DISPLAY GROUP OF SPECIMENS. (From photograph taken in the author's museum.)

METHODS IN THE ART OF TAXIDERMY,

BY OLIVER DAVIE,

AUTHOR OF "NESTS AND EGGS OF NORTH AMERICAN BIRDS," ETC.

NINETY FULL-PAGE ENGRAVINGS, CHIEFLY DRAWN BY THEODORE JASPER, A.M., M.D.

THE WHOLE CONTAINING FIVE HUNDRED FIGURES CLEARLY ILLUSTRATING THE MODES OF PROCEDURE IN THE ART, TOGETHER WITH EXAMPLES OF CHARACTERISTIC FORMS AND ATTITUDES OF VARIOUS SPECIES OF THE ANIMAL KINGDOM. INCLUDING REPRODUCTIONS FROM PHOTOGRAPHS OF ACTUAL WORK BY AMERICAN TAXIDERMISTS.

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PREFACE.

IN April, 1882, my artist delivered to me the first drawings intended for this work. As specimens were procured from time to time, from which to make illustrations of the various procedures in the skinning and mounting of animals, the progress was continued until the present volume is the consummation of our efforts. We have likewise incorporated some reproductions from photographs of actual work by American taxidermists. All scientific technicalities which could possibly be avoided have been omitted in the text. Our aim has been to produce a work amply illustrating the various modes of procedure in the art of taxidermy, intended especially to instruct the beginner. Those who are experienced in the art may also be aided by some new and practical methods which we have included within these pages.

We have not followed any established order of zoölogical classification in the arrangement of the chapters, but have taken up the practical lessons on birds first, because they usually give the most satisfactory results to the beginner. The mammals, which are more difficult, come next in order and, lastly, the complicated preparations of crustaceans, fishes, reptiles, etc.

Acknowledgements are due the New York Engraving and Printing Co. for the faithful reproduction of my artist's work, and for the skill and care displayed in the printing of the plates.

239 West Tenth Avenue,
January 10, 1894,
Columbus, O.

Oliver Davie

HISTORICAL INTRODUCTION.

IT is not my intention to elaborate on the history of a subject whose life has been so short and uneventful as that of the art of taxidermy. Our "great lights" in the art are few, and if we cannot point to examples as ancient as those which immortalize the grandeur of other arts, it may be because its objects in their very nature are perishable. If there were any early attempts in the art, the subjects must have been so inartistic and unnatural looking while they lasted that they were perhaps regarded as curious, but as works of art were probably never recognized and were never recorded in history, tradition, poetry or song, and, meteor-like, their rays were soon lost in the firmament of the fixed planets of other arts whose light will continue to shine for all time. Were the examples as desirable as those of sculpture or painting, we should be able to trace their history to very remote periods.

If the mounting of the skins of vertebrate animals to appear life-like was carried on in ancient times, we have no evidence as to the quality of the work or by whom it was done.

An old narrative of the Carthaginian navigator, Hanno, has been verified through extensive research, and that portion relating to the original discovery of the gorilla may possibly have a bearing on the question of the antiquity of our art. By this record, five hundred years before the Christian era this old voyager recorded the capture of gorillas and the preservation of their skins; or, as the record has it, "we killed and skinned them, and conveyed their skins to Carthage." History also relates that these skins were preserved in the temple of Astarte, where they remained until the taking of the city in the year 146 before Christ, as stated by Pliny, who called them *Gorgones*.

From this, however, we cannot infer that these specimens were mounted or arranged to represent life-like attitudes, but simply that the skins were preserved. If our art is of ancient date, we have no relics of it, as we find in the other arts, as lasting as those of Grecian sculpture, which date back as far as the eighth century B. C. The famous Lion Gate at Mycenæ is supposed to be even older. We have no monuments in our art that defy the march of time like the bronze Discobolus of Myron, yet to be seen in the Vatican at Rome, and many others of equal antiquity and value. We have no traces of our art which correspond to those grand mural paintings of Pompeii now collected in the museum at Naples, which are supposed to date from the first period of Roman painting. We have no parallel with these to give evidence that our art was at all practiced in ancient times.

The art of embalming was invented by the Egyptians for the purpose of preserving dead bodies from decay by means of aromatics, antiseptics or desiccation. It was an art created by the demands of the religious superstition of the times, and was practiced by the ancients from the earliest periods, but, unfortunately, was not calculated to enlighten and elevate. In their sepulchres, tombs and pits are found not only countless bodies of human beings, but also myriads of dogs, apes, crocodiles, cats, ibises, sheep, oxen and other animals.

All this was associated with their religious belief, for they held that the soul, after completing its cycle of separate existences extending through several thousand years, again returned to the body, and if that were found decayed or wasted, it transmigrated. It was not for the love of having their specimens look natural and life-like, but for the reason of their superstitious belief, that their spirits would, in course of time, return to their bodies, and they would again live with their cats and dogs as before the spirit left the body.

Embalming is simply a means of preservation, is a separate art, and cannot, strictly speaking, come under the head of taxidermy, while taxidermy proper attempts to reproduce the forms, attitudes and expressions of animals as they appear in life.

The skins of animals were used from the most remote periods for clothing and various useful and ornamental articles, but respecting those periods we have no knowledge of the skins being mounted to represent life-like forms and attitudes. History records the fact that the older Indian tribes decorated themselves on different occasions with the heads of porcupines, foxes, raccoons, eagles, etc., stuffed so as to look quite natural.

It is told that the first attempt to stuff birds was when the Hollanders in the early part of the sixteenth century began their commercial intercourse with the East Indies.

A nobleman brought back to Amsterdam a large collection of live tropical birds and placed them in an aviary, which was heated to the proper temperature by a furnace. It happened that the attendant one night before retiring carelessly left the door of the furnace open, thereby allowing the smoke to escape, which suffocated the birds. The nobleman beholding the destruction of his large collection, which was the pride of the city, began to devise means for the preservation of the dead birds. To this end the best chemists of Amsterdam were called in for consultation, and it was decided to skin the birds and fill their skins with the spices of the Indies for their preservation. This was done, and they were then wired and mounted to represent life. For many years they were the hobby of the nobleman and the pride of the inhabitants.

But with these few very faint and unsatisfactory glimpses we have taken of our art, through the dark corridors of time, we must leave its past history to the oblivion that surrounds it, and look at the attempts of more modern times.

Very interesting allusions are frequently made to taxidermic specimens in some of the world's greatest literature. In Shakespeare's Romeo and Juliet, Act V, Scene 1, Romeo, in addressing Juliet, says:

> "I do remember an apothecary,—
> And hereabouts he dwells, whom late I noted
> In tatter'd weeds, with overwhelming brows,
> Culling of simples; meagre were his looks,
> Sharp misery had worn him to the bones:
> And in his needy shop a tortoise hung,
> An alligator stuff'd, and other skins
> Of ill-shap'd fishes."

Samuel Butler, in Hudibras, gives us a picture in the astrologer, Sidrophel's laboratory.

It would be difficult to supply a better stock in trade for a wizard's den than that which Hogarth has furnished the apartment in his illustration of this scene. It is the most striking, if not the best, of Hogarth's illustrations of the Hudibras. Everything we see in the room bespeaks the cunning craft of the astrologer in the ignorance of his fellow-creatures. Besides two globes, terrestial and celestial, and the spread scroll with its cabalistic signs, there is a stuffed crocodile, a sword fish, a tortoise, a bat, frog, snake and a few lizards. There is also a human skeleton with an owl mounted upon its shoulder. The room is luridly illumined by a burning lamp which is suspended by a chain from the crocodile, which seems to be the presiding genius of the place.

Not only do we know that examples of taxidermy decorated the dens of astrologers and the shops of apothecaries in the middle ages, but many a trophy of a day's hunt adorned the stately halls of palaces. The head and antlers of the stag which was laid low by "my lord's prowess" were preserved and hung as a memento of the chase. In recent years, as in the past, those in the humbler walks of life have likewise cherished a love for the preservation of the objects of animated nature, and in their lowly chambers may often be found specimens of taxidermic handiwork of great beauty and rarity. In a large number of instances our art has found patronage by those whose humble names have become immortal. Highland Mary, the idol of Burns, the greatest lyrical poet that ever lived, died in a room containing, among other simple decorations, three or four stuffed birds. We might recall many significant instances of individuals whose love for objects from the fields of nature, through modest personal efforts established a nucleus which formed the basis of some of the great museums of the world. The existing literature on the subject of taxidermy which has been published from time to time throws considerable light upon its rise and progress.[1]

So far as my investigation goes, I have not been able to trace any writings on the subject of taxidermy farther back than two hundred years.[2] The oldest work in my collection is a *Natural History* published at Paris by the Royal Academy in 1687, on the dissection of various animals. In this work mention is made of the fact that the Hollanders were the first to bring into Europe live specimens and skins of the cassowary and a number of other strange birds which they secured on their first voyages (1517) to the Indian archipelago. These were stuffed at Amsterdam.

Reaumur in 1748 published a memoir of the method of preserving skins of birds to be sent into distant countries. He received birds from all parts in spirits of wine, according to the instructions he had given, and formed a beautiful cabinet of natural history in his own house which, after his death, became the basis of the collection of birds in the Museum of Paris.

In 1752 M. B. Stollas issued at Paris a work entitled "Instructions on the Manner of Preparing Objects of Natural History." The work contains five full-page illustrations. Some of the most ingenious devices for the mounting of birds and quadrupeds are given in this work. Why his methods were not more universally adopted by those immediately following him is difficult to understand. The same year appeared H. L. Duhamel's work of a similar title. E. F. Turgot appears to be the author of an anonymous work on taxidermy, which was issued at Lyons in 1758. The methods of skinning and mounting birds and small quadrupeds, described and illustrated in this

1. In preparing this historical sketch I have depended almost entirely upon the data found in the books and pamphlets relating to taxidermy in my own collection, numbering 110 titles.

2. In Mr. L. M. McCormick's valuable "Bibliography of Taxidermy," published in the third annual repor of the Society of American Taxidermists, the oldest writing mentioned is dated 1689.

work, are not the best by any means, while those for mounting reptiles, fishes and crustaceans are far better than some of the methods employed at the present day. This book is beautifully bound in the old style vellum. Another French work, by P. N. Nicholas, published at Paris in 1801, gives practical methods of mounting quadrupeds and reptiles, but the one given for mounting birds is the old unskillful, soft-filling method. The bird skin is also treated quite differently. It is soaked in a bath of preserving solution which, if at all practicable, would certainly aid in its preservation.

In 1786 the Abbé Manesse published a volume under the title of "Treatise on the Manner of Stuffing and Preserving Animals and Skins." He presented his work to the Academy of Sciences at Paris. It contained some very useful advice in the mounting of birds, but the excluding of poisons and the adopting of alkalies for the preservation of skins proved a failure in his day and is not admissible in modern taxidermy.

About this time an old German sculptor living at Lahaye devoted himself to the practice of taxidermy, and in a short time surpassed all those who had employed themselves in the mounting of animals. He excelled in the mounting of large mammals.

Becœur, of Metz, who first compounded the well-known preservative, arsenical soap, mounted birds and quadrupeds by replacing their skeleton back in their skins. The muscles being removed from the bones, which were allowed to remain attached to their ligaments, he replaced the flesh with flax or cotton, wired the legs and vertebral column, sewed up the opening in the skin, placed the specimen on its stand, gave it a suitable position and then put on the finishing touches. It is recorded that his work was skillfully done and the attitudes of his subjects were natural, because with the skeleton he could not go far wrong.

A German work, issued anonymously at Leipsic in 1788, contains some rather unusual methods of mounting birds and mammals. Professor J. S. Wiley in 1855 published a fifty page pamphlet, entitled "The Preparation and Preservation of Objects of Natural History." It is one of the best and most thorough treatises on the subject that has ever appeared. The different methods offered in this work form a combination based upon those employed by the best French and German operators. His manner of collecting and preparing fishes and reptiles is of the best kind. One in the German by Dr. W. Shilling, published at Weimar in 1860–61, in three volumes, is one of the best foreign works with which I have met. Philipp Leopold Martin, in 1870, published at Weimar a most creditable and complete exposition of our art. A book by H. T. Race, in the Danish, published in 1842, contains old methods of mounting birds and mammals, in which the methods of preservation are not at all reliable. A little work of twenty-nine pages, by S. H. Sylvester, published in this country in 1865, is a most practical work as far as it goes. The instructions are very concise, but clear and of the most practical kind. Those given are only for birds and small quadrupeds. A work by Nathaniel Whitlock, appeared in London in 1831, and gives some very good instruction in the "Skinning and Mounting of Birds, Beasts and Fishes." It makes little difference, however, what methods a man employs if, by their means, he attain in a satisfactory manner the ends in view; but of all the above mentioned works, Martin seems to be the only author who has a proper knowledge of the uses of clay in taxidermy.

In fact, it is difficult to comprehend how the old taxidermists managed to make the heads and faces of large, and also some of the smaller mammals, look natural without its use or something equivalent to it. It would be difficult, indeed, without something of a plastic nature, to reproduce the exact character of the lips and faces of dogs and larger mammals, the faces and fingers of monkeys, etc.

It is true that Naumann in 1815 advocated the use of clay in birds by making a stout wire frame, which he filled with soft clay and allowed it to dry, thus producing a piece of work of great weight.

The proper uses of clay in our art are well known at the present day. It can be moulded into any shape desired, and will forever retain the form given it, and an experienced hand by its use can reproduce to a nicety all the wrinkles, hollows and elevations that are characteristic in the expressions of any animal. This part of the art requires the delicate touch which characterizes the hand of the true sculptor when the image in his brain is first created in clay. In fact, he who would attain a high standard in the advanced branches of taxidermy must be in one sense of the word a sculptor. In the work published in 1840 by William Swainson, and also in that of Capt. Thomas Brown, there appears not one word on the value of clay in taxidermy. Its uses then in our art may be considered of comparatively recent date. My venerable preceptor, Dr. Theodore Jasper, has always employed it in modeling mammals. His experience in the art extends over a period of more than fifty years. The use of clay were undoubtedly known in Brown's and Swainson's time, but it is a well known fact that many methods in taxidermy, like the mixing of metals by the alchemists of old, were held secret by their discoverers, which prevented them from becoming generally known.

American books on taxidermy are not numerous, but besides those already noticed, we may name Maynard's "Taxidermist's Guide" and the "Taxidermist's Manual;" also Joseph H. Batty's "Practical Taxidermy." Mr. William T. Hornaday's "Taxidermy and Zoölogical Collecting" is the best work that has thus far appeared, foreign or American.

Our "great lights," if such they may be called, are Charles Waterton, of England, and Jules Verreaux, of France. The first was an enthusiast and had many queer ways of doing things, while Verreaux, of Paris, is said to have created masterpieces in the art fairly rivaling "some of the examples of the higher plastic arts." Titian R. Peale, an energetic collector, is said to have improved the art in the United States.

The distinguished naturalist, Prince Maximilian, of Nieu Wied, Germany, for several years explored regions of North and South America in search of specimens of birds and mammals. In the American Museum of Natural History are numbers of examples in the Maximilian collection bearing labels in the handwriting of the Prince, with dates from 1812 upwards.

Associated with the early beginning of the art of taxidermy in this country is one Scudder, who was proprietor of a small museum in the old alms-house in the City Hall Park, New York City. A little later came an Englishman by the name of Ward who did work at this museum which soon merged into a larger institution under the management of the Peales, whose museums in Philadelphia and New York were patrons of the art in those days. Mr. George N. Lawrence, the distinguished American Ornithologist, and Mr. Daniel Holder, were enthusiastic collectors and students of birds. They enjoyed the acquaintance and friendship of Wilson, Prince Bonaparte, Audubon, Nuttall and others of distinction. During Audubon's collecting tour throughout the plains of the West he was accompanied by an artist in taxidermy. Poor Wilson, on the other hand, in this capacity and whatever he did, depended entirely upon his own efforts and genius to make his name immortal. Dr. J. B. Holder states that some years previous to 1840 a Mr. Mann established himself in Boston as a practical taxidermist. His style of work was of the old school, and purely mercenary. Soon after 1840 a Mr. Ogden came from England with inherited skill in taxidermy and an enthusiasm that despised pecuniary compensation as the sole incentive to art. The Boston Museum had been established in Tremont Temple, and the Boston Society of Natural History had not long before been organized. Through these institutions Mr. Ogden was at once given employment and his work on the largest mammals was successful to a high degree, as well as in the modeling of birds, reptiles and fishes. A large number of individuals outside of the large cities in those days might be named who gave the subject of taxidermy much time and study and became enthusiastic wholly for their own pleasure or for professional purposes. A vast change however has taken place in the more recent productions of intelligent and earnest American taxidermists. The most improved methods of the world's best artists have been carefully studied and often improved upon by American ingenuity.

