing them to a current of air. When perfectly dry, they may receive a coating of copal or mastic varnish.

It must be kept in view, that if the preparation is allowed to remain too long in the state of maceration, the ligaments themselves will be destroyed by putrefaction, and the intention of procuring a natural skeleton defeated.

An excellent and simple way of procuring natural skeletons of Mice, small birds, and fish, is to put them into a box of the proper size, in which holes are bored on all sides, and then buried in an Ant hill. The Ants will enter numerously at these holes and eat away all the fleshy parts, leaving only the bones and connecting ligaments; they may be afterwards macerated in clean water for a day or two to extract the bloody color, and to cleanse them from any dirt they may have acquired, then whitened by lime and alum water, and dried in frame or otherwise, as may be most convenient. In country situations Wasps may be em-

ployed in this service; these are most voracious animals, and if a skeleton is placed near one of their nests, or in an empty sugar cask, where they resort in plenty, they will perform the dissection with much greater expedition, and equally well as the Ants. Wasps have been known to clean the skeleton on a mouse or small bird in three or four hours, while Ants would require a week to effect it.

When the animal is of a large size, the ligaments are sometimes unable to sustain the weight of the bones, in which case, an iron wire of sufficient thickness is passed through the centre of the back bone, which must pass out anteriorly, so as to fix the head to the cervical vertebræ. It is made in the form of two forks, the one for the support of the anterior, the other for the exterior part; for this purpose two pieces of iron wire are taken the length of the skeleton, they are twisted together, leaving a fork at each extremity, and are then both fixed to the board on which the skeleton is to be placed. One of these should enter the ribs and encompass the back bone, between the scapular bones on each shoulder; the other two should pass between the bones of the pelvis.

It not unusually happens that pieces of the skeleton detach one from another, in which case, two holes are bored in the ends of the bones, which are separated, and are re-united by means of small brass wires.

ARTIFICIAL SKELETONS.

Skeletons of man and animals, of a middling and large size, cannot be made in the manner described for natural skeletons. In this case, the bones, covered by the flesh, are immersed in water, and allowed to remain without changing it, until the soft parts begin to get putrid, when the animal matter is easily removed; and by repeating the maceration two or three times, it may all be completely abstracted. The duration necessary for first maceration will depend upon the state of the atmosphere, being always much shorter in Summer than in Winter.

After the fleshy matter has been completely freed from the bones, they should be exposed on the roof of a house, or other convenient situation, until they are rendered quite white, and free from grease.

The fat in bones bears a close resemblance to the fixed oils. In the bones of whales it exists fluid like oil. In the long bones of oxen, horses and other large quadrupeds, it is semi-fluid, constituting the marrow. When, therefore, this is present in considerable quantity, the process may be much accelerated by drilling holes with a gimlet or other instrument in the opposite ends of the bones, and injecting, by means of a syringe, a tepid solution of pearl-ash, the potash combining with the oleaginous matter, forming a kind of soap, which, being soluble in water, is easily removed. Chloride of lime is also employed for the same purpose.

The relative portion of earthy and animal matter varies according to the nature of the bone, and the purposes it is intended to serve. The bones of quadrupeds and birds contain a much greater proportion of earthy matter than those of reptiles and fishes, and hence are more easily cleaned. Here it may be remarked, that the color of bones varies in different animals. In some common fowl it approaches to a dark yellowish brown. Food exercises considerable influence on the color, as is demonstrated in animals which feed on madder.

When the bones are perfect and dry, they are connected by means of wire and screws, &c. This is the most difficult part of the operation, as it requires considerable skill to reassemble the bones, so that they may be placed in their natural order and position. The operation is begun at one end of the extremities, by making holes in the apophysis, or round ball of the bone. This is effected by means of a wimble or lathe, or with a gimlet, although this instrument has hardly sufficient power for perforating so hard a substance as bone. The bones are then attached to each other in their natural order, with nealed iron wire, or brass wire, by means of the perforations which have been made. The ends of the wire should be twisted, and not too firmly, but sufficient to allow a little play between the articulation; this mode to be pursued till the whole wires are put together. They are then ready for placing on a board, and are kept erect by means of one or two perpendicular bars of iron, commensurate to the weight of the skeleton. In the larger species of birds, one support is necessary; it is passed through the breast-bone and attached under the spine, as represented in the skeleton of the Goshawk. The position of this support must be varied according to the attitude in which the skeleton is to be placed.

In skeletons of the Horse, the Ox, the Hippopotamus, the Rhinoceros, the Camel, and the Elephant, the links of wire which we have above described, are insufficient to unite their bones ; for these, two iron pegs are used with a head at one end and a screw at the other. Each screw is provided with a nut, and each pair of screws must have a narrow plate of iron bored at each end to pass the screw through. Supposing the bones of the leg or thigh of a large quadruped are to be united, a hole is bored through the apophysis, about two inches from the extremity, and the same having been done with both leg and thigh-bones, they are brought together, and one of the screws passed into one of the holes of the plates which he have mentioned, and then through the perforations in the bone, and lastly into the other plate ; they are tightened together by means of the nut. The screws should be nearly an inch longer than the thickness of the bones. The two ends of the bones are thus united and supported by the two plates which are kept together by the screws. Provision must be made for the play of the bones, by leaving a sufficient distance in boring the holes, through which the pegs are passed.