The climax of excellent work has indeed been left for the artists of the New World to accomplish. The organization of the Society of American Taxidermists did much for the diffusion of knowledge of the art. Methods were no longer held secret, but their merits and demerits were freely discussed by those of the profession, and the doors of the studios were thrown open to the public. The knowledge of methods alone does not any longer bespeak a man's genius in this art; the only secret being to *imitate Nature.*

The superior work done at Ward's great Natural Science Establishment has also had its influence over the efforts of the new school of American taxidermists. We now have many artists in the field. A vast number of their productions, to be seen in the museums of this country, attest the high order of excellence of their work, surpassing anything in the taxidermic art the world has ever seen. The magnificent groups of mammals and birds in the American Museum of Natural History, Central Park, N. Y., tell of the profound ability of the late Mr. Jeness Richardson. The groups in our National Museum, Washington, D. C., also stand as lasting monuments to the ingenuity and skill of William T. Hornaday, Frederic A. Lucas, Joseph Palmer and others. Among those who have likewise been identified with the recent progressive period in American taxidermy may be mentioned the names of Jules F. D. Bailly, P. W. Aldrich, Elwin A. Capen, William J. Critchley, John G. Bell, Prof. L. L. Dyche, Thomas W. Fraine, C. W. Graham, John Martens, Mr. and Mrs. G. H. Hedley, William Palmer, Chas. K. Reed, J. Rowley, Thomas Rowland, S. F. Rathbun, John Wallace, Frederic S. Webster, Frank B. Webster, and a host of others who have gone into the rich fields of nature, turned from the narrow trodden paths and plucked flowers whose beauty was never before seen. They have discovered and reproduced new scenes such as were never carved in stone or painted on canvas.

CHAPTERS.

LIST OF PLATES.

CHAPTER I.

INSTRUMENTS, MATERIALS, WORKSHOP, ETC.

Individual preference may often regulate the quantity and quality of a collector's outfit, when the size of his purse does not have to be taken into consideration.

The extent to which you desire to carry on operations in taxidermy will altogether determine what should constitute your equipment; but, as for the beginner, who is to learn the A B C of the art, the instruments necessary to proceed with are comparatively few and inexpensive. As the amateur proceeds, however, he will gradually discover what is desirable and necessary in his practice, and will provide for his wants accordingly.

In order to attain the fullest success, the taxidermist must provide himself with excellent tools, and all materials requisite for the performance of his work. 'Tis the shining steel instruments of modern make that become favorites among skilled workmen.

Powers could never have executed his "Greek Slave" with a common cold-chisel, and many a battle has been lost for lack of the proper sinews of war. By all means, equip yourself before entering the field.

I shall not dwell longer on the importance of providing a first-class outfit, but shall inspect the quarters in which we are to do the work, and the place in which we are to store our specimens, great and small. We shall first examine the workshop, its general appointments, and the materials to be used.

The Workshop.—Unless you are an inspired genius, do not select a gloomy, out-of-the-way room in the cellar or garret, for such environments are seldom congenial to the best kind of work. The alchemists and taxidermists of old made this mistake, but I would advise you not to follow their example, unless circumstances absolutely compel you to do so. Select a well-lighted, airy room in your house, or have one built to suit your purpose, and make its appointments as complete as will suit your own convenience. An ideal workshop, together with a repository or museum hall, the capacity of which will answer any purpose required for work in taxidermy, whether you desire to engage in it for pleasure or for profit, may be described as follows: A room, not less than 18x20 feet, and one story in height, should occupy the ground floor, with two good-sized windows at one end, a door at the side, made large enough for the egress of your mounted elephants, horses, etc.; a sky-light in the roof should be arranged so that it can be opened for ventilation. Adjoining this, a repository or museum hall should be built, 40 feet long and 15 feet wide, with two sky-lights, made sufficiently large to admit plenty of light. This hall should be furnished with glass wall and aisle cases, made as nearly dust-tight as possible. My private museum hall, at No. 239 Tenth Avenue, is of this same design and proportioned as above. In our workshop, which still demands our attention, a dark closet must be made for the drying of freshly mounted specimens, and another for the storage of materials, such as tow, excelsior, and straw by the bale, plaster of Paris, salt, and ground alum by the barrel or hundred weight, and potter's clay by the ton. Make a work table 7 feet long, 3½ feet wide, and 2 feet 6 inches high, the top out of 1½-inch oak plank, dressed; make the table portable, so that you can fasten it to the wall directly in front of the windows, or move it into the center of the room under the sky-light. At one end of the table fix a heavy iron vise. Have sunken into this table, at one end, flush with the top, a piece of plate glass 3 feet square, on which to skin birds. A chopping block, made of a section of a sycamore, is an excellent thing for many purposes. A case with drawers, to contain the necessary tools, should be placed close by. Various sizes of stone, glass and earthen jars should be provided in which to pickle the skins of the smaller mammals. Make a large box-like tank or vat, constructed of oak and lined with sheet lead, to hold the skins of the large subjects. Over this tank, in the ceiling, should be fixed a rope and pulley to facilitate the handling and turning of heavy skins.

The salt and alum solution in which the skins are placed evaporates very rapidly, and it is necessary to tack a thin strip of sheet-rubber round the edge of the lid of the large tank to make it fit tightly. The same construction may be followed in making the lids for the stone jars.

In taking the skins of mammals out of the salt and alum bath to place or fit them on the manikin, or when the skins in this position are wrapped in wet blankets to keep them moist during the process of sewing, the liquid is constantly dripping from them. It is quite necessary, therefore, to provide a water-tight platform, properly drained, on which to stand the manikin.

I have here described an ideal workshop, and it is not, by any means, expected that the beginner will prepare so elaborately for a line of work in which he has not attained proficiency.

PLATE I.

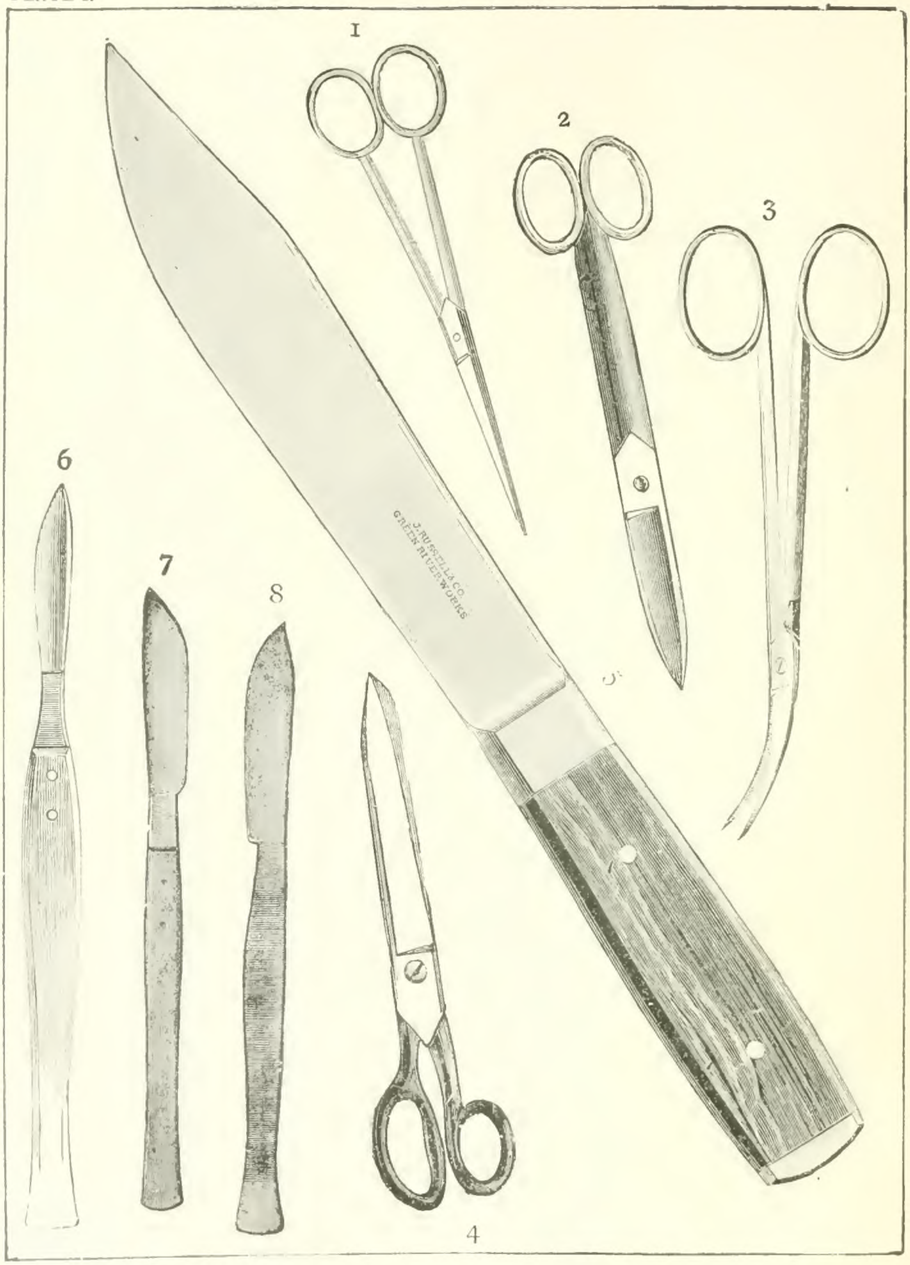


PLATE I.

INSTRUMENTS.

Figs. 1, 2, 3, best shapes of scissors to use.
Fig. 4, shears for coarse work.
Fig. 5, "killing knife" for skinning large subjects.
Figs. 6, 7, scalpels for small work.
Fig. 8, cartilage knife, all steel, for heavy work.

Do not be backward in beginning operations on the dining or kitchen table, and work there, at least, until you have been ejected, specimens and all, by the lady of the house. Do not let a scanty supply of tools stop your progress. I have seen wonderful pieces of taxidermy done with a sharp penknife, some wire, tow, needle and thread, and some arsenic. The qualities which go to make a good 'jack-of-all-trades' are brought into requisition in taxidermic art.

Materials.—In addition to the excelsior, tow, plaster and other materials already mentioned, our workshop would be very much lacking in its requirements if the following were not included: *i. e.*, spirits of turpentine and boiled linseed oil with which to mix paints for painting the discolored parts of mounted animals, benzine, hard oil finish (white, for varnishing), arsenious acid, common whiting, bi-carbonate of soda, muriatic acid, shellac, white glue, arsenical soap, twine of two or three sizes, cotton batting, sponges of several grades and sizes, coarse and fine long-fibre hemp tow, fine flax tow, as used by upholsterers.

Most of the tools used by the carpenter are essential adjuncts to the taxidermist's outfit; also many of those used by the blacksmith, including the anvil, portable forge, and bolt clippers.

A small supply of walnut, oak, ash, and hemlock lumber is always useful, besides $\frac{1}{4}$, $\frac{1}{2}$, $\frac{7}{8}$, and 1 inch dressed pine boards and 2x4 pine scantling.

Essential to our stock is an assortment of annealed wire, and, for the benefit of those who are inexperienced in the matter, I give below the common names of a few North American birds and mammals, and the various sizes of wire which I have used in their mounting. I take for my standard wire gauge the one manufactured by The Washburn & Moen Manufacturing Company, Worcester, Mass.

No. 6—American White Pelican, Brown Pelican, Whooping Crane.

No. 6 or 7—Whistling Swan, *Olor columbianus* (Ord.), Trumpeter Swan, *Olor buccinator* (Rich.), Sandhill Crane, *Grus mexicana* (Mull.), Wild Turkey.

No. 8 or 9—Flamingo, Wood Ibis, Bald Eagle, Golden Eagle.

No. 9 or 10—Loon, American White-fronted Goose, Canada Goose, Brant, *Branta bernicla* (Linn.), Great White Heron, *Ardea occidentalis* (Aud.), Great Blue Heron, often erroneously called "Sandhill Crane" or "Blue Crane," Roseate Spoonbill, American Egret *Ardea egretta* (Gmel.), Turkey Vulture.

No. 10 or 11—Double-crested Cormorant, American Herring Gull, Mallard, Redhead, Canvas-back, American Eider, Red-tailed Hawk, Red-shouldered Hawk, American Osprey, Great Horned Owl, Snowy Owl.

No. 11 or 12—American Merganser, Red-breasted Merganser, Shoveler, Wood Duck, Surf Scoter, Barred Owl.

No. 12 or 13—American Bittern, Black-crowned Night Heron, Yellow-crowned Night Heron, Sage Grouse, Crow.

No. 13 or 14—Hooded Merganser, Baldpate, Green-winged, Blue-winged, and Cinnamon Teals, Pintail, Buffle-head, Old-squaw, Ruddy Duck, Florida Gallinule, American Coot, Ruffled Grouse, Prairie Hen, Marsh Hawk.

No. 14—Reddish Egret, Louisiana Heron, Little Blue Heron, Green Heron, King Rail, American Barn Owl, American Long-eared Owl, Short-eared Owl.

No. 16 or 17—Dabchick, Greater Yellow-legs, Black-bellied Plover, American Golden Plover, Mourning Dove, Screech Owl, Belted Kingfisher.

No. 17 or 18—Least Bittern, American Woodcock, Wilson's or Jack Snipe, Solitary Sandpiper, Killdeer, Bob-white, Saw-whet Owl, Flicker, Blue Jay, Yellow-headed Blackbird, Meadowlark, Purple, Florida, and Bronzed Grackles, Brown Thrasher.

No. 18—Wilson's or Common Tern, Yellow and Black-billed Cuckoos, Hairy Woodpecker, Yellow-bellied Sapsucker, Red-headed Woodpecker, Red-bellied Woodpecker, Robin.

No. 19—Black Tern, Virginia and Sora Rails, Baird's Sandpiper, Piping Plover, Downy Woodpecker, Crested Flycatcher, Red-winged Blackbird, Baltimore Oriole, Rusty Blackbird, Wax-wings, Mockingbird, Catbird.

No. 20—Red, Northern, and Wilson's Phalaropes, Least Sandpiper, Semi-palmated Sandpiper, Kingbird, Cardinals, Wilson's Thrush, Olive-backed Thrush, Hermit Thrush, Bluebird.

The sizes from Nos. 21 to 24 are suitable for so many of the diminutive birds found among the Finches, *Fringillidæ*, and in the family of Vireos, *Vireonidæ*. Nos. 23 and 24 are particularly desirable for nearly all the American Warblers, *Sylvicolidæ;* these sizes are also necessary in mounting all of the diminutive Wrens, the Titmice, *Paridæ*, the Creepers, *Certhiidæ*, and the dainty little Sylvians, of which I may mention the Ruby-crowned and Golden-crowned Kinglets, and the Blue-gray Gnatcatcher. No. 26 is suitable for any of the North American Hummingbirds.

In each instance where two sizes of wire are mentioned for the severally named species, I have invariably used the larger when I was sure the size of the wire would not break the skin along the back of the leg, or disfigure it in any way. In mounting a half dozen Flamingos, I used No. 9 wire. In many birds the sizes of the wires were still larger than the largest given, especially when the bodies of the birds were massive and heavy, as in the Loon, Pelican, and Swan. When the bird is to stand on one leg, and sometimes when it is to be mounted with wings spread, a larger size is necessary. The smaller sizes of wire, it is true,

PLATE II.

INSTRUMENTS.

Fig. 1, chain and hooks for hanging up birds while skinning.

Fig. 2, drill for making holes in legs of birds, especially dry skins, that the wire may pass through more easily. Several sizes are necessary.