The Horse and other animals require a double bar to support them. A bar is also passed through the vertebræ of the neck, spine, and tail, and the ribs are attached by means of wires, or flat pieces of plate iron.

In these larger animals, the heads are for the most part sawn through, for the purpose of studying the structure of the internal cavity and partitions. These are kept together by means of a hinge, so that they can be opened and shut at pleasure.

CHAPTER VIII.

THE CHASE AND MANNER OF COLLECTING ANIMALS.

QUADRUPEDS AND BIRDS.—It is hardly necessary to recommend a double-barrelled gun. One of the barrels should be loaded with small shot or dross of lead for small birds, and the other with large shot. These should have much less powder than an ordinary charge, so as not to tear and injure the animals. Paper, cotton, or flax, and powdered dry earthen ashes should form part of the naturalist's stores.

When a bird is killed, a small quantity of dry dust is to be put on the wound. For this purpose the feathers must be raised with a pin, or a gun-picker, close to the wound. The bill of the bird should have a small quantity of cotton or flax introduced into it to prevent the blood from flowing, and spoiling the plumage. The feathers must be all adjusted, and the bird then placed on the ground to allow the blood to coagulate. Every specimen should be placed in a piece of paper of the form of a hollow cone, like the thumb bags used by grocers. The head should be introduced into this, the paper should then be closed around the bird, and packed in a box filled with moss, dried grass or leaves.

Birds taken alive in nets and traps are to be preferred to others for stuffing, and also those caught by birdline, which must be removed by spirits of wine.

Birds should always be skinned the same day they are killed, or next day at farthest, particularly in Summer; as there is a danger of putrefaction ensuing, by which the feathers will fall off. However, in Winter there is no danger for some days; but in tropical climates they must be prepared soon after they are killed. The same observations apply generally to quadrupeds.

Bats and Owls are caught during the day, in the hollows of aged trees, in the crevices of walls, and ruins of buildings. These are animals which, it may be presumed, are still little known in consequence of their nocturnal habits.

Those who prepare for the chase, with the intention of preserving animals, should take care to provide themselves with implements necessary for fulfilling the objects advantageously. The articles most needful are one or two pairs of large pincers, scissors, forceps, scalpels, knives, needles, thread, and a small hatchet, as well as one or more cannisters of preserving powder, some pots of arsenical soap, or arsenical composition, and some bottles of spirit of turpentine. Cotton may be employed in stuffing the skins, and therefore a considerable quantity should always be taken along with the naturalist. In parts of Asia and Africa, where this cannot be procured, tow must be employed, or old ropes teased down; and where even this cannot be found, dried grass and moss may be used. M. Le Vaillant used a species of dog-grass while in Africa, which is very abundant in that country; and it answered the purpose remarkably well.

It being supposed that a traveler has an ample caravan, provided with all the necessaries which we have pointed out, and having killed a quadruped, he will skin it immediately, according to the method which we have pointed out. He will then sew up the skin after receiving a partial stuffing, and having been anointed with the arsenical soap or composition. All the extremities must then be imbued with spirit of turpentine, and the skin should be placed in some convenient place to dry, so that it may have the advantage of complete exposure to the air. The turpentine must be again applied at the end of three or four days, more especially around the mouth of the quadruped.

It will be of the utmost advantage to remain a week or ten days at one place ; by which means the naturalist will have had time to render himself somewhat acquainted with the animals which localize in that neighborhood. And as some species frequently confine themselves to a very limited spot, by leaving the place too hurriedly he is apt to overlook them.

After the traveler has determined on leaving his cantonment, he must see that all the objects he has collected are in a condition to be removed. He must examine carefully each specimen, and see that they have not been attacked by the destructive insects, so abundant in warm climates. Should flies have deposited their eggs in the lips of the quadrupeds or birds, these must be destroyed by spirit of turpentine. When a set of animals or birds are thoroughly dry, they should be packed in a box or case, which has been well joined.

A journal ought to be kept detailing all the circumstances connected with the animals, the places in which they were killed, and the color of their eyes, together with any information that can be procured of their habits from the natives. People are too apt to forget particulars when engaged in such varied pursuits, and the sooner they are committed to paper the better.