Fig. 3, long scissor-like stuffing forceps for placing filling in the necks of birds; 12-inch length is most desirable.

Fig. 4, dissecting saw $4\frac{1}{2}$ inches long with movable back.

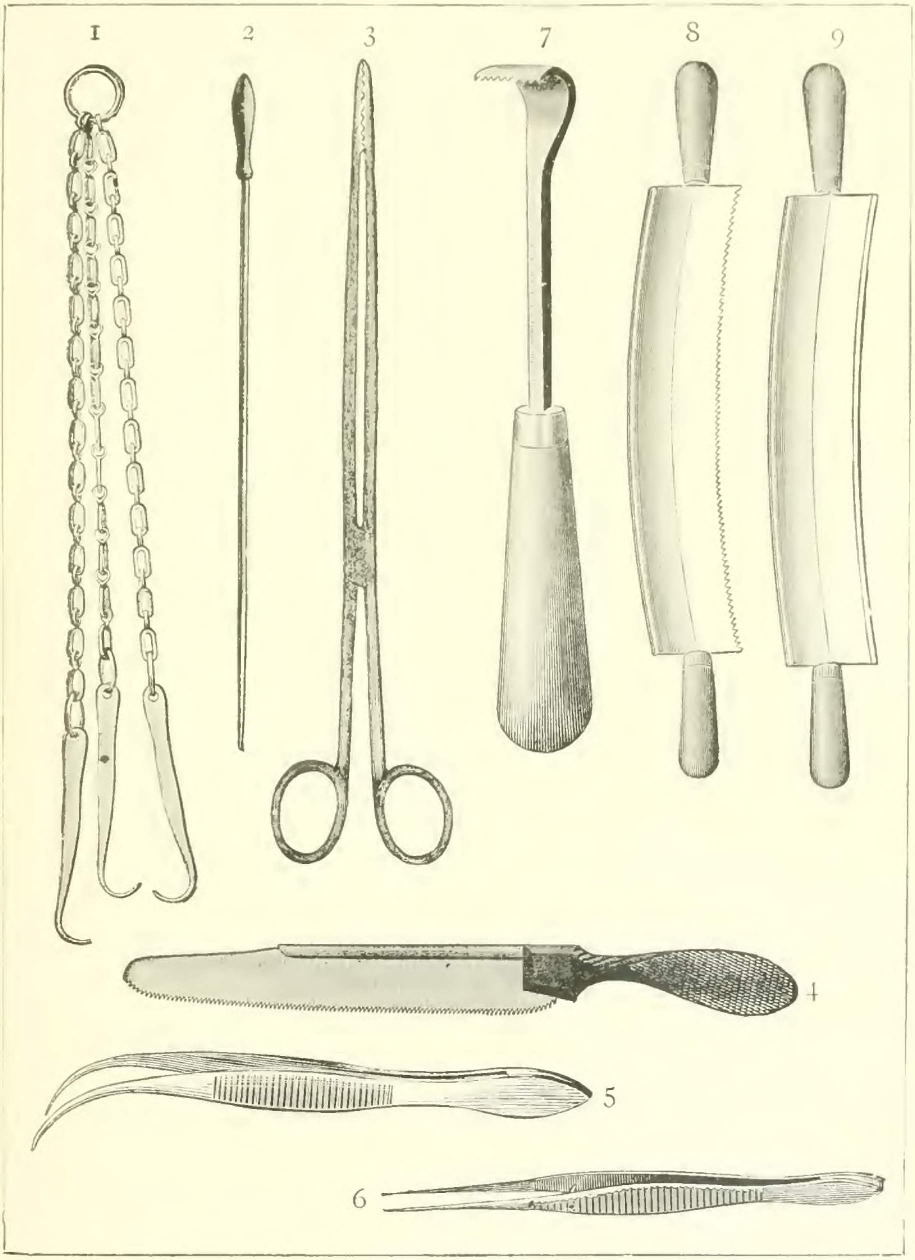
Fig. 5, fine curved, pointed spring forceps.

Fig. 6, fine straight spring forceps.

Fig. 7, skin-scraper, for scraping or shaving down the dry skins of mammals.

Fig. 8, toothed currier's knife for paring down the dry skins of large mammals.

Fig. 9, keen-edged currier's knife, suitable for thinning down green or dry skins of the larger quadrupeds.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will support the specimens when thoroughly dry, and they are, in fact, the sizes most commonly used, but the object is to make every structure so strong that there will not be the slightest doubt as to its firmness when finished.

What is more aggravating than to discover, after your specimen is standing, that the supports are not quite strong enough; that your specimen wabbles, and that, in order to remedy the defect, it must be taken down and taken apart and heavier supports inserted! One or two experiences like this, especially with mammals, will teach the novice that to adopt heroic sizes of wire in the first place, when possible, is the best course to pursue, even if it does involve a little more physical labor all around.

Let me recommend to my readers the use of copper wire in the mounting of birds and the smaller mammals; for more than one reason it is far superior to the annealed iron wire which is so generally used. It is more easily worked, because it is more pliable, and, best of all, it will last forever. For my first knowledge of the use of copper wire in mounting specimens, I am indebted to Dr. Jasper, my artist, and the inventor of so many of the devices in the art which his own hands have so faithfully delineated in this work.

The sizes of wires which I have used in some of the full-grown mammals are as follows:

No. 7—Wolverine.
No. 7 or 8—Wild Cat, *Lynx rufus* (Guldenstadt).
No. 8 or 9—Red Fox, Gray Fox.
No. 10—American Badger, Otter, Raccoon, Ground Hog, Beaver.
No. 11 or 12—Civet Cat, Martin, Skunk.
No. 12 or 13—Muskrat, Gray Rabbit, Opossum.
No. 14 or 15—American Mink, Gray Squirrel, Fox Squirrel.
No. 17 or 18—Weasel, Red Squirrel, Chipmunk, Gopher

A full-sized Bullfrog, *Rana catesbiana* (Shaw), mounted in a quiet, natural position, requires No. 19 wire for its support; and in an upright or human-like attitude, No. 17.

Some of the tailed Amphibians, the size of the Mud Puppy or Water Dog, *Necturus maculatus* (Rafinesque), or the species known as the Hellbender or Mud Devil, take a No. 14 wire. Most of these however, are preserved in clear spirits. The African Ostrich requires $\frac{1}{2}$-inch iron rod.

The common domestic cat usually needs a No. 12 or 13 wire; Pointer, Setter Dog, Coyote, $\frac{1}{4}$ inch Norway round iron rod; Gray Wolf, $\frac{5}{16}$ inch; Giant Kangaroo, $\frac{3}{8}$ inch; Cougar or American Panther, $\frac{5}{16}$ inch; American Tapir, $\frac{3}{8}$ inch; Caribou and large Mountain Sheep, $\frac{1}{2}$ inch;

Moose, Elk, and Giraffe, $\frac{3}{4}$ inch. The size of rod which I have always used for supports in the horse and cow was $\frac{5}{8}$ inch; this size is also necessary for the American Bison.

List of Essential Tools, etc.

3 pairs of fine scissors, one curved, Figs. 1, 2, 3, Pl. I.
1 pair shears, Fig. 4, Pl. I.
3 scalpels, Figs. 6, 7, Pl. I.
2 cartilage knives, Fig. 8, Pl. I.
2 "killing knives," Fig. 5, Pl. I.
3 skin-scrapers, various sizes, one small for birds, "home made" as directed, Fig. 7, Pl. II.
1 currier's knife, toothed, one with plain edge, Figs. 8, 9, Pl. II.
1 bone-saw, Fig. 4, Pl. II.
3 pair spring forceps, one curved point, two straight, Figs. 5, 6, Pl. II; Fig. 4, Pl. III.
4 drills of different sizes, for making holes in legs of birds—dry skins especially. Fig. 2, Pl. II.
1 chain and hooks, Fig. 1, Pl. II.
2 pair Hall's cutting pliers, 5 and 7 inch, Fig. 1, Pl. III.
3 flat-nosed pliers of different sizes, Fig. 2, Pl. III.
1 hand-vise, Fig. 3, Pl. III.
6 sizes of surgeon's needles, three straight, three curved, Fig. 6, Pl. III.
3 stuffing rods, of various lengths as directed, of iron wire, notched at one end, with loop or wood handles, as in Figs. 1, 2, 3, Pl. IV.
5 boxwood and steel modeling tools of different shapes, Figs. 4, 5, 6, 7, 8, 9, Pl. IV.
3 gouges of different sizes.
5 chisels of various sizes.
2 sizes of screw-drivers.
1 2-foot rule.
1 12-foot tape measure.
1 thread-cutter for iron, 1 for brass.
1 bolt-clipper.
1 first-class hand-saw.
1 key-hole saw.
1 ratchet-brace, with bits and drills.
6 gimlet bits of different sizes.
2 sizes of monkey-wrenches.
1 first-class hatchet.
1 machinist's hammer.
1 claw-hammer.
1 tack-hammer.
1 cold-chisel.
1 nail-punch.
3 hack-saws, for iron and brass.
1 pair of calipers.
1 set of files, five sizes.
1 glue-pot.
10 darning-needles of different sizes.
4 awls, various sizes.
3 papers of common needles, various sizes.

PLATE III.

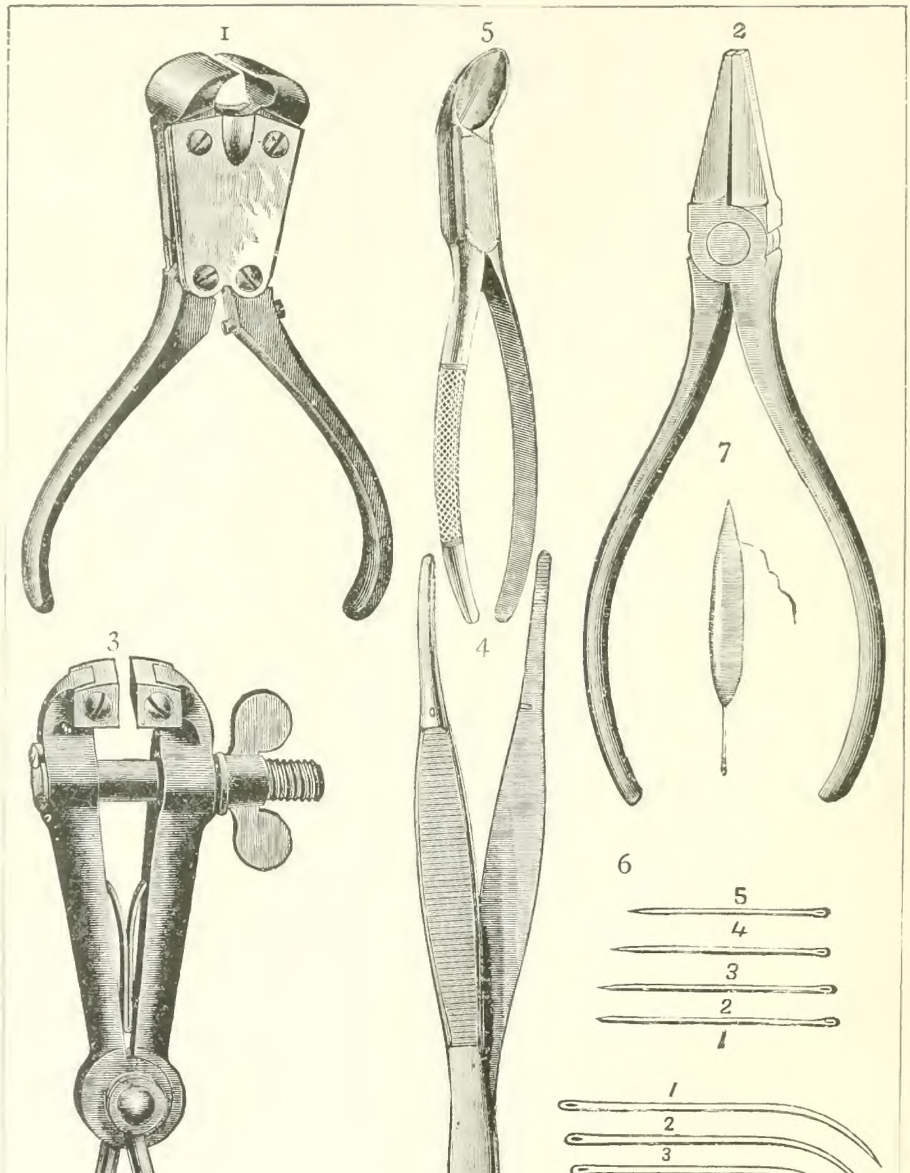


PLATE III.

INSTRUMENTS.

Fig. 1, Hall's compound lever nippers; best cutting pliers for the general use of the taxidermist, the most useful sizes being 5 and 7 inches.

Fig. 2, flat-nosed pliers, used in taxidermy for bending and clinching wire, etc.

Fig. 3, hand-vice for holding wire while filing sharp points thereon.

Fig. 4, spring forceps, for placing filling in necks of the smaller birds, etc., best size 5 inches.

Fig. 5, surgeon's bone forceps, used for detaching the legs and necks of turtles and small quadrupeds; also handy in skinning fishes.

Fig. 6, straight and curved surgeon's needles.

Fig. 7, bobbin of soft thread for winding the feathers of birds; obtained at cotton mills, technically called cops.

1 paper of pins.
1 set of glover's needles, five sizes.
2 balls of Barbour's Irish flax, No. 12.
12 spools Barbour's linen thread.
1 thimble.
1 spirit-lamp or gas-stove.
1 ball best linen sewing twine.
1 bobbin of fine, soft thread for winding the plumage of birds, Fig. 7, Pl. III.
1 copper tank in wooden box for collecting alcoholics.
1 alcoholometer for testing the strength of alcohol.
4 iron kettles of various sizes, from one gallon upwards.
2 pails, or more.
½ dozen bowls of different sizes.
2 small trowels.
1 sculptor's broad spatula, copper, 10 inches long, for moulding.
1 R. Hoehn Co.'s taxidermist's salinometer for testing strength of salt and alum solution.
1 good stomach and a clear head.

The scalpel is the necessary instrument for skinning small birds, and there is an advantage in having several with various sized blades, as seen in Figs. 6 and 7, Plate I. Some are made of a solid piece of steel, like the heavy cartilage knife, Fig. 8, which is best for the larger birds and the smaller mammals.

The very best knife in shape and quality for heavier work is that called the "killing knife" (Plate I, Fig. 5), manufactured by J. Russell & Co., Green River Works, Turner's Falls, Mass. The price of this knife is only seventy-five cents, and will well repay any taxidermist who will provide himself with several of them. In case you can not procure it, the butcher-knife must, of course, take its place.

The surgeon's bone forceps, or bone cutters, either straight or curved edge, will be found handy for detaching the legs and necks of turtles, and they are also convenient in the skinning of fishes, birds and small quadrupeds (Fig. 5, Plate III).

When you come to severing legs and wings, clipping off pieces of flesh, fat, and tendons, each of the various shaped scissors Plate I have their special use.

The skin-scraper (Plate II, Fig. 7) is an absolutely necessary instrument for scraping or shaving down the hard, dry skins of mammals which you desire to mount.

The toothed currier's knife (Fig. 8) is most excellent for paring down the dry skins of large mammals, while the keen-edged one, represented by Fig. 9, is suitable for use on green and dry skins. A sharp draw-shave will answer the purpose when the currier's knives can not be obtained. For scraping the dry skins of birds, I usually take an old tablespoon, flatten the bowl, cut it off square in the middle, bend it, and file teeth in it, similar to Fig. 7, Plate II. This makes a first-class instrument for scraping dry bird skins and also those of the small mammals.

The dissecting saw (Fig. 4, Plate II) should be 4½ inches long, with movable back. It costs $2.75, but it can be substituted much cheaper by cutting the same length off a hack saw, and fitting it to a wooden handle. This instrument is indispensable in sawing through the shells of turtles and through the bones of mammals, as the case may demand.

The long scissor-handled forceps (Plate II, Fig. 3) are used for placing filling in the necks of ducks, herons, and other long-necked birds. The most desirable length of these forceps is 12 inches. For placing the filling in the necks of the smaller birds, the spring forceps, 5 inches long (Fig. 4, Plate III), are the most commonly used. Several sizes and shapes, however, should be at hand, such as are represented by Fig. 5 and 6, Plate II; light and delicate ones for arranging the plumage of birds, and doing many other little things which you will soon acquire by habit and experience.

The chain and hooks (Fig. 1, Plate II), are used for hanging up the body of a bird after you have reached the point of skinning over the tail, as shown in the plate illustrating the skinning of the robin. A good-sized fish-hook with the barb filed off and suspended on a strong cord will answer the purpose very well.

The drill (Fig. 2, Plate II), made of a sharpened steel wire with a wooden handle, is a very handy tool for making holes in the legs of birds, especially in the legs of dry skins where, in many cases, it is almost impossible to force a soft annealed wire without first making a hole with the drill. Several sizes are necessary.

By far the best cutting pliers for the general use of the taxidermist is Hall's compound lever nippers (Fig. 1, Plate III). These, together with those represented by Figs. 2 and 3 of the same plate, are manufactured by the Interchangeable Tool Co., Boonton, New Jersey, who also make a side-cutting pliers on the same mechanical principle. The side-cutters are used where the end-cutters fail to reach, which is seldom the case with the latter in our work.

Besides having a most powerful leverage, one of the beauties of Hall's double-lever nippers is, that when the jaws break new ones can be replaced at a trifling cost. These pliers can be procured at hardware stores, and the best sizes are 5 and 7 inches, respectively. Any wire which the 7-inch nippers will not cut, it is best to resort to the bolt-clipper, commonly used by the blacksmith to cut iron rods and bolts.

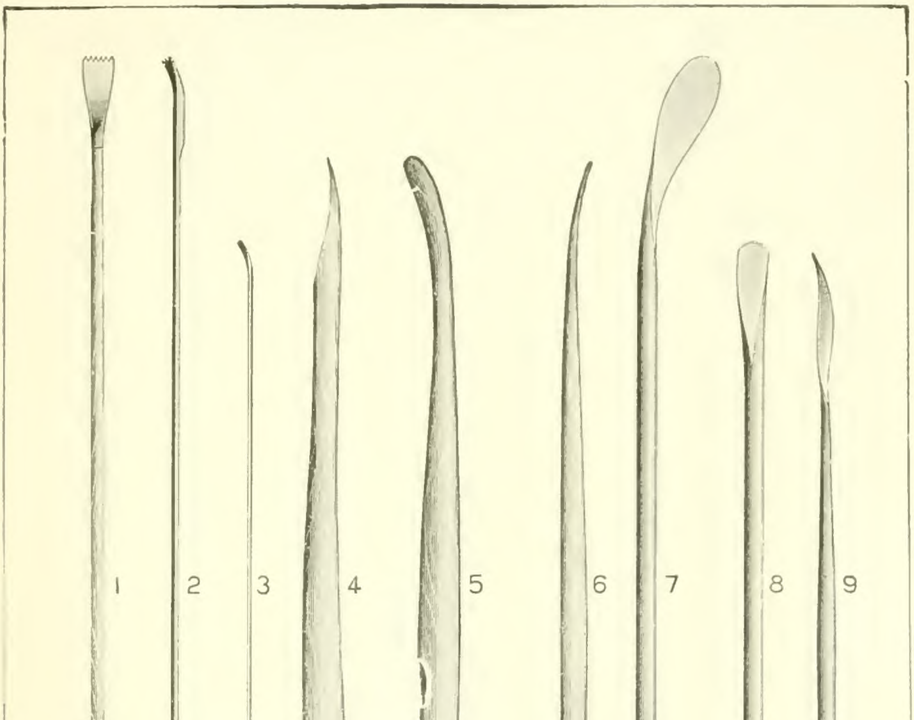
PLATE IV.

INSTRUMENTS.

Figs. 1, 2, 3, stuffing rods; like Fig. 1 should be two or three feet long, made of hard wood and tipped with steel, notched; and like Fig. 2 of light steel rod, three feet long for large mammals. Fig. 3 should be 18 inches long for small mammals.

Figs. 4, 5, 6, box-wood modeling tools.

Figs. 7, 8, 9, steel modeling tools.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The hand-vise (Fig. 3, Plate III) is essential in holding the annealed wire while filing sharp points thereon, while several sizes of flat-nosed pliers (Fig. 2, Plate III) are necessary in bending and clinching wire, and for many other uses to which they are adapted.

In sewing up the openings in mammals and birds, preparatory to putting on the finishing touches, it is best to use the regular surgeon's needles, straight and curved, of various lengths (Fig. 6, Plate III). Few taxidermists, however, use anything better than a common needle for birds.

If you cannot buy extra long needles for sewing manikins, you can make them by grinding a sharp point on one end of steel wire; heating the other end red hot and, while in this state, flatten the end with a hammer. It becomes cold during this operation, but heat it again and while hot, with an awl punch an eye in it while it rests on a bar of lead. In this way you can make excellent needles for any large size for mammals.

Experience has taught me that a soft, downy thread is best for winding the feathers of birds, and this is particularly the case in the smaller species. For this purpose I prefer the thread from the bobbin, which can be obtained at the cotton mills, technically called cops (Fig. 7, Plate III). When this can not be obtained, a spool of No. 40 thread will answer the purpose for the smaller birds. For the larger species—hawks, owls, etc., the soft, fluffy Barbour's No. 12 Irish flax, commonly used by shoemakers for making wax-ends, is the very best.

The stuffing rods are shown in Plate IV, Figs. 1, 2, and 3. Two that I use for large mammals are made of ash, tipped with steel, notched as seen in Fig. 1; they are 2 and 3 feet long, respectively. Another is made of a light steel rod, curved at the point, and notched, and is 3 feet long, with wooden handle, like Fig. 2. One represented by Fig. 3, for small mammals, is made of a lighter steel rod, and is 18 inches long. To make a small stuffing-rod for birds, take a piece of hard, straight iron wire, No. 13, twelve inches long, hammer one end flat, notch it, give the point a slight curve, or make it straight (both kinds are useful), make a loop for the handle, or put on a wooden one, as indicated in Figs. 2 and 3, Plate IV.

The stock of implements which has already been described and catalogued is yet incomplete, for we must bring to our assistance some of the essential tools and materials which are employed in other arts. For putting on the finishing touches—painting or tinting the discolored fleshy parts of mounted animals, and for modeling the open mouths of mammals, etc., we must not forget to bring into our studio or workshop our artistic ability, tube paints, brushes, the palette, and a number of sculptor's modeling tools.

The modeling tools are made of various materials, such as cocoa-wood, boxwood, wire, zinc, copper, and steel, and are of various shapes. Any of the instruments or materials used by artists may be procured of any dealer in artists' materials, or of F. W. Devoe & Co., Manufacturers and Importers of Artists' Materials, New York City. A few of the most desirable shapes of the modeling tools for our purpose are illustrated in Plate IV; Figs. 4, 5, and 6 are made of wood, and 7, 8, and 9 are of steel.

The following Windsor & Newton's tube colors are necessary: Burnt umber, burnt sienna, chrome green, chrome yellow, chrome red, emerald green, flake white, Indian red, indigo, ivory black, lampblack, Naples yellow, Prussian blue, raw sienna, raw umber, sugar of lead, van-dyke brown, venetian red, vermilion. These colors are put up in convenient collapsible tubes, and are the best for fine work.

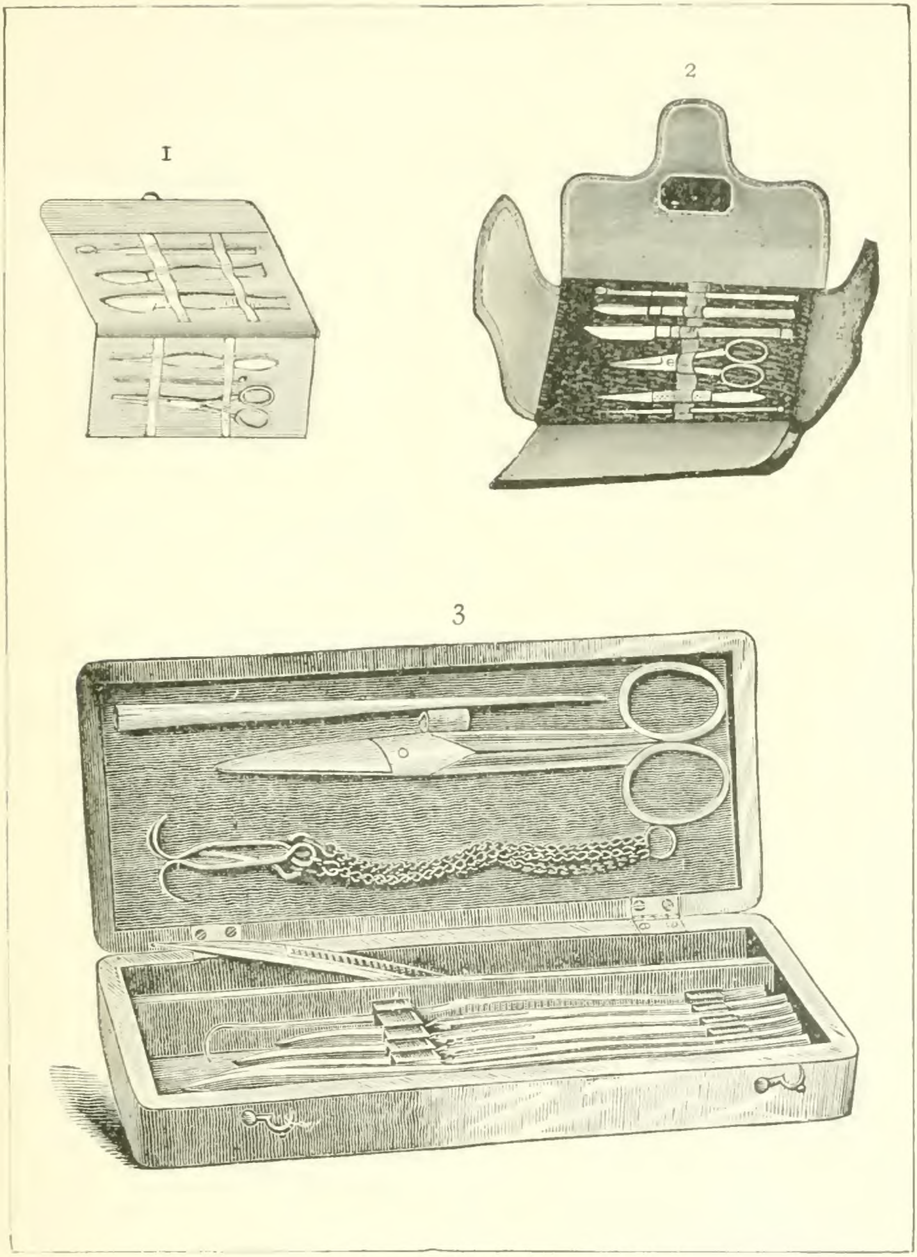
A palette 10x14 inches is sufficiently large. This should be accompanied by a palette-knife and cups. Most of the above colors, it should be remembered, can be procured ground in oil in one-pound cans, and also in *dry colors;* these will be found absolutely necessary for coarse work on mammals, and the brush suitable for this grade of painting is the common socket sash tool, the best sizes being from Nos. 3 to 9, costing from fifteen to thirty-five cents each. In this kind of work it is also very desirable to have a 3 and 4 inch stippling brush, or "stippler," as it is called. For medium work, the best brushes are of fitch hair, or a combination of fitch and French bristles, both round and flat; the sizes from 1 to 6 are the most desirable. For fine work get the artist's round Russia sable hair brushes; the sizes run from 1 to 12, the intermediate sizes answering the more general purpose.

The artist's materials enumerated above are of the utmost importance to any person who would engage in the higher branches of taxidermic work. With these he must test his ability in putting on the final touches which give expression and color to many of the specimens belonging to the higher orders of the animal kingdom, while they are of just as much importance in finishing a large number of the birds, reptiles, and fishes.

Artificial Eyes for Animals.—Glass eyes are manufactured in every variety of shape, color and size to suit the various animals. Plate VI will give a fair idea of the sizes, shapes, and styles commonly used.

In skinning a specimen, be sure and take particular note of the color of the eye, and in ordering from your dealer, you should always give the name of the animal for which the eyes are intended, and state

PLATE V.



INSTRUMENTS.

Figs. 1, 2, pocket field cases of instruments.

Fig. 3, common dissecting case, containing many of the tools needed by the beginner as well as the field-collector. (See Chapter III).

that you desire the sizes figured in this work. You will then receive exactly what you order. Most eyes come attached to wires, as seen in Figs. H and K.

Nos. 0 to 27, it will be observed, have a round, black pupil; the color of the iris of these is extremely variable, being carmine, yellow, straw, white, green, blue, brown, reddish-brown, and dark hazel.

These are the kind used for birds, and they are the plainest for mammals, except the *entirely black* eye, which is often substituted for the colored ones, both in mammals and in birds, when the iris is of so dark a hazel or brown that it can scarcely be distinguished from black. This is the case in a large number of the smaller birds, as the Titmice, Creepers, Wrens, Warblers, Tanagers, Swallows, Finches, and many of the larger species. The plain black eye, for instance, is commonly inserted in the Barred Owl; its proper color, however, is blue-black. The same may be said of the Barn Owl. Of the mammals, in which the plain black eye is generally used, except when the subject is albino, I may mention the Weasel, Mink, Skunk, Raccoon, all of the squirrels, Ground Hog, Gray Rabbit, Opossum, and the Black Bear. Sometimes our sensibilities are shocked upon seeing a solid black eye in a mounted deer's head. Solid black eyes, it should be understood, can be obtained in any of the sizes given, but they should never be substituted if there is a distinctly visible tint in the iris of the specimen for which they are intended.

So far as my experience goes, the most convenient glass eye for the taxidermist to use is the *clear flint* eye, which, with tube colors and varnish, can be painted any color to suit the eyes of the subject in hand.

In the grade with the round, black pupil, the sizes range from Nos. 0 to 27; in those of the clear, transparent kind, used for various mammals with round pupil and *white corners*, the sizes range from Nos. 6 to 27; elongated pupils in the clear glass have Nos. 6 to 27; in the irregular pupil, for fish, the sizes range from Nos. 6 to 24.

For any animal in which there is a preternatural whiteness of the feathers or hair, and a peculiar pinkness of the iris and pupil of the eye, the albino glass eye should, of course, be used. The albino eyes can be obtained in sizes from Nos. 1 to 17 in the *plain round* style, and from Nos. 18 to 27 with *white corners*.

Figure A in our plate represents an eye with elongated pupil and plain iris. The sizes in this style range from 16 to 27, and the colors of iris are brown, and a very light brown suitable for deer, elk, moose, caribou, goat, sheep, etc. A finer quality is represented by Fig. B, elongated pupil, veined green, yellow, straw or brown iris. They can be had in sizes from Nos. 6 to 17, and are the best styles for cats (Fig. C). The larger ones of the same style range from Nos. 16 to 26, and are suitable for wildcat, leopard, lynx, panther, etc. An eye of the same grade (Fig. D), which has a round pupil, veined iris, hazel or brown, is for fox, dog, bear, etc. The same is made in sizes from Nos. 10 to 16, with white extending entirely around the iris, for dogs and other small quadrupeds. For fish, irregular pupils are made (Fig. E), with silver, gold, green, or bronze iris, the sizes being from Nos. 8 to 24.

The eyes with *white corners*, combining all the qualities of the finer grades which I have described, are considered by many taxidermists to be the best. They are shown by Figs. F and G. Nos. 10 to 18, round pupil, veined brown iris, for fox; Nos. 10 to 22, round pupil, veined hazel iris, best for dogs, bears, etc.; Nos. 15 to 18, elongated pupil, brown veined iris, for fox; Nos. 16 to 27, round and elongated pupil, veined hazel iris, for large mammals.

Sizes and Colors of Eyes for Birds.— In giving the following sizes and colors of birds' eyes, I should state that they are given chiefly from personal knowledge and experience, or from specimens now actually in my private collection. There is often a wide difference between the color of the eyes of the adult birds and those of the young of the same species.

No. 23 — African Ostrich, brown.

No. 18 to 21 — Great Horned Owl, Straw.