When the traveler arrives in Africa, he will meet with animals of the largest size ; such as the Elephant, Rhinoceros, Hippopotamus, Giraffe, Quagga, Urus, Bubulus, Condoma, as well as large Antelopes and Deer. He will unquestionably find some difficulty in his endeavors to bring with him the skins of these animals, as in that country it is even troublesome, in many cases, to transport the necessaries of life. But the ardor of the zealous naturalist

will here be increased by beholding such splendid specimens as he can never meet with elsewhere. All his energies will be strengthened, and every sacrifice made to enable him to transport the fruits of his toils.

We need only to recur to the zeal manifested by Le Valliant in his travels, and the rapturous delight experienced by him when he first beheld and killed the Giraffe. He brought this large skin from Caffraria, where he killed the animal, a distance of two hundred leagues from the Cape of Good Hope.

Should the traveler, accidentally, or in pursuit of natural objects, find himself possessed of the carcase of one of these large and fine animals, he would deeply regret not being able to fetch away the skin from want of a knowledge how to separate it from the body. We shall, therefore, suppose that he has killed an animal the size of a Bull. He must first make an incision under the belly, in the form of a double cross. The central line must reach from the chin to the anus; the two other transverse cuts must reach from one foot to the other. These are always made inside, so that the seams may be less conspicuous when the animal is mounted. When the skin is stuffed, the hoofs are detached by laying them on a stone, and striking them with a hatchet or mallet. The nails or hoofs must be left attached to the skin. After this, the skin is removed from the feet, legs, and thighs, and treated in other respects as pointed out in skinning other large animals. The bones of the head must be preserved if possible, leaving it attached at the muzzle only. All the muscles must be removed from the head, and the bones rendered as clean as possible.

As it is probable that an animal of this magnitude has been killed at a great distance from any habitation, there will not be an opportunity of macerating the hide in alum and water. The skin will also be too thick for the arsenical soap to penetrate with effect. Under these circumstances, the next best thing to preserve it is to take the ashes of a wood fire, and rub it well inside. The skin should then be stretched along the boughs of a tree, and allowed to dry. The skull, after it has been dried, must be returned into the skin, and the lips, ears, and feet, imbued plentifully with turpentine, which operation must be several times repeated at intervals. Nothing is more effectual in preventing the attacks of insects than this spirit, and no larvæ will exist in places which it has touched.

The skin will be sufficiently dried within two or three days, so that the hair may be turned inwards. If some common salt can be procured, a solution of it should be made, and the hair rubbed with it. Both sides of the skin must be rubbed with this two or three times, at intervals of a day.

When sufficiently dry, the skin may be rolled up and packed. The hair ought to be inwards, with a layer of dried grass intervening, to prevent friction during conveyance. The operation of rolling up the skin must be begun at the head.

If the journey is long, the skin should be unrolled, and placed in the sun for a few hours, and the places liable to the attack of moths should be again rubbed with turpentine.

When a skin thus prepared has reached the place where it is to be put up, it must undergo a preparation previous to its being mounted. In the first place, it must be extended along the ground with the hair undermost, so that it may acquire fresh pliability, and those parts which remain stiff must be moistened with tepid water. The skin must then be placed in a large vessel of water saturated with alum, there to remain eight or ten days; after which, it must be extended on half rounded pieces of wood, and thinned with a sharp knife, which is facilitated by the projections of the wood, enabling the operator the more easily to cut it, while it is gradually shifted, till the whole has been pretty equally thinned. When this operation is completed, it is allowed to soak in water with an equal quantity of that saturated with the alum. Twenty-four hours will be sufficient.

In hunting for Snakes, great caution must be exercised, as it is well known that the bite of some of these proves fatal within a quarter of an hour, particularly that of the Rattlesnake and some others. Indeed, it would be more prudent to allow the natives to hunt for these poisonous reptiles, as they are better acquainted with their haunts, and the means of defence to be employed in this dangerous pursuit. They are also better acquainted with those which are poisonous. We may, however, remark, that the poisonous Snakes have, in general, much larger heads than those which are harmless, and their necks are also narrow.

SHELLS.

Shells, on account of the elegance and variety of their forms, and beauty of their colors, are objects much sought after, not

only by naturalists but also by most persons who are unacquainted with science. There is no species, particularly in remote climes, which does not deserve to be brought home, the things most common in those countries being frequently the most rare in ours. Shells are found on every part of the surface of the globe. Some are inhabitants of the land, while others only frequent rivers, lakes, ponds, and ditches; and another and more numerous class live in the ocean. Land-shells are spread over the whole surface of the earth, and although more accessible, are perhaps less known than those which inhabit the "mighty deep."

LAND-SHELLS, for the most part, are to be found creeping abroad either in the evening or after a gentle shower of rain. During the heat of the day they retire to shaded retreats, under thick bushes, the crevices of rocks, the hollows of decayed trees, or under their bark; beneath stones, amongst moss, or in holes in the ground. A little experience will teach the naturalist readily to find their retreats.