No. 18 or 19 — Snowy Owl, straw.

No. 17 — Barred Owl, blue-black, or black; Great Gray Owl, brownish-yellow.

No. 15 — Bald Eagle, adult, straw; young, called Gray Eagle, hazel. Golden Eagle, brown.

No. 13 to 15 — Screech Owl, straw.

No. 14 or 15 — White Pelican, adult, pearly white; young, brown. Brown Pelican, white.

No. 13 or 14 — Great Blue Heron, pale yellow, straw; Osprey, straw.

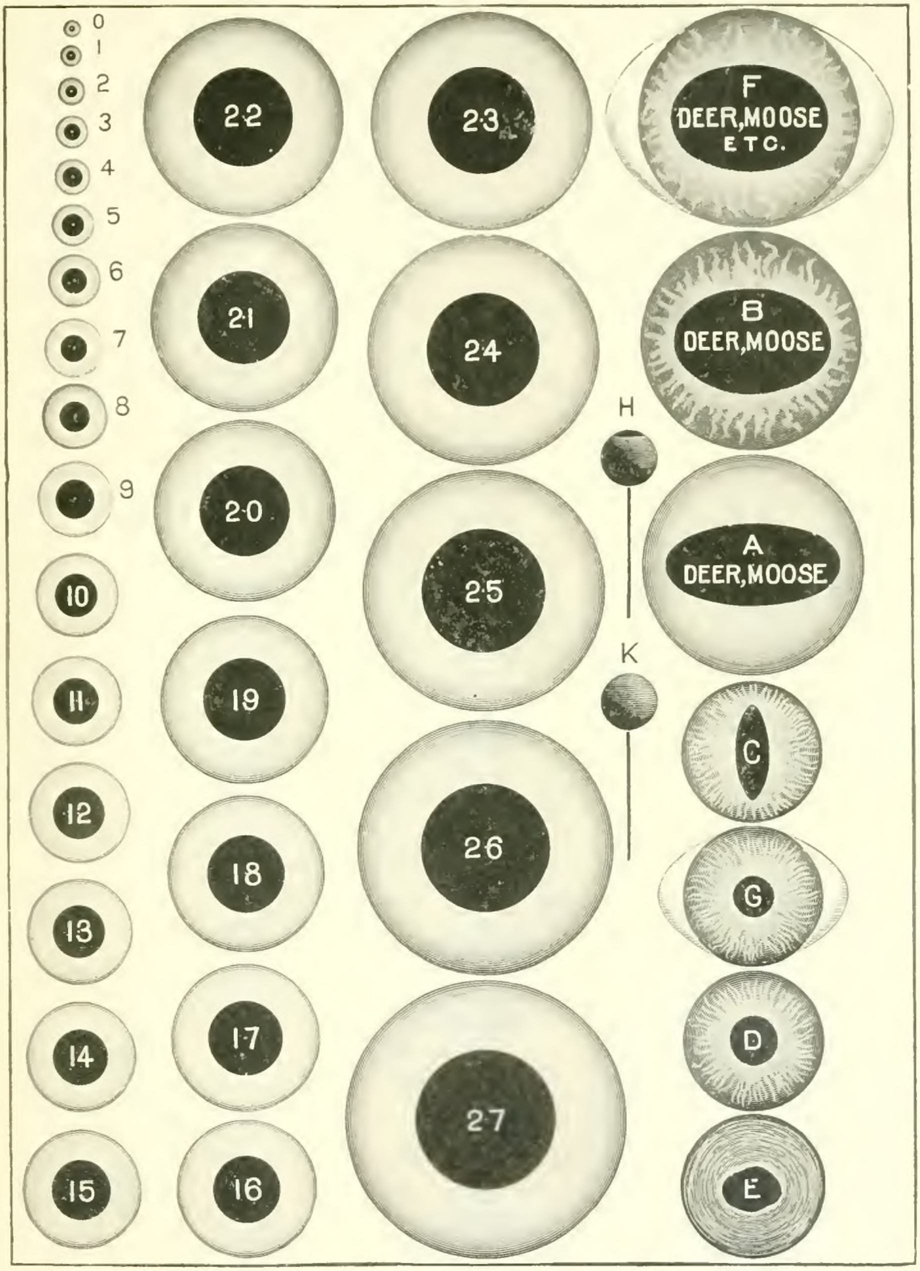
No. 13 or 14 — Loon, red; Night Heron, adult, red; young, brown. Yellow-crowned Night Heron, orange.

No. 12 to 14 — Red-tailed Hawk, yellow or brown; Richardson's Owl, straw.

No. 12 or 13 — Canada Goose, hazel; White-fronted Goose, hazel or brown; Wood Ibis, Goshawk, red; Long-eared Owl, straw; Short-eared Owl, straw.

No. 10 — Flamingo, reddish-brown; American Bittern, straw; Acadian Owl, straw.

No. 10 or 11 — Wood Duck, red; American Hawk Owl, straw.



ARTIFICIAL EYES FOR ANIMALS.

This plate represents the various shapes, sizes and styles of glass eyes usually inserted in taxidermic specimens. (See page 22).

No. 8 or 9 — Double-crested Cormorant, Florida Cormorant, Violet-green Cormorant, green; Louisiana Heron, red; Little Blue Heron, yellow; Reddish Egret, red; Green Heron, yellow; Snowy Heron, straw; Golden-eye Duck, golden-yellow or straw; Barrow's Golden Eye, golden; Buffle-head, yellow; Old Squaw, straw; Harlequin Duck, reddish-brown; American Eider, brown; Stellar's Duck, brown; Pacific Eider, brown; King Eider, brown; Ruddy Duck, reddish-brown; American Merganser, carmine; Red-breasted Merganser, carmine; Hooded Merganser, yellow; Black Duck, brown; Pintail, brown; Gadwall, reddish-brown; Wigeon, brown; Green-winged Teal, brown; Blue-winged Teal, brown; Cinnamon Teal, brown; Shoveller, orange-red; Canvas-back, red; Red-head, orange; American Scaup Duck, yellow; Mallard, brown, hazel; Sharp-shinned Hawk, adult, red; young, straw.

No. 6 or 7 — Glossy Ibis, red or brown; White-faced Glossy Ibis, red; White Ibis, pearly blue.

No. 5 or 6 — Anhinga, or Snakebird, carmine; Least Bittern, straw.

No. 5 to 7 — Flicker, Robin, Blue Jay, Red-winged Blackbird, hazel or black.

No. 3 to 5 — Sparrows in general, hazel or black.

Sizes of Eyes for Quadrupeds —Like the sizes given for birds, those of the quadrupeds are, in a number of cases, taken from specimens in my private collection. Many of the sizes, however, are taken from the lists of experienced dealers.

Mink and Skunk, Nos. 7 or 8; Red Squirrel, No. 8; Gray Squirrel, No. 10; Fox Squirrel, No. 11; Raccoon, Nos. 11 to 14; Rabbit Nos. 12 to 15; Jack Rabbit, Nos. 14 to 17; Fox, Nos. 15 to 17; Coyote, Nos. 15 to 17; Wolf, Nos. 16 to 18; Bull Dog, Nos. 17 or 18; Pug Dog, Nos. 14 to 18; Black-and-tan Dog, Nos. 14 to 16; Setter and Pointer Dog, Nos. 16 to 18; Black Bear, Nos. 15 to 17; Grizzly Bear, Nos. 17 or 18; Domestic Cat, Nos. 11 to 16; Wild Cat, Nos. 16 to 18; Lynx, Nos. 16 to 18; Cougar, or Mountain Lion, Nos. 20 to 22; Jaguar, Nos. 22 or 23; Bengal Tiger, Nos. 24 or 25; African Lion, Nos. 23 to 25; Horse and Cow, Nos. 25 to 27; Deer, Nos. 22 or 23, Maine; Nos. 23 or 24, New York; Nos. 24 or 25 in the West; Nos. 21 or 22 Florida; Caribou, Nos. 24 or 25; Moose and Elk, Nos. 25 or 27.

Doubtless, few of my readers will attempt to equip themselves so perfectly for work in taxidermy as I have detailed in this chapter. In order to pursue a single branch of zoological collecting — birds for instance — it is necessary to possess but few of the tools and materials already enumerated. Many will learn to do what they can in the art simply as a pastime; others with a view to making a collection of zoological specimens of a certain district or territory: while some who have the right kind of ambition, enthusiasm, pluck, and energy, will not allow the gigantic specimens of zoology to stagger their ingenuity. If the student is undecided as to how far his practice in the art will extend, a very few of the more important instruments and materials are all that are necessary until his fire is kindled or suddenly goes out.

As dealers in naturalists' supplies I can recommend The Frank Blake Webster Company, Hyde Park, Mass., who keep every article the naturalist and taxidermist requires. It will pay any beginner to send ten cents for their illustrated catalogue of naturalists' materials. Mr. Frank H. Lattin, of Albion, N. Y., is also an extensive dealer in naturalists' materials and zoological specimens. Codman & Shurtleff, surgical instrument makers, Nos. 13 and 15 Tremont street, Boston, Mass., manufacture many of the instruments figured and recommended in this work. For the best taxidermist's salinometer in the world, for the alcoholometer, or any kind of hydrometers that you may desire, I can recommend The R. Hoehn Co. manufacturers, No. 44 College Place, New York City.

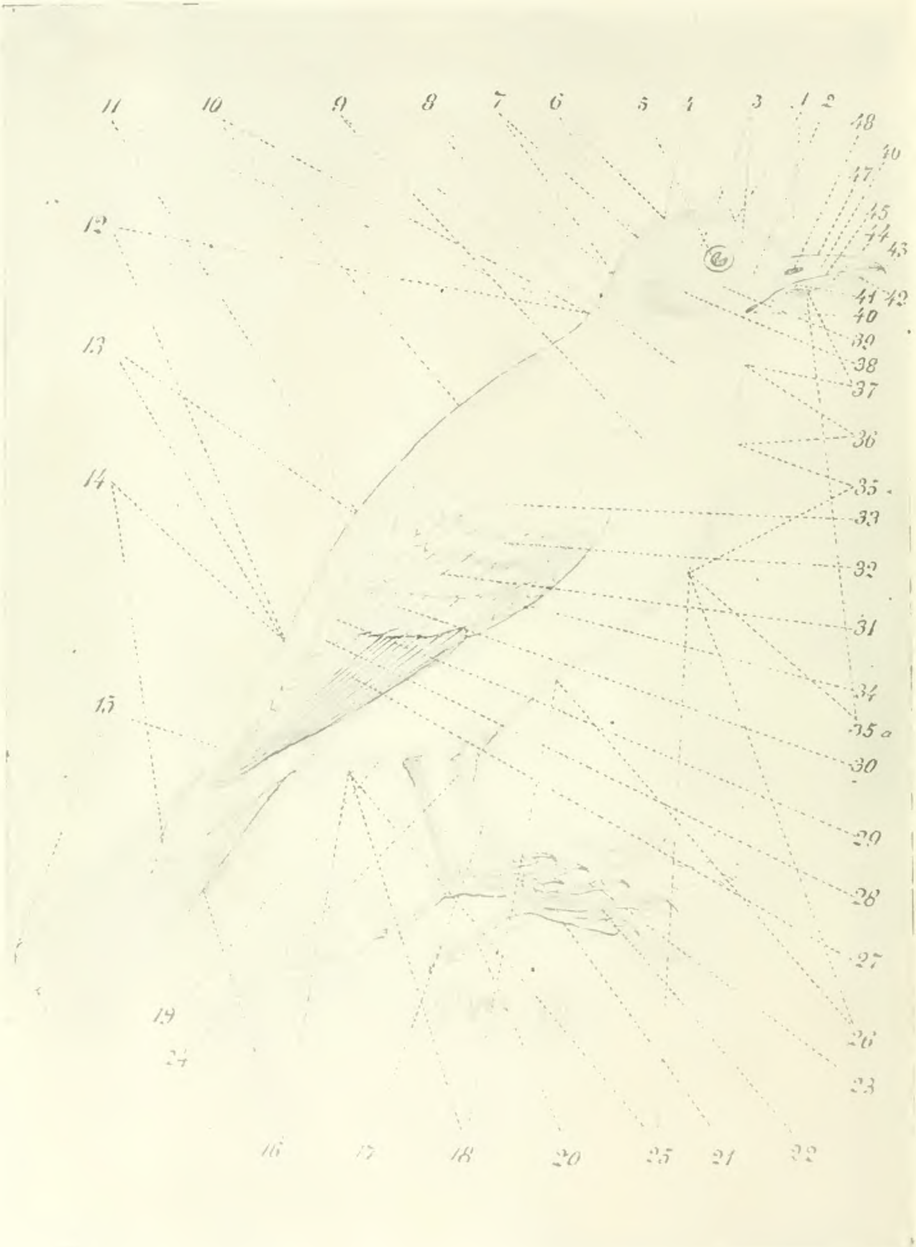

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PLATE VII.

TOPOGRAPHY OF A BIRD.

1, forehead (*frons*); 2, lore; 3, circumocular region; 4, crown (*vertex*); 5, eye; 6, hindhead (*occiput*); 7, nape (*nucha*); 8, hind neck (*cervix*); 9, side of neck; 10, interscapular region; 11, *dorsum*, or back proper, including 10; 12, *notæum*, or upper part of body proper, which includes 10 to 13; 13, rump (*uropygium*); 14, upper tail-coverts; 15, tail; 16, under tail-coverts (*crissum*); 17, tarsus; 18, abdomen; 19, anal region; 20, hind toe (*hallux*); 21, outer or fourth toe; 22, middle or third toe; 23, second or inner anterior toe; 24, heel; 25, *gastræum*, including 18 and 26; 26, breast (*pectus*); 27, primaries; 28, secondaries; 29, tertiaries; Nos. 27, 28, 29 are all *remiges;* 30, primary coverts; 31, greater coverts; 32 median coverts; 33, lesser coverts; 34, bastard wing; 35, lower throat or *jugulum;* 36, middle throat or *gula;* 37, chin or *mentum;* 35*a*, the throat, including 35, 36 and 37; 38, auriculars; 39, malar region; 40, corner of mouth, or angle of commissure; 41, ramus of under mandible; 42, *gonys;* 43, *apex* or tip of bill; 44, side of under mandible; 45, cutting edges of bill, or *tomia;* 46, side of upper mandible; 47, ridge of upper mandible, *culmen;* 48, nostril.

CHAPTER II.

PRESERVATIVES, POISONS AND COMPOUNDS USED IN TAXIDERMY; THEIR PREPARATION AND THEIR GENERAL USES IN THE ART; TOGETHER WITH OTHER INFORMATION OF VALUE.

Arsenical Solution and Arsenical Paste.—

Crystallized Arsenic - - - -	1 pound.
Bicarbonate of Soda - - - -	½ pound.

Place these two ingredients in a vessel containing five pints of water and boil the whole down to three pints, or until the arsenic and soda have disappeared, stirring frequently to keep them from settling to the bottom. Crush the large pieces of arsenic in order that they may more quickly dissolve. When cold it is ready for use. Put the liquid in a large bottle, properly labeled, "Poison." When a quantity of this solution is mixed with common whiting to the consistency of cream it is ready to be applied to the inside of skins with a brush, and is called *Arsenical Paste.* For the purpose of mixing the solution and whiting take a wide-mouthed bottle or a shallow dish and keep a large and a small brush in it for use on the various sizes of skins. Other uses of the clear solution alone will be treated presently in this chapter. The beauties of the *Arsenical Paste* are, that it is quickly and easily made, is cheap, makes a most substantial coating and its poisonous effect on skins is equal to anything of the kind made, not excepting the time-tried Arsenical Soap which many may still prefer to use.

Arsenical Soap.—

White soap, - - - -	2 pounds.
Powdered arsenic, - - -	2 pounds.
Camphor, - - - -	5 ounces.
Sub. carbonate of potash, - -	6 ounces.
Alcohol, - - - -	8 ounces.

DIRECTIONS.—Slice the soap and melt it in a small quantity of water over a slow fire, stirring it sufficiently to prevent its burning. When melted, add the potash and lime, and boil until it becomes quite thick. Now stir in the powdered arsenic, after which add the camphor, previously dissolved in the alcohol. When the mass has been boiled down to the consistency of thick molasses, pour it into an earthen jar to cool and harden. Stir it frequently while cooling to prevent the arsenic settling to the bottom. When cold it should be like lard or butter. For use, mix a small quantity with water until it resembles buttermilk, and apply with a common paint brush.

Poisoning Feathers and Hair.—One of the best methods I know of for poisoning feathers and hair to protect them against the ravages of moths, dermistes, etc., is by the application of the arsenical solution in a weak form. Take any quantity of water, one-fourth of which should be the arsenical solution. Thoroughly saturate with this weakened solution a sufficient quantity of clean, white sand to bury a bird skin in from twelve to twenty-four hours. At the end of this time the feathers will be sufficiently poisoned. This liquid can be made as strong as desired by adding more of the arsenical solution, but it should be tested with a black feather to see that it is not too strong of the solution, and if too strong there will be a gray or white deposit left on the feather.

With a liberal coating of arsenical paste or arsenical soap on the inside of the skin your specimen is made as much proof against the attacks of insects as possibly can be. A small quantity of the pure arsenical solution put in the salt and alum bath is a most thorough means of poisoning hair of mammals.

Upon finished specimens of quadrupeds this solution should be used in a slightly stronger form than that directed for the treatment of bird-skins. In applying it to these it should be poured from the spout of a small tea-pot. Should the solution be so strong as to cause a gray deposit to develop on the hair when dry it can be sponged off with warm water.

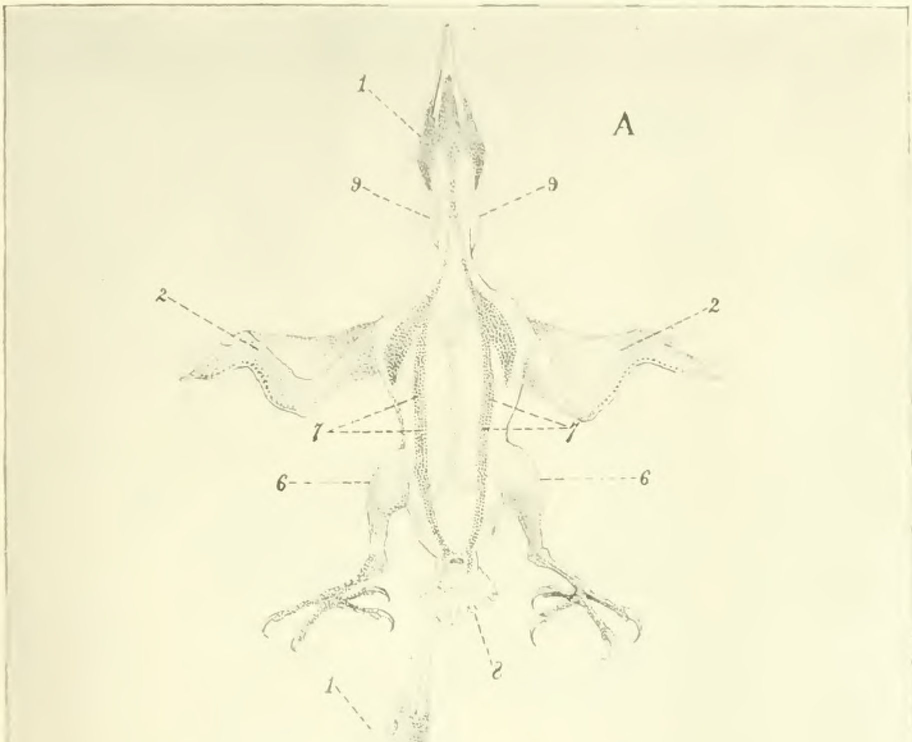
Corrosive Sublimate Solution.—This is a most powerful solution for saturating the hair or feathers of mounted specimens. Its proportions are half alcohol and half water, with all the corrosive sublimate the alcohol will take up, and is prepared in this manner: Should you desire to make two gallons of the solution, first take one gallon of the alcohol and dissolve the corrosive sublimate in it—about six ounces—which would be about one ounce to every three pints. The alcohol does not take up all sublimate and the liquid must be poured off that which settles to the bottom. When this is done add a gallon of water and your saturated solution is made. It should be applied in the same manner as that given for *poisoning feathers and hair*, with the weakened arsenical solution.

PLATE VIII.

FEATHERED TRACTS AND UNFEATHERED SPACES IN BIRDS.

Although the feathers of a bird lay over each other like shingles on a roof it does not follow that they grow *everywhere* upon the skin. Feathers grow in tracts with bare spaces between. A uniform and continuous feathering, however, occurs in some birds as, in the ostriches, penguins, and toucans. Some birds, to be sure, are naked about the head or feet.

Figures A and B in our plate are taken from a specimen of the Flicker *Colapes auratus*, A representing the under portion and B the upper part of the bird's feathering. Fig. 1 is the capital tract which clothes the head and generally joins the dorsal and ventral tracts. Fig. 2, alar tract, all the feathers which grow on the wing, except the humeral tract. Fig. 3, humeral tracts, being the place where the beginner often fails to make the feathers of the shoulders lay as they do in life, caused chiefly by making the artificial body too full at this point. Fig. 4, spinal or dorsal tract, running along the middle of the bird from above the nape of neck to the tail, subject to great variation. Fig. 5, femoral tracts, band upon outside of each thigh, subject to great variation. Fig. 6, leg tract covers the legs as far as these are feathered, generally to the heel, always below the knee and sometimes to the toes as in many owls. Fig. 7, ventral tract, the plumage along the belly and under parts commencing at or near, and frequently running into the dorsal tract, but subject to great variation in forms. Fig. 8, the tail or caudal tract, includes the feathers of the tail, their coverts and those about the *cleodochon*, and usually join the termination of the dorsal, ventral and femoral tracts. Fig. 9, represents the salivary glands so wonderfully developed in woodpeckers.


A
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The Wickesheimer Solution.—This is a solution in which fleshy objects may be preserved entire.

The formula is as follows:

Alum - - - -	500 grains.
Salt - - - - -	125 grains.
Saltpetre - - - -	60 grains.
Potash - - - - -	300 grains.
Arsenic trioxide (white arsenic) - -	100 grains.

The whole should be dissolved in one quart of boiling water and then allowed to cool, when it should be filtered. For every quart of this solution add four quarts of glycerine and one quart of alcohol. In this preparation objects may be preserved indefinitely.

Solution for Keeping Bird Skins Soft.—The taxidermists and field collectors in general are indebted to Mr. Thomas M. Earl, for the discovery of this invaluable solution. It is simply an expedient. The object of the preparation being to preserve a bird skin in a *soft* condition for at least four to five months, so that it may be mounted at any time to suit the convenience of the collector or taxidermist. It is composed of two-thirds glycerine and one-third pure carbolic acid. When collecting in the field in any quarter of the globe, and especially in distant tropical jungles, where heat and time count, where packing space is not the least of the many vexatious questions that arise, this simple solution will lighten the burden of any man's mind as well as his cargo.

After having skinned your bird as usual, apply the arsenical solution with a brush all over the inside of the skin. After this apply with a soft brush the glycerine and carbolic acid. Do not be afraid to put plenty of it on the skin. See that the wing and leg bones, the base of the tail, the entire neck and around the base of the skull are thoroughly saturated. When this is done the skin is ready to be packed *flat*. In this manner a vast number of skins can be packed in a small compass. It is absolutely necessary to clean all fat and grease from skins, so that the solution may have free action. On large skins it is necessary to repeat the application in about four months if it is desirable to keep them soft for a longer time. When you come to mount a skin prepared in this way, the feet which have, of course, become hard, must be relaxed or softened in the same way as described in the chapter on relaxing bird skins, and after they have become sufficiently soft proceed in the regular manner of mounting.

Salt and Alum.—Two of the most important ingredients known for the preservation or curing of skins in taxidermy, and they are used in various ways.

A strong salt and water bath is commonly used in which to immerse very large alligators, turtles and other reptiles of extraordinary proportions, immediately after skinning. The length of time they should remain in this solution is twenty-four hours or more, according to the condition of the subject.

Upon being taken from this bath the entire inside of the skin, bones and all, should be heavily coated with the arsenical paste or arsenical soap and, lastly, with powdered alum.

Salt alone is used by many collectors in the field for curing skins of mammals until the salt and alum bath in some taxidermist's shop or that of their own can be reached. When salt is used *alone* on the skins of mammals they should have plenty of it rubbed and spread upon them, especially in warm weather. In damp climates, however, powdered alum will be found by far the best, and in either case skins should be, by all means dried in the shade, never in the sun.

A mixture of two-thirds powdered alum and one-third arsenic thoroughly rubbed on skins of mammals and birds is for the purpose of curing them, and also for poisoning them against the attacks of insects. It is used chiefly when the specimens are to be made up into dry skins. George Graves, F. L. S., recommends this preparation in his *Naturalists' Pocket-book*, published in 1818, and it has been in vogue ever since. Some take the double precaution and give the skins a heavy coating of arsenical paste or arsenical soap, and supplement it by rubbing on equal parts of salt and alum. The use of salt and alum in taxidermy, however, reaches its climax in the

Salt and Alum Bath.—No taxidermist can do any considerable work in quadrupeds without using this important preservative, and, since it is so cheap, simple and convenient, none should be without a thorough knowledge of how to prepare and handle it.

My formula for making the salt and alum solution is as follows: For every gallon of water put in two ounces of alum and six ounces of salt; boil until the salt and alum have dissolved, stirring frequently during the process. When cool or lukewarm test it with your salinometer. It will probably register 15°, which is *exactly* right; at a less degree of strength you are liable to ruin the skin, for the hair is likely to slip off; if stronger it will harden the skin too much. You can now put this solution into your glass or earthen jars or lead-lined tank, described in the last chapter.

The taxidermists' salinometer can be procured for one dollar, prepaid, from the R. Hoehn Co., 44 College Place, New York City. This is the ideal salinometer, seven inches long, and you can make up

PLATE IX.

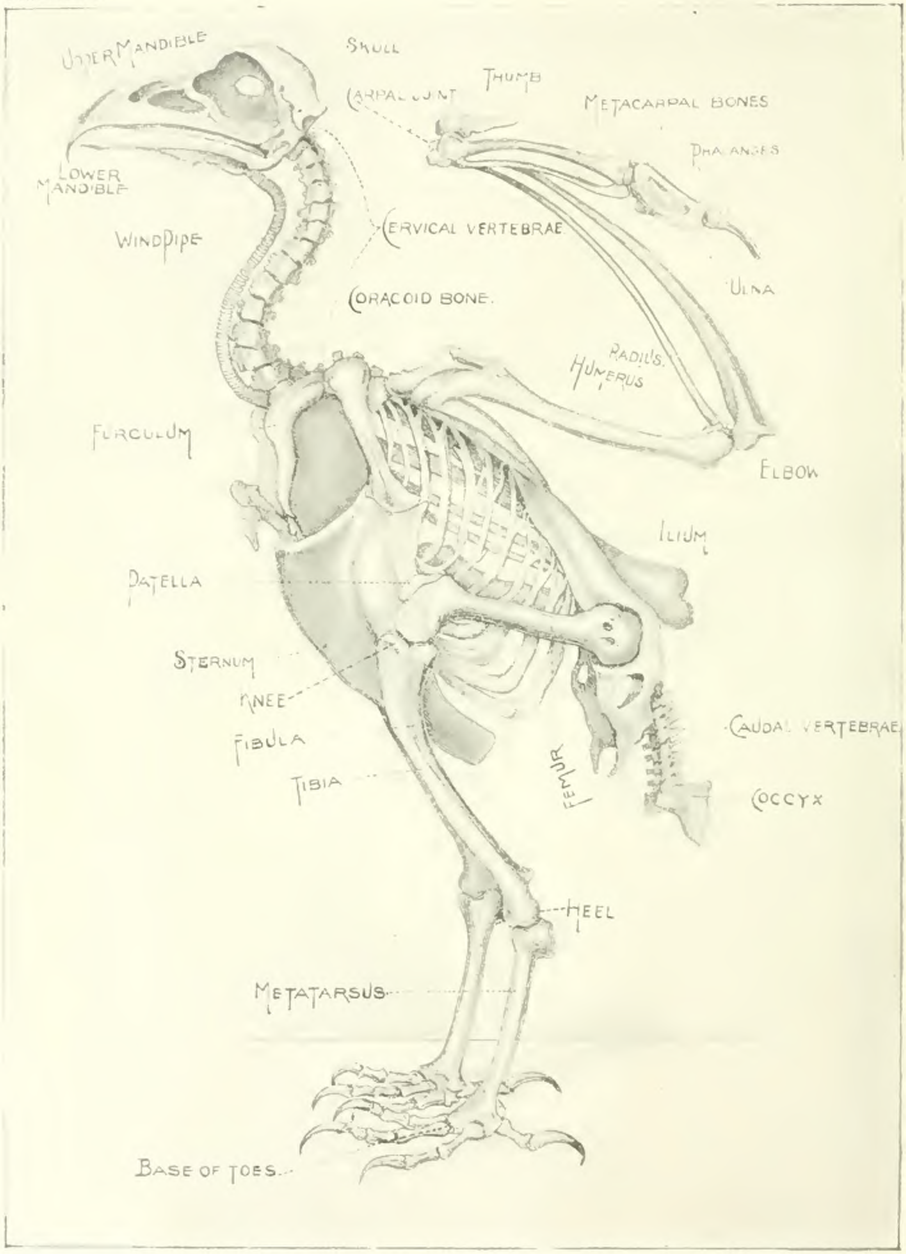
UPPER MANDIBLE
SKULL
THUMB
CARPAL JOINT
METACARPAL BONES
PHALANGES
LOWER MANDIBLE
WINDPIPE
CERVICAL VERTEBRAE
CORACOID BONE
ULNA
RADIUS
HUMERUS
FURCULUM
ELBOW
ILIUM
PATELLA
STERNUM
KNEE
CAUDAL VERTEBRAE
FIBULA
FEMUR
TIBIA
COCCYX
HEEL
METATARSUS
BASE OF TOES

PLATE IX.

SKELETON OF AN EAGLE.

Cervical Vertebræ.—We use all the neck vertebræ in mounting long-necked birds, like the herons, etc. The wind pipe is imitated by wrapping wire with fine tow.

Humerus.—This is the bone which can be broken or snapped with the fingers before skinning the smaller birds, in order that the wing will drop down out of the way. It should remain whole and intact in the large species.

Elbow.—In the very small birds you may detach the humerus at the elbow, skin down the ulna and radius, detaching the feathers from the ulna, clear down to the carpal joint. In the larger birds we detach the humerus from the coracoid socket, or shoulder socket; skin down to the elbow, clean the flesh off and *stop there*, skinning the wing afterward from the outside, as directed in Chapter IV.

Femur.—This is the thigh bone, and we allow it to remain attached to the body in birds, and never use it except in some cases as discussed in Chapter IV (see Legs in Raptores, and also Plate XX.)

Knee.—This is where we sever the tibia from the thigh bone or femur and skin down to the heel, stripping off the flesh clear to the heel. The fibula, it should be remembered, is the small spike-shaped bone on the outside of the tibia which goes to make up the drumstick any quantity of solution required *in the* field without the use of a test-glass.

Every taxidermist of any experience whatever knows now much more difficult it is to mount a dry skin than a fresh or wet one.

The chief beauty of the salt and alum bath is that it will preserve a skin for many years in as soft and pliable condition as when it is taken from the animal, and it can be mounted as easily as though the skin had been taken off yesterday. I once placed in a sealed jar of this solution the skins of an opossum, raccoon and a fox squirrel and kept them for seven years. These skins were as easily mounted as though they had just come from the backs of the animals. I kept the skins of two African elephants for eight months in a tank containing this bath, renewing the liquid but once, however, and for the first week or ten days changed the position of the skins and moved them about each day, so that no spot in the skins was left untouched by the action of the bath. I once dug a tapir out of the ground which had been buried three days, and had about given up all hopes of saving the skin on account of the hair starting out on the abdomen and on several parts of the body. With a *warm* salt and alum bath, containing an *extra* quantity of alum, the hair in the skin was made perfectly firm and the skin easily managed. With this solution used in the manner described you can often save the skin of an animal which has been dead for several days, with the hair starting out on the blue-green abdomen.