FRESH WATER SHELLS must be sought for, if in deep lakes, with a dredge, or if in shallow places, with a tin spoon fixed on the end of a stick. This is made of a circular piece of tin four inches and a half in diameter, beat concave, and then perforated with numerous small holes, not exceeding the sixteenth part of an inch in diameter; around this must be soldered a perpendicular rim, three-quarters of an inch broad, and also perforated with holes. To this must be attached a hollow tubular handle three inches long, for the insertion of a walking-stick. It must have a few holes towards its outer end for passing a string through, to tie it firmly, and prevent it being lost. With this spoon the collector must rake along the mud at the bottom of ditches or ponds, and after bringing a quantity to the surface, he must wash the mud entirely away, by shaking the spoon on the top of the water, and it will all pass through the holes and leave the shells. The sharp edge of the spoon is also useful in detaching aquatic shells from the under surface of the leaves of water-plants.

The large Swan-Muscle (*Anadonta Cygnea*), and other Anadons, generally lie deep in the mud, so that they cannot be procured by dredging. I found it necessary to invent a net to fish for these. This consisted of an iron triangle of twelve inches, with a hollow handle fixed on its base, and in this is inserted a pole of

sufficient length to reach the bottom. It is firmly screwed to the handle. A net is attached to the triangle either of twine or hair-cloth. The point of the triangle should be sharp, so that it may the more easily penetrate the mud, and it is drawn through it in situations where shells are supposed to exist.

MARINE SHELLS.—These are to be found in all seas; some of them inhabit rocks on the shore within high-water mark: others reside in deep water, and can only be taken by dredging, or by the use of a kind of net called in France the *Gangui*, and an instrument called the *Rake* has also been successfully used.

Different species of sea-weed are frequently covered by minute shells,—weeds should always be carefully examined. Many of the smaller and microscopic shells are found at high-water mark among the fine dross and drifted fragments of shells; this sand should be brought home and examined at leisure. To facilitate the process, a small wire-cloth sieve should be made, of about six or seven inches square, and all the sand sifted through it, and the shells left.

MOLLUSCOUS ANIMALS.

Many species of worms, and other soft invertebrate animals, are to be caught also by the dredge. There is no way of preserving these animals except by putting them in spirits. Animals of this kind are still very imperfectly known, notwithstanding the researches of Lamarck, Poli, and other celebrated naturalists. Every opportunity should, therefore, be embraced of bringing them home; indeed, we are still little acquainted with those which inhabit our own seas.

When animals of this kind are procured in foreign parts, a careful noting of the latitude should be taken; and it should be stated whether they live singly or are congregated, if they are phosphorescent, and if they were taken in deep water. And as these animals are very liable to lose their colors by being put in spirits, a careful noting of these should be taken whenever they are caught, as the colors are very evanescent; or, what would be still better, a drawing of the animal should be made.

INTESTINAL WORMS.—Whenever we have killed either a quadruped, bird, or fish, we should carefully examine the stomach and intestinal canal of the animal, to see if there are any worms;

indeed, there are few animals without them ; they must also be preserved in spirits. Besides the stomach and intestines, worms are also found in the livers and other parts of the body ; also in the back of skate and various fishes.

INSECTS.

This class is subject to infinite variety, according to climate and soil. The Entomologist, or the mere collector, must not confine himself to those whose beauty of coloring renders them attractive, but collect all that come in the way. Those species which have wings, and fly around plants, we take by means of gauze nets, and also those which swim in the water. Those which live on putrid substances, and such as are disagreeable to the touch, are seized with pincers ; they are first put into camphorated spirits to render them clean. Trees are the habitations of innumerable insects ; many of them skulk under the old rotten bark, and others attach themselves to the foliage. A cloth should be spread under the trees, or an umbrella, and the branches shaken with considerable force, when they will fall down, and may then be caught.

Insects are killed by making a crow-quill into a long point and dipping it into prussic acid, an incision with it may be made immediately below the head of the insect betwixt the shoulders, which usually produces instant death. But this acid must be used with much caution, because its effects are almost as instantaneous and fatal in the human subject as in the lower animals. When cork cannot be had for lining the bottoms of the boxes, a layer of beeswax may be used in its stead. The pin should be deeply sunk in this substance, as it is more liable to loosen than when in cork.

It is of much importance to procure the Caterpillar as well as the insect, and, in this case, some of the leaves on which it feeds should be placed in a box beside it, so that it may reach maturity. A small perforation should be made in the box for the admission of air.

Every kind of insect, except Butterflies, Spingees, and Moths, may be preserved in bottles of spirits, which will not injure them ; when they are taken out they are immediately placed in the position in which it is wished to preserve them, and they

are then allowed to dry. Another mode of preserving Cleop-
terous insects, such as Beetles, &c., is to put them in a dry box
amongst fine sand. A row of insects is placed in a layer of
sand, and then a new layer of about an inch in depth laid on
the top, and so on till the box is filled. This mode of pack-
ing will not, however, do with soft insects and those having fine
wings.

It is extremely desirable that all the different kinds of Spiders
should be caught, particularly those said to be venomous ; also
Termites, or White Ants, the different Scolopendra and Gally
Worms, &c. The nests of Spiders and other insects should also
be sent home ; in short, every insect which is remarkable, in any
way, either for its history or properties.

It is also of much importance to bring specimens of the plants
on which they feed ; these should be dried, and their localities
marked, the kind of soil on which they grow, and the situations,
whether moist or dry, should be noted.

BRITISH INSECTS.

WOODS, HEDGES, AND LANES.—By far the greatest portion of
insects are found in these situations. In woods, the Entomologist
must beat the branches of the trees into his folding net, and must
select for this purpose the open paths, skirts, &c. The trunks of
trees, gates, and timber which is cut down, should be carefully
examined, and a great many Lepidopterous and Coleopterous
insects are found in these situations, and in no other. In hedges
and lanes, many of the most valuable and beautiful insects are
found, as also in nettles and other plants which grow under them ;
these should be well beat, but more especially when the white
thorn blossoms in the months of May and June. Hedges where
the roads are dusty are very seldom productive.

HEATHS AND COMMONS.—Many insects are peculiar to these
situations from the plants which grow on them, as well as from
the dung of cattle, by which many of them are frequented, in the
latter of which many thousands of insects may be found in a
single day, in the months of April and May. These are prin-
cipally of the Order Coleoptera.

SAND PITS.—These are favorable for the propagation of
Cupris lunarius, *Notoxus monoceros*, *Lixus sulcirostris* and other

rare insects. Minute species are found abundantly at the roots of grass.

MEADOWS, MARSHES AND PONDS.—In meadows, when the Ranunculi or butter-cups, are in blossom, many *Musca* and Dipterous insects generally abound. The flag-rushes are the habitations of *Cassida*, *Donacina* and others. Drills in marshes should be examined, as many species of insects are found on long grass. The larvæ of various Lepidoptera and Neuroptera are confined to these situations, more especially if hedges and trees are near the spot. Ponds are rich in microscopic insects. These are obtained by means of the landing net, which, for this purpose, need not be so long as represented in fig. 1, and should be made of pretty thick cotton cloth, but sufficiently thin to allow the water to escape. The mud, which is brought up from the bottom of ponds and ditches, should be examined, and what small insects are found may be put in a small phial filled with water, which will not only clean them, but keep them alive; and in many instances the naturalist will be surprised, upon the examination of these, the most wonderful productions of nature.

MOSS, DECAYED TREES, ROOTS OF GRASS, &c.—Many insects will be found in moss and under it; the roots and wood of decayed trees afford nourishment and a habitation to a number of insects; many of the larvæ of *Lepidoptera* penetrate the trunks of trees in all directions; most of the *Cerambyces* feed on wood, as well as some species of *Carabidæ* *Elateridæ*, &c. In seeking for these, it is necessary to use the digger. It is sometimes requisite to dig six or seven inches into the wood before they are found.

BANKS OF PONDS AND ROOTS OF GRASS.—These are a never-failing source of collecting, which may be followed at all seasons of the year, and in general with great success; those banks are to be preferred which have the morning or noon-day sun.

BANKS OF RIVERS, SANDY SEA SHORE, &c.—These situations afford a great variety of *Colcoptera*, *Crustacea*, &c. The dead carcasses of animals thrown on the shore should be examined, as they are the receptacles and food of *Silphiodæ*, *Staphilinidæ*, &c. May and June are the best seasons for collecting these insects.

DEAD ANIMALS, AND DRIED BONES, should be constantly examined, for these are the natural habitats of several insects. It

is not uncommon for country people to hang dead moles on bushes; under these the Entomologist should place his net, and shake the boughs on which they are hung, as many of the Coleoptera generally inhabit these.

FUNGI AND FLOWERS.—These are the constant abode of insects, and many curious species will be found on them.

It is a mistaken idea that insects are only to be found in summer, as they are to be met with, either in a living or pupa state, at all seasons. Dried moss, beneath the bark of trees, and under stones, are extremely likely places to find insects in winter; and even then the Entomologist is more likely to procure some of the rare species, than in summer, as these are ranging in search of food, and in situations hidden from view.

At this season, if the weather is mild, the pupæ of *Lepidoptera* will be found at the roots of trees, more especially those of the elm, oak, lime, &c., or beneath the underwood, close to the trees, and these frequently at the depth of some inches under the ground.