In this case make the solution so strong that a fresh hen's egg will float in it. For years this has been Dr. Jasper's method of testing the strength of brine when the skin was so far gone that the preservation of it was in question. At 25° an egg will float; at 20° it will sink to the bottom of the solution. If the skin you have is a bad case you had better make the solution 35° by adding more salt and alum.

In placing the skins in the salt and alum bath put them in leg-bones and all, and be sure to change their position and move them up and down and around for the first two or three days. See that the skin is spread out as much as possible, that it is not doubled and folded, for when this is the case there are spots on the inside of the skin that the liquid is liable not to touch or penetrate, and in these places the epidermis and the hair will come off. When this solution has been in use, or if it is allowed to stand open it loses its strength; this can be renewed by adding more fresh liquid of a much greater degree of strength than usual.

The young of the smaller species of mammals, such as foxes, squirrels, rabbits, etc., should never be put into the bath. It is better to mount these without wetting the hair, for it is very difficult to comb out and dress the matted hair to look perfectly natural. It is next to impossible to take the skin of a rabbit from the salt and alum bath and comb and brush it out so as to give to the fur that fluffy appearance, which it should have.

Never put a skin into the bath without first thoroughly cleaning it; take off all the fat and particles of flesh and wash from the hair all blood stains.

Alcohol.—Used as a preservative of fleshy objects entire when collecting in the field, or when it is not practical to skin and mount them by the usual processes in taxidermy, such, in particular, as the small and medium sized reptiles and fishes, entire and in the form of skins. Do not take any risks on the quality of spirits which you purchase for the preservation of alcoholic specimens. The U. S. Pharmacopœia recognizes alcohol, containing 94 per cent. of absolute alcohol, or alcohol having the specific gravity of 0.820. Its quality, however, will frequently range all the way from 75 to 94 per cent. Use your alcoholometer and see that it is 94 per cent. alcohol before you dilute it for the preservation of your specimens. The proper strength for the preservation of *fishes* is one-third of its bulk of water; for *reptiles*, one-half water. Just as much as the quality of the alcohol varies from 94 per cent., the amount of water added to its bulk must be measured proportionately. For this reason it is of importance to always have at hand an alcoholometer with which to test the strength of the spirits.

In all specimens preserved in this manner be sure to make an abdominal incision so that the fluid may have free action.

Potter's Clay.—This is one of the most valuable substances that the taxidermist can employ in his art. In many cases it is absolutely impossible to reproduce the forms and features of various animals with any degree of accuracy without the aid of this pliable and plastic material. The German veterans in our art have used it for coating the manikins of quadrupeds for a half century. Dr. Jasper has employed it in building out the structures of mammals for forty years. Phillipp Leopold Martin, the German taxidermist, advocates its use in his work, published in 1876. Its general adoption, however, by American taxidermists is of recent date.

In a paper read at a meeting of the Society of American Taxidermists in 1881, Mr. William T. Hornaday sets forth the advantages, in many cases, of clay as a filling over fibrous materials. My experience with it extends over a period of twenty years. The muscles on the skull and neck of my first deer's head were modeled in clay, and I keep it as a relic to prove that there is some truth in the theory of evolution, especially in the work of "ane wha was ance a 'prentice han." Since then the muscles on the manikins of all my large mammals have been built out of clay and the forms of all snakes, turtles, alligators and other reptiles, including several twenty-inch Hellbenders and many fishes have been made chiefly by the use of clay. I may say the same of many of the dogs which I have mounted; the modeling of the heads and flippers of seals; the tail and head of the beaver; the heads, hands and tails of monkeys, down to the tail of the muskrat, together with its hind feet. The soft, spongy feet of any of the smaller mammals should always be opened and filled with clay, and in skinning the heads of any of the larger mammals pocket the skin of the upper lip, and when you place it on the model fill this pocket with clay and press it into shape. The deep hollows, elevations and wrinkles which are characteristic in the faces of some quadrupeds, and their flabby lips must be wrought out by the use of clay. It cannot be done satisfactorily with any springy material like tow. When a skin is shrunken smaller than it should be and it is desirable to stretch it to its natural size, then an elastic substance such as tow is the proper thing to force its expansion. The filling in mounted fishes should be of clay — around a core of wood or tow.

There are many advantages to be gained in the use of clay in taxidermic work: one is that it will not expand or contract and will retain any form you may give to it. Should you desire to alter any point in the form of your subject the dry clay can be softened and worked beneath the skin. If you are working a large mass and it happens to get hard, soften it again with water. If you have your model partially finished and desire to keep the clay soft, do as the sculptors do, throw a wet blanket around it. To prepare clay for use, chop some tow very fine with a sharp hatchet on your chopping block and mix it with the clay; this will toughen it. If you desire to make it a solid mass when dry add a quantity of strong glue liquid, mix the whole thoroughly. There is only one fault, if it may be called such, to be found in the use of clay on manikins, it is that the mounted specimens are sometimes very heavy. A carefully made manikin does not require a heavy mass of clay everywhere upon it. It should lay in masses only where the prominent muscles are to be developed.

Gustav Stainsky, a pupil of Phillipp Leopold Martin, has, however, devised a means by which the clay can be mixed and the mounted specimen when dry will be considerably lighter. His method is simply to mix saw-dust with the clay, or saw-dust, plaster of Paris and clay. Where it must be laid on in great masses he uses fine wood shavings mixed with the clay and plaster of Paris.

Papier-Maché.—It will repay any taxidermist four-fold to learn to make and use a good quality of papier-maché. In fact, it is impossible for him, in many cases, to produce certain effects without its use. It is indeed very simply made, and when you have experimented with one or two batches of it you will discover what is required to make the proper quality.

This material has been manufactured in Europe for more than a century, where it has been employed in making articles of ornamentation and use, and its composition has been modified according to the nature of the articles manufactured.

I shall first describe how to make it for our purpose, and then tell in what way we employ it. Paper pulp, of course, is the first ingredient you must prepare. If you cannot obtain it already manufactured you must make it yourself. Take some old newspapers, of the soft kind, tear them into bits and put them into a kettle of boiling water. Beat them or grind them in any manner you choose until it becomes a pulp free from lumps of any size whatever or small particles of paper. Now dissolve some of the best quality of glue in your glue-pot to a consistency commonly used in gluing articles of any kind. Take the pulp from the water and gently squeeze it, but *not* until it is perfectly dry. Put the pulp in a bowl and pour in some of the hot glue and stir it until it becomes a sticky mass. Now add some plaster of Paris and again stir the whole together. If, after thoroughly mixing it, you discover that it is too dry to stick fast to some smooth surface add a few more drops of glue or water. The whole mass should be vigorously kneaded through the fingers until it is absolutely free from lumps. It should always be kept in the form of a ball, and it will retain its softness for a day or two by wrapping it in several thicknesses of wet cloth, or by placing it under an inverted bowl. If you desire to work with it a number of days add a few drops of glycerine while you are mixing it. Papier-maché to be of the best quality to work well should be so sticky that when rubbed on the palm of the hand a thin coating will adhere to it. There is positively no better material or composition than papier-maché when it comes to modeling the open mouths of mammals, mending broken bones, modeling entire bones which are to go into "restored" skeletons, filling up the chinks, seams and holes in the skins of elephants or any other animals, restoring the portions of the beaks and claws of birds that have been partly or wholly shot away; making artificial rock-work, branches of trees, tree stumps, etc., etc. The uses to which it can be put are indeed numerous. I remember distinctly that a gas-pipe once suddenly sprang a leak in my work-shop. In the opening, which was several inches long, I applied papier-maché and to-day it serves the purpose, apparently as well as solder. In making artificial work of any kind with this material a common putty knife or a small trowel are the instruments to use; in modeling mouths and other finer work in papier-maché the various shaped modeling tools should be employed.

Setting Artificial Eyes in Animals.—There are several compositions which may be used as a foundation in which to imbed the artificial eyes in mounted specimens. Putty is commonly employed. Papier-maché is better, or potter's clay mixed with a solution of glue is by far the best. Next in order of superiority is absorbent cotton thoroughly saturated with mucilage. (See foot-note *Inserting Glass Eyes*. Chapter IV.)

To Anneal Iron Wire.—Take common iron wire, make it red-hot and allow it to cool gradually; this renders it soft and pliable.

To Straighten Annealed Wire.—Any of the smaller sizes of annealed wire may be made as straight as a new knitting needle by fastening one end in a vise, and, with a pair of flat-nosed pliers take hold of the other end and pull steadily until every kink disappears. It can then be cut up into pieces to suit your purpose. The heavy wire must, of course, be hammered straight on an anvil or other solid surface.

Gluing Hair on Mammal Skins.—It very frequently happens that there are bare spots on the skins of your mounted specimens which need to be repaired with hair which must be glued fast. The seams, cracks and accidental holes which have been filled with papier-maché must also be covered with hair from pieces of skin of the same species or any quadruped whose hair will match that of your mounted specimen. Sometimes colored, fibrous tow is used to take the place of hair. To replace the hair, or when you substitute, use common fish-glue or a bottle of royal glue will answer the purpose. Either of these glues will answer for mammals, and I have used them in gluing feathers in birds, but for good reasons I prefer the following:

Glue for Feathers.—This should be placed in a wide-mouthed bottle and applied with a small fine brush:

Gum arabic	4 ounces.
White sugar	1 ounce.
Arsenical soap	½ ounce.
Starch	4 ounces.
Water	10 ounces.

Melt the gum arabic in water, after which boil all the ingredients well together.

Artificial Branches.—Take a piece of annealed wire of a suitable thickness, fasten it to a stand and wind fine tow around it, binding it firmly down with twine. Bend it to the desired angle. Over the surface apply common glue and then cover it with lichen that has first been pulverized. This makes a most natural looking artificial branch, and any number of shoots desired can be made from the main trunk. Artificial leaves should first be fastened at various points on the branch before the glue has been applied.

The method I employ in making artificial branches is similar to the one just described, except that I spread papier-maché over the surface, comb a grain in it to look like bark and paint it to represent the color of the natural surface. Artificial stumps can be made in this manner and decorated round about with grasses and mosses

In my collection I have a number of specimens mounted on natural cedar stumps admirably arranged and decorated by Mr. Frank B. Webster, and I do not hesitate to pronounce them a success. I shall here quote what he says concerning them: "A good assortment of old roots, obtained from the dead trees in swamps—the soft rotten brown ones and the bleached cedars should be sought after. In fact, the finest and most valuable stumps are some of these choice natural ones. These, with a few principles to work upon, will produce variation of results as great as the imagination."

Artificial Branches.—Another method of making artificial branches which very closely resemble the natural may be simply and quickly done in the following manner: Prepare a skeleton tree of heavy wire, brush the same with glue and wrap with tow to the desired dimensions. Brush glue over the tow and wrap with strips of rags about an inch in width, in order to give smoothness. The tree is now ready to be modeled with what I shall term a plaster; to be made as follows: Into a cup place a quantity of yellow ochre in the dry form, and with the ochre mix a very small amount of dry lampblack. Have ready some well-cooked glue, such as would be used for joining, and pour the same slowly into the dry mixture of ochre and lampblack, stirring until the mass becomes a thick paste or plaster. Get a small twig from a tree and compare in color with the mixture. If the latter is too dark, add more ochre, if too light more lampblack. Now, with an old case-knife spread the plaster over the trunk and branches of the artificial tree. If you want leaves on the tree place them as desired before modeling the branches. Allow the plaster to become hard, and if your work has been properly done the branches can hardly be distinguished from natural ones. It is sometimes best to brush over the trunk and branches thus formed a similar mixture but thinner, resembling paint in consistency. Keep the mixture in the cup warm while you are engaged modeling. This may be best done by placing the cup in a pan of hot water. Artificial stumps and rocks may be made in a similar manner. The color of the plaster may be varied for other purposes by the use of the dry pigments used in mixing paint as elsewhere explained in this chapter.

Artificial Rocks.—Rock-work may be constructed by making a framework of wood on a base of dimensions suitable to the size of the specimen to be mounted thereon. Over this tack sheets of paper, duly crumpling it to give the surface a rough, rock-like form. Give it a coat of common glue and allow it to dry. Now put on coarse quality of papier-maché here and there and shape your rock to your own taste. The next step is to give the whole surface a coating of glue and sprinkle it until completely covered with crushed granite, sandstone or any other rock you may desire to imitate. Fine pieces of rock-work can be made of peat or cork on which sand, mixed with various colors of smalts, with moss and lichens carelessly thrown on here and there for natural effect. It does not require a profound geological knowledge to know when you have made a well-shaped boulder, but it requires the genius and the "touch" to mould the regular and irregular lines of stratification which go to make up many varieties of the erratic forms of rocks.

Artificial Rocks, Branches, Etc.—Dr. B. H. Warren's method of making rock-work, stumps, branches, etc., is with paper pulp, plaster of Paris, cement and glue. In this mixture is put lampblack or other dry colors to obtain the various tints of rocks, bark, etc. It is laid on a light frame of wood covered with building paper.

Snow Scenes.—Icebergs and snow scenes may be made on the same principle described for rock-work. Some taxidermists fill in with excelsior and tack thin cloth over all the surface, producing the irregularities with papier-maché. Mr. Webster in his article, "Practical Taxidermy" in *Ornithologist and Oölogist*, for July, 1886, gives us the desired information in a nutshell: "Paint * * * and use plaster of Paris, glass frosting and mica snow. Powdered burnt alum can also be used. Icicles can be obtained from any dealer, and grass immersed in strong alum water will, by the alum adhering, have a decided winterish appearance. If a scene made by this causes a shiver in July it may be considered a success."

For Modeling Tongues, Mouths, and in General Fancy-Work.— The following is Joseph H. Batty's composition, which he has successfully employed for years: "Procure three pounds of white glue, one pint raw linseed oil, and one pound of resin. Heat the oil and resin, then add hot glue and stir thoroughly. Thicken with Paris white until the mixture has the proper consistency to mould when warm. This composition soon dries, becomes very hard, and can be colored or gilded. Fancy decorations of any design can readily be made from plaster or wood, and be glued on shields and cases, thereby saving the expense of carving."

To Tan Small Skins.—"When taken from the animal, let the skins be nailed in the shape of an oblong square to dry, fur side down. Before taking them from the board, clean off all the fat or oily matter with a dull knife. Be careful not to cut the skins. When you wish to tan them, soak thoroughly in cold water until soft; then squeeze out the water, and take of soft water three quarts, salt half a pint, and best oil vitriol one ounce. Stir well with a stick, and put in the skins quickly, and leave them in thirty minutes. Then take them in your hands and squeeze (not wring) them out, and hang in the shade, fur side down, to dry. If you get the quantity of liquor proportioned to the skins, they will need no rubbing to make them soft; and tanned in this way, the moths will never disturb them."— *Col. Horace Park's Sportsman's Hand-Book.*

Paints, Varnishes, and Stains.— It is necessary for the taxidermist to have some knowledge of staining and polishing woodwork and mixing colors for branches, rock-work, etc. It matters little how perfect he has made his specimen if its mountings are improperly finished, the general effects will be displeasing. A well-polished support for his bird or a properly finished shield for his deer-head will add much to the artistic appearance of his work.

To paint or varnish well requires care, good tools and materials. He who thinks to lighten his labor by brushing over his work a little oil, or a coat of thick, unsuitable varnish, makes a great mistake. The idea that anything is good enough has its origin in ignorance or laziness, much to the detriment of the final condition of the work in hand.

Paints.— To keep a great variety of paints on hand will be found inexpedient, since they are impaired by exposure to air or by long standing, and as the taxidermist requires but a little at a time, it is best to mix what he needs as occasion requires. A small jar of the best *boiled linseed oil* is indispensable, also a like quantity of the *spirits* *of turpentine* and good *japan-drier*. The most suitable pigments to be kept on hand are *lampblack*, *white lead* ground in oil, vermilion, burnt umber, chrome yellow, yellow ochre, Venetian red, etc., all of which will be found useful from time to time. These can be obtained in the dry state or ground in oil—the former condition probably being the best for the taxidermist. With these materials a great variety of colors can be produced, although only a few will be found ordinarily serviceable. For mixing black paint, take a small quantity of linseed oil, add japan-drier in the proportion of one gill to a quart of paint, then thicken with lampblack to a proper consistency. For second coat turpentine may largely take the place of the oil unless the work is to be exposed to the weather, in which case turpentine should not be used. For mixing white paint, thin white lead to a proper consistency with turpentine, using no oil after the priming coat. Give two or three coats and finish with varnish mixed with a small quantity of the white paint. Let this coat of color-and-varnish, as it is called, have time to dry, then polish with pulverized pumice-stone and water, in the manner hereafter described.