In the months of June, July and August, the woods are the best places to search for insects. Most of the Butterflies are taken in those months, flying about in the day-time only. Moths are either found at break of day, or at twilight in the evening. The following method of taking Moths is pointed out by Haworth, in speaking of the Oak Moth (*Bombyx Quercus*). "It is a frequent practice with the London Aurelians," says he, "when they breed a female, of this and some other day-flying species, to take her, whilst yet a virgin, into the vicinity of woods, where, if the weather is favorable, she never fails to attract a numerous train of males, whose only business seems to be an incessant, rapid, and undulating flight, in search of their unimpregnated females; one of which is no sooner perceived, than they become so much enamoured of their fair and chaste relation, as absolutely to lose all kinds of fear for their own personal safety, which, at other times, is effectually secured by the reiterated evolutions of their strong and rapid wings. So fearless, indeed, have I beheld them on these occasions, as to climb up and down the sides of a cage which contained the dear object of their eager pursuit, in exactly the same hurrying manner as honey-bees, which have lost themselves, climb up and down the glasses of a window."

CHAPTER VIII.

RECEIPTS.

FOR VARIOUS ARTICLES USED IN THE PRESERVATION AND
SETTING UP OF ANIMALS.

SOLUTION OF CORROSIVE SUBLIMATE.

Mr. Waterton's Method.

PUT a good large tea-spoonful of well-pounded corrosive sublimate into a wine bottle full of alcohol (spirits of wine). Let it stand over night, and, the next morning, draw it off into a clean bottle. When the solution is applied to black substances, and little white particles are perceived on them, it will be necessary to make it weaker, by the addition of some alcohol.

A black feather, dipped in the solution, and then dried, will be a good test of the state of the solution: if it be too strong, it will leave a whiteness upon the feather.

ARSENICAL SOAP.

Invented by Bécœur, Apothecary, Metz.

Arsenic, in powder,	- - -	2 pounds.
Camphor,	- - - - -	5 ounces.
White Soap,	- - - - -	2 pounds.
Salt of Tartar,	- - - - -	12 ounces.
Powdered Lime,	- - - - -	4 ounces.

The soap must be cut in small and very thin slices, put into a crucible with a small quantity of water, held over a gentle fire, and frequently stirred with a wooden spatula, or a piece of wood of any kind. When it is properly melted, the powdered lime and salt of tartar must then be added, and thoroughly mixed. It must now be taken off the fire, the arsenic added gently, and stirred. The camphor must be reduced into a powder, by beating it in a mortar, with the addition of a little spirits of wine. The camphor must then be added, and the composition well mixed with a spatula, while off the fire. It may be again placed on the fire, to assist in making the ingredients incorporate properly, but not much heated, as the camphor will very rapidly escape. It may now

be poured into glazed earthen pots, and allowed to cool, after which a piece of paper should be placed over the top, and afterwards some sheep leather; and then set aside for use. The composition is about the thickness of ordinary flour paste.

When it is necessary to use the soap, put as much as will answer the purpose into a preserve pot, and add to it about an equal proportion of water. This is applied to the skin or feathers with a bristle brush.

N.B. It should be kept as close as possible, and used with caution, as it is a deadly poison.

The above is the receipt made use of at the Jardin des Plantes, Paris.

Mr. Laurent's Receipt.

A distinguished French naturalist, Laurent, recommends the following composition, after ten years experience, for preserving the skins of stuffed animals. He observes, at the same time, that it penetrates them with greater readiness, and preserves them much better than any preparation which has hitherto been in use.

Arseniate of Potash	-	-	-	2 drachms.
Sulphate of Alumine,	-	-	-	2 do.
Powdered Camphor,	-	-	-	2 do.
White Soap, powdered,	-	-	-	$\frac{1}{2}$ oz.
Spirits of Wine,	-	-	-	6 oz.
Essence of Thyme,	-	-	-	3 drops.

The arseniate of potash, sulphate of alumine, and soap, are to be placed in a phial, with a large mouth, and the spirits of wine to be poured on them, at a heat of *twenty-five* degrees, and they will be perfectly combined in twenty-four hours. The essence of thyme is then added, when the phial must be carefully corked. This composition is to be shaken together, before it is made use of, and it must be spread over the skin of the animal or bird with a brush.

SOLUTION OF PEARL-ASHES.

Two ounces of pearl-ash to one gallon of water.

ANNEALED IRON WIRE.

Take common iron wire, make it red hot, and suffer it to cool gradually; this renders it soft and pliable, so that it may be easily bent in any direction.

CEMENT.

Fine Whitening,	-	-	-	-	2 oz.
Gum-Arabic,	-	-	-	-	2 oz.
Finest Flour,	-	-	-	-	$\frac{1}{2}$ oz.
Ox-Gall,	a tea-spoonful.				

The whole to be dissolved, and mixed well with water into thick paste.

This is well adapted for attaching different objects, and especially for fixing shells to pasteboard, &c.

GUM PASTE.

White Sugar Candy,	-	-	-	-	2 oz.
Common Gum-Arabic	-	-	-	-	4 oz.

Let these be melted in a pot of hot water, and then strained through a linen or horse-hair sieve. When properly dissolved, add to it two table-spoonfulls of starch, or hair-powder, and mix the whole well together. This paste may be used for many purposes, and it never spoils. It may be dried, and by pouring a little warm water on it, it will soon be ready for use. If it is wished to be all melted, and hurriedly, the pot containing it should be placed in warm water, or sand.

FLOUR PASTE.

Make flour paste in the ordinary way, and add to it a small portion of the solution of corrosive sublimate, or powdered corrosive sublimate. This will prevent the attack of mites, to which paste is very liable when dried. This paste may be dried into a cake, and moistened when required.

SOLUTION OF GUM-ARABIC.

The solution of gum-arabic is made by simply adding water to it. When used as a varnish, or for attaching objects, it is extremely apt to get too brittle, in very warm weather, and to crack, or split off in scales; to prevent this, a quarter of an ounce of white or brown sugar candy must be added to two ounces of gum-arabic.

PAPER PASTE, GUMMED.

Take a coffee-pot, filled with water, and add to it a quantity of paper, which has been slightly sized, like that used for printing

engravings. Let it boil for three hours, and, when the water has evaporated, boil it again for a similar length of time. Take out the paper, and squeeze it well in a colander, and then pound it in a mortar, until it is reduced to a very fine paste. It must then be dried. When it is required for use, add to it some of the solution of gum-arabic ; and keep it in a pot for use.

POLLEN POWDER.

The paper made as above directed, when well dried, is pounded in a mortar till it becomes a very fine powder ; it is then put into a tin pepper-box, and when any of the parts of Parrots' bills, &c., are wished to have this powdered appearance, a little of the solution of gum-arabic is washed over the part with a camel-hair pencil, and the powder dusted on it and allowed to dry.

RED VARNISH.

Take a stick of red sealing wax, beat it down with a hammer, and then put it into a phial, with an ounce of strong spirit of wine, which will dissolve it within four or five hours. It may be applied to any part with a camel-hair pencil, and it will dry in less than five minutes.

Black, yellow, and green, or indeed any color of varnish, may be made from sealing-wax of these various colors.

To those unacquainted with the combination of colors, we may mention, that a mixture of blue and yellow produces green ; pink and blue makes purple ; red and yellow, orange ; black, red, and yellow, brown ; black and blue, gray. These may be varied, in an infinity of shades, by either color predominating, and by the addition of other colors.

LUTING FOR RENDERING BOTTLES AIR-TIGHT.

Common Resin.

Red Ochre reduced into a fine powder.

Yellow Wax.

Oil of Turpentine.

These must be melted over a fire in the following manner ; and the vessel in which it is made should be capable of holding three times the quantity required, to allow room for boiling up. An earthenware pipkin with a handle is the best thing for the purpose, and a lid must be made of tin to fit it. The luting will be rendered more or less brittle, or elastic, as the red ochre prevails :

The wax is first melted, and then the resin ; the ochre is then added in small quantities, and stirred quickly with a spatula each time. When all the ochre has been added, it must be allowed to boil six or eight minutes ; the turpentine is then added, and briskly stirred with the spatula, and continue to boil it. There is considerable risk of the mixture taking fire, and should it do so, the lid must immediately be put on the vessel to extinguish it.

To ascertain the consistence of the luting, a little must be, from time to time, dropped on a cool plate, or flat piece of iron. If it is too soft, more of the ochre must be added to it ; and if too hard, additional wax and turpentine.

TOW AND FLAX SLIVERS.

These are fillets of prepared tow and flax, of from one to three inches in breadth. They are extremely uniform in their thickness, being made to weight, and can easily be procured from any flax-spinning mill, at a moderate price per pound weight.

METHOD OF MAKING ENAMEL-EYES FOR ANIMALS.

Much of the character and expression of animals depends upon their eyes ; it will, therefore, be evident that great attention is necessary in the artificial imitation of these.

In this operation, a pipe of baked earth is used, or a tube of glass six or seven inches in length, at the end of which a little white enamel is placed. This is placed to the flame, so that it may be blown. This enamel forms a globe, whose dimensions depend upon the quantity of air introduced. When this globe is of the size wished, we place in the middle, and perpendicularly to the point of the pipe, the quantity of enamel necessary to form the enamel. The second enamel is then incorporated with the first by presenting it to the flame, while attention is paid to turn the pipe gradually round, so that the enamel may diffuse itself equally, and the iris be exactly circular. If it is required that this iris should be of various colors, like that of man for example, small filaments of enamel are distributed in diverging rays of the suitable color ; the eye is then placed in the flame, until these have incorporated with the iris, after which the pupil is placed as before directed, and the glass applied as before directed.

During this operation, the globe is almost certain of sinking

down, partly from the air escaping, partly from the heat, and from the pressure which is used in applying the different substances : air must again be supplied from time to time to prevent it from losing its form. This becomes particularly necessary when glass is applied, and when it is extended over the whole surface of the iris.

The eye having got its form and size, the pipe is taken away. To effect this, after the air has been introduced, the entrance of the pipe is stopped with the finger, and the back part of the eye exposed to the flame ; when the air contained in the globe, and rarified by the pipe, comes through at the place where the flame has most action. This opening is prolonged by turning the point of the flat pincers, or an iron-wire, all round the pipe ; one point only is left by which the eye remains fixed. It is then warmed equally all over, after which it is exposed to a gentle heat, and when it again cools, it is separated from the pipe.

ARTICLES REQUIRED FOR SKINNING AND MOUNTING QUADRUPEDES, BIRDS, REPTILES, AND FISHES.

1. A box containing scalpels of different shapes ; a pair of scissors with pointed blades, and two or three pointed forceps of different sizes, the extremities of one of which ought to be indented.
2. Two flat pincers, or pliers, large and small.
3. A round pincer for turning wire.
4. A cutting pincer for wire.
5. A hammer.
6. Two files.
7. A triangular.
8. Points for perforating holes.
9. A saddler's awl for drilling holes ; also various shoemakers awls, which will be found useful.
10. Brushes of different sizes for putting the preservative on the animals' and birds' skins, and for smoothing and dusting the feathers.
11. An assortment of iron-wire of all sizes.
12. Flax and tow, coarse cotton. When these cannot be had, untwisted ropes or cords. A quantity of tow and flax slivers for twisting round the leg-bones of small quadrupeds and birds.
13. Some small hardwood meshes for assisting in stuffing.

INSTRUCTIONS TO TRAVELERS.

The best means of procuring living animals, is by applying to the natives of the different countries, who are accustomed to their habits, and the situation in which they are likely to be found, and to take them in traps and snares. They are also more likely to be able to find their retreats, so that they may take these animals in a young state, and also birds in their nests.

By thus securing animals while young, they are much more likely to reach home in a living state. Every exertion should be used to render them familiar, when, being habituated to the appearance of man, they will be more able to resist the effects of a tedious sea voyage than those which have been taken when wild, and are under a continued degree of excitement. Every care should be taken to soothe and caress them ; and there is no animal whose manners cannot be softened by gentle treatment. During fine weather, they should be allowed to take exercise on the deck, as nothing is so injurious to their health and growth as being long pent up in a small cage. While thus confined, it will be obvious that they require a much smaller portion of food than when they can have sufficient room to exercise themselves. Many of these animals are lost from over-feeding. Their diet should be given with great regularity, but always in such quantity as they can easily digest.

Next to food, cleanliness is of the utmost importance, and if this requires too much of the attention of those who are bringing them home, it will be easy to procure the assistance of some of the crew. And unless this is strictly attended to, there is little chance of preserving their health,

When animals' skins are imported, it is also necessary to bring the head and feet. Those of the mammalia, which can be put into a barrel or bottle, should be preserved entire in spirits.

In the event of not being able to transport the carcase, the next best thing is to bring the skeleton along with the skin. It will not be necessary to mount these. All that is required is to boil the bones, take off the flesh, and dry them. Afterwards all the bones belonging to the same skeleton should be put in a bag by themselves, taking care to fill up the bag with dried moss, or any other substance which will prevent friction. The more effectually to secure this, the small and tender bones ought to be wrapped

in paper. It is of the utmost consequence that not a bone should be lost.

In shooting birds, it is of much importance not to use the shot too large; indeed, it ought to be proportioned, as nearly as possible, to the size of the bird to be shot at. When the bird is killed, the blood must be carefully wiped away, and a little cotton must be put into the bill to prevent the blood flowing from it to injure the feathers. The wound should also be stuffed with cotton.

Birds should be skinned as soon as possible, as the feathers are apt to fall off if kept too long. The os coccygis must be kept attached to the skin. If several individuals of the same species be killed, one should, if possible, be preserved entire in spirits, with the whole muscles of the body. If the bird has a fleshy crest, it ought to be preserved in spirits.

It is of the utmost consequence to procure the male, female and young, and these at different ages besides, as many species are subject to great variety, in their progress from the young to the adult state. This is more particularly the case with Eagles and Hawks, many of which have been described as different species in their immature state. The eggs and nest should also be procured.

REPTILES.—The chief thing to be attended to in skinning reptiles is not to injure the scales; and in the Lizard kind, care must be taken not to break the tail. But for all the smaller and middle sized species, the best mode is to preserve them in spirits; and of the larger kinds which are skinned, the skeletons ought to be kept. The flesh should be taken away with knives and scalpels as well as possible, and the bones thoroughly dried, and packed in a box with cotton or grass, and they can be articulated after they are brought home. When the skeletons are too large, they may be separated into convenient parts for packing.

FISHES.—Many species are common to all seas, but there are a vast number which are quite local. Unless, therefore, the traveler is certain of the frequency of those he meets with in his own country, he ought to bring them home. River and fresh water fishes generally are subject to great variety, every lake and river having varieties peculiar to itself, which the experienced fisher, or naturalist, can at once detect. It is, therefore, very interesting to be possessed of these varieties.

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