Tints.—In mixing tints the body color—that is, the one that predominates over the others used—must be first secured, then the other colors may be gradually stirred in. Experience will teach the necessary quantities of these to be added in order to produce the desired tint. It should be remembered that the finer the quality of the mixing pigments, the better will be the effect sought for. The following tints may be produced by the use of the annexed colors. The body-color is the first mentioned:

Gray—White lead, and lampblack.
Buff—White, and yellow ochre.
Pearl—White, black, and blue.
Orange—Red, and yellow.
Violet—Red, blue, and white.
Purple—Violet, red, and white.
Olive—Yellow, blue, black, and white.
Chestnut—Red, black, and yellow.
Flesh—White, yellow ochre, and vermilion.
Fawn—White, yellow, and red.
Chocolate—Raw umber, red, and black.
Drab—White, raw and burnt umber.
Pea Green—White, and chrome green.
Copper—Red, yellow, and black.
Lemon—White, and yellow.
Pink—White, vermilion, and lake.
Cream—White, and yellow.
Straw—White, and chrome yellow.
Lilac—White, and violet.

Laying on Paint.—Get rid of all defects as far as possible in the woodwork to be painted. Don't depend upon the paint to hide the imperfections if they can be removed. All uneven surfaces must be reduced by the plane, scraper, or sand-paper. Set all nail-heads, and after the priming coat is dry putty up the holes. The first, or priming coat, should be laid on evenly and with as much care as the last. It is a mistake to suppose that it makes no difference how rudely the first coat is applied. Sand-paper lightly before applying a second coat. Three or four coats are generally necessary, each being laid on with particular care and finished by long strokes of the brush.

Varnishing.—Many kinds of varnishes are in use, each adapted to some particular work. *Shellac varnish* is a solution of shellac gum and alcohol, and consists of three kinds—brown, white and French shellac, the latter being of a pale cider color and adapted for any kind of work. This varnish is often rubbed on with a cloth, drying rapidly so that a number of coats may be applied in a few minutes. Ordinary *carriage varnish*, which can be obtained from any dealer in paints, can be used to good advantage in many kinds of work. It is made by melting copal gum, mixing it with linseed oil, adding a small quantity of dryer and thinning to the proper consistency with turpentine. It dries in about eight hours and excels in brilliancy and durability. *Hard oil finish* is very serviceable and should find a place and a use in the taxidermic workshop. It hardens in a few hours and when properly worked will give a fine polish. Varnishes should be kept in a dry place, and when applied it should be in a dry place where there is no dust. Do not varnish your work and then begin to sweep your room as I have seen some do.

Brushes.—The taxidermist needs but few brushes, but they should be of the best and should be well cared for. Two or three brushes varying in size from one to two and one-half inches will suffice for ordinary work. Do not use the same brushes for paint that are used for varnish, nor the same for varnish that are used for paint. Do not allow brushes to become hard for the want of care, as in such a case they become useless for good work. Paint brushes may be kept soft in water, but varnish brushes should never be placed in water. Paint brushes that are set with glue should never be placed in water until they have been used in paint. A good way to keep varnish brushes is to suspend them by the handle in a can of slow drying varnish, the bristles not being allowed to touch the bottom. It is best not to rinse varnish brushes in oil or turpentine; if they become dirty cleanse them by working them over a clean surface.

Polishing Natural Wood.—While the taxidermist may sometimes have occasion to paint his stands, shields and artificial work of various kinds, he will usually obtain a better effect by polishing the natural wood. Black and white walnut, cherry and oak are favorite woods, and when well polished by an expert present a handsome appearance. To do these well requires experience and care. The jack-of-all-trades seems to go upon the precept that anything is good enough and does his work with any kind of tools, while the expert mechanic must proceed about his work systematically and with the best of tools.

Before proceeding to apply varnish the pores of the wood must be properly filled. *Hard wood filler* may be purchased of any dealer in painters' supplies. If it cannot be obtained, however, a good substitute may be made as follows: Take a small quantity of whiting and mix with such colors as will approach the nearest the color of its wood to be filled. This mixture should be *dry*. Give the wood a coat of *oil*, then sprinkle over it the dry colors, which are now to be rubbed over well with a cloth or a piece of chamois. Clean off all superfluous material, and when the oil has thoroughly dried the varnish may be applied. Shellac varnish may be put on with a cloth, being rubbed briskly over the wood. A good polish may be produced by the use of *hard oil finish*, which is a kind of varnish and not difficult to work. Having properly filled the wood apply a coat of the hard oil which will dry in a few hours. When it has dried hard, rub off the gloss with pulverized pumice-stone and water, taking care not to rub through to the wood, especially at the angles and sharp places of the work. Clean thoroughly and apply a second coat of the finish. Rub off the gloss as before and apply a third and a fourth coat in the same manner, rubbing down the work after each coat dries with the pumice-stone. Having applied the last coat and again employed the pumice-stone to kill the gloss, clean the work and rub down with *rotten* stone and *sweet oil*. Clean and polish with chamois leather. Good copal varnish may be applied similarly.

Stains.—If the wood of which our work is made is pine or poplar, and it is desired to give it the appearance of hard wood, stains can be employed to do this. Dealers usually keep good cherry and walnut stains in stock, but if they can not be obtained, they can be produced with little trouble and expense.

An excellent black stain, which is susceptible of a high polish, can be made as follows: Pour two quarts of boiling water over one ounce of powdered *extract of logwood*, and when the latter is fully dissolved add one dram of yellow chromate of potash, and stir. Give the wood several applications and polish with shellac varnish, or finish in hard oil.

Prepare cherry stain by dissolving four ounces *anotta* by boiling in three quarts of rain-water; add a lump of potash the size of a walnut, and boil for one-half hour longer. When cool it is ready for use, and may be bottled for keeping.

Rosewood may be imitated by giving the wood to be stained several applications of a decoction of logwood and redwood chips in equal parts.

The appearance of walnut may be given to wood by sponging with a strong solution of permanganate of potash. Several applications may be necessary to produce the desired effect. Dark stains may also be obtained by the use of the pigments before mentioned applied in oil. Walnut may be imitated, for instance, by the use of Van Dyke brown and a little sienna. A little experience and care will soon teach the inexperienced the proper proportions of the pigments to be employed.

CHAPTER III.

COLLECTING SPECIMENS IN GENERAL; SEASONS; FIELD EQUIPMENTS; CARE AND TREATMENT OF SPECIMENS.

The rule is to secure your specimens wherever you encounter them, whether it be at market or in the field. Obtain a typical male and female of each species during the season when their fur or feathers are at their best; and if you have many specimens to select from do not waste time in preparing an inferior example of a race. If the species are rare, however, prepare all that are obtainable—good, bad and indifferent—together with their skeletons. The young at different ages are valuable studies, and should be collected whenever possible.

Labeling, Sketching, Measurements, Etc.—Never collect a specimen without recording in a book and on a label the full measurements, date of capture and the name of the locality in which it was taken, and, if you are not ashamed of your work, put your own name on the label. Adopt some system of measurements and use it in labeling every specimen. It is one of the best habits you can form in preparing specimens in any branch of zoology. In their proper places I give directions for measuring mammals and birds which are commonly used. Note the color of the eyes, bill, feet, naked patches of skin or any soft parts liable to fade or change in any way while the specimen is drying. Take as your guide Ridgeway's *Nomenclature of Colors*, published by Little, Brown & Co., Boston, Mass. Best of all, paint the colors on the spot with your water-color paints in the sketch you have made. Do this in the case of any specimens you collect, be they reptiles, fish, birds or mammals. To be able to make a good sketch of the whole, or any portion of an animal, is an accomplishment of great value to the collector. If you can not do this so that it will be intelligible to others, by all means make a sketch that you can interpret yourself.

When the plumage of birds is alike in male and female, the sex may be determined by dissection

One of the most valuable aids to the taxidermist is an exact outline of the dead specimen. Lay it out on a large sheet of manilla paper before skinning it, arrange the legs in a natural walking attitude, and with a long lead-pencil mark the entire outline of the quadruped. Take plenty of time, study your subject, and make this diagram with great accuracy. You can hardly estimate the value of this outline; its use is the next best thing to a cast when you come to mount your specimen. Any taxidermist will heartily thank you for your painstaking if a sketch like this accompanies the skin.

Seasons for Collecting — BIRDS: Any month in the year is suitable for collecting birds in the temperate zone. Spring and fall, however, are the ornithological harvest times; for these are the periods of migration with most birds, and at these seasons they are the most abundant. In the United States, during the months of July and August the young are not fully feathered and the old are moulting. December and January are the best months for collecting hawks and owls, for most of these breed in February and March. In tropical latitudes the dry season is the best; in the Arctic regions, midsummer.

MAMMALS: From the first fall months to February is the season for collecting mammals in temperate latitudes, but December and January will find many of them in the finest fur. The young may be collected from May to August. They are of interest, but should not be taken when too young, before they are sufficiently developed to be typical representatives of the *young* of a species.

Guns, and Modes of Capturing Specimens.—The gun offers the most certain method of obtaining specimens, and is, in most cases, the only one that can be pursued with much probability of success. Strychnine placed in portions of carcasses and in pieces of meat brings down many a wolf, fox, eagle, etc. For procuring small mammals and birds, traps of various kinds are often employed, but ordinarily firearms are resorted to. The selection of a gun depends largely upon the means of the collector, if not upon his preference. If he is addicted to the use of first-class instruments, he will purchase a No. 10 or 12 gauge hammerless breech-loader, for hunting large birds and small mammals. For large birds and small mammals I use a No. 12 hammerless gun; for the smaller birds I have a No. 20, with which I have killed large hawks and owls, and it seems to be a good all-around weapon, as also is a No. 32 breech-loader, which I use with success on the smaller birds. The Frank Blake Webster Company, of Hyde Park, Mass., has just placed on the market a No. 32 auxiliary barrel or tube, which fits in either a No. 10 or No. 12 gauge breech-loader. It is provided with brass shells, which can be reloaded at a trifling cost. With this tube inserted in one barrel, and its shells loaded with mustard-seed; the other barrel reserved with shells containing coarse shot, you are prepared for birds of almost any size, and also the smaller mammals. If possible, always use brass shells with your shotguns, though expensive at first, like the copper wire which I recommend for mounting birds, they will last forever. In selecting a rifle for hunting large game, the quantity of powder and weight of lead is all there is to be considered if you intend using any of the first-class rifles. By all means choose a rifle for which you can most readily procure ammunition. The 45-calibre Government cartridge, loaded with 70 grains of powder and 405 grains of lead, has sufficient penetration to kill the largest game we have in this country, and it has no unpleasant recoil.

If you are to hunt in the land of the elephant, rhinoceros and hippopotamus you should provide yourself with a double No. 8 rifle or a double-barreled No. 8 smooth-bore. The latter is the style of weapon which was used by Mr. Hornaday while hunting elephants in India.[1]

Field Outfit.—If you are to collect specimens in the vicinity of your home, you will, of course, return to your workshop to prepare them. This is the case at least with the smaller specimens which can be transported entire without much difficulty. The large subjects must, in most cases, be skinned where they happen to fall, and this is often far from camp when the means of transportation is limited. Sometimes in traveling we must skin our smaller specimens on the top of our tool chest, on our lap, and on any other surface where we can work to the best advantage.

If the procuring of mammals, birds, reptiles, and fishes are to occupy your entire time and attention on a collecting trip of perhaps eighteen months, in any quarter of the globe, the following, which chiefly formed Prof. Wiley's outfit while collecting in Africa, would undoubtedly fill the bill on any similar occasion of a trip extending over the same period of time.

1 8-bore double-barreled rifle.
1 Sharp's special rifle, 45-100-500.
1 12-gauge double-barreled breech-loading shot gun with fifty brass shells and 1000 No. 2 primers; a 32 auxiliary barrel, with two dozen brass shells, and 1000 No. 1 primers.
1 Barclay loader.
1 32-calibre Smith & Wesson revolver.
10 pounds powder.
50 pounds of shot, various sizes, from the size of mustard-seed and upwards.
1000 paper labels, two or three sizes.
200 lead labels.
200 pure tin labels.
6 butcher knives, or better still, killing knives, Pl. I, Fig. 5.

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1 See "Two Years in the Jungle," by William T. Hornaday. Published by Charles Scribner's Sons, New York

3 pounds No. 19 copper wire.
6 all-steel scalpels.
6 cartilage knives.
1 pocket knife.
1 skin scraper and one currier's knife, toothed, Figs. 7, 8, Pl. II.
1 small, home-made skin scraper for birds and small mammals described in Chapter I.
3 pair scissors.
1 pair shears.
3 pair flat-nose pliers.
1 pair scissor-shaped forceps 12 inches in length.
1 pair spring forceps, Fig. 4, Pl. III.
1 tool-holder containing chisels, awls, screw-driver and gimlet bits, saw-blades, etc., all of which can be quickly fitted into an adjustable clamp.
1 first-class claw hammer.
1 first-class hatchet.
1 medium sized hand-saw.
2 pair Hall's cutting pliers, Pl. III, Fig. 1.
2 flat files.
2 three-cornered files.
6 papers needles and pins, assorted sizes.
6 spools Coats' thread, various sizes.
4 balls hemp twine, various sizes.
2 dozen surgeon's needles, curved and straight, various sizes.
2 papers Glover's needles.
1 dissecting saw, 4½ inches long, with movable back, Pl. II, Fig. 4.
1 Davie's taxidermist's salinometer.
1 alcoholometer.
1 thermometer.
1 12-gallon lead tank in wooden chest for mammal skins.
1 copper tank in wooden box for alcoholics.
1 compass.
3 sponges, small, medium, large.
1 two-foot rule.
1 twelve-foot tape measure.
1 oil-stone.
8 pounds crystalized arsenic.
4 pounds bicarbonate of soda.
15 pounds dry arsenic.
15 pounds arsenical soap.
1 field glass.
1 opera glass.

With few exceptions this elaborate equipment, together with the hygenic outfit, clothing, etc., was classified and packed in five substantial walnut boxes and served the purpose for collecting and preserving several thousand skins and rough skeletons of mammals, birds, reptiles and fishes in Central Africa.[1]

For a short collecting trip in any section of this country the following outfit, put up in a neat box 6x3x13 inches can be purchased

1. See Wiley's *Preparation and Preservation of Objects of Natural History* pp. 18-24.

for $15.00. It is suitable for the amateur and sportsman, in the field as well as at home; is compact, convenient and very easily transported from place to place.

1 12-inch scissor-shaped stuffing forceps.
1 6½-inch stuffing forceps.
1 5-inch spring forceps.
1 5-inch spring forceps, fine.
1 3-inch spring forceps.
1 6-inch flat-nosed pliers.
1 5-inch flat-nosed pliers.
1 4-inch flat-nosed pliers.
1 medium scalpel.
1 large scalpel.
1 pair fine scissors.
1 pair curved scissors.
1 pair shears.
1 5-inch Hall's cutting pliers.
1 5-inch cutters.
6 curved needles.
2 files.
1 vise and needle.
1 hooks and chain.
2 brain spoons.
1 oil-stone.

With the addition of a half dozen large skinning knives (Plate I, Fig. 5), four cartilage knives, needles, thread, tape measure, two-foot rule, poisons, note book, labels, etc., you are well enough equipped to collect large numbers of skins and rough skeletons of any of the mammals or birds which exist on the North American continent. For the sportsman-naturalist who takes an occasional trip for specimens and desires to skin and preserve the trophies of a day's hunt, the cases of instruments figured in Plate V are as handy as anything of their kind. Fig. 1, for instance, costs $5.00 and contains the following:

1 cartilage knife.
1 scalpel.
1 brain spoon.
1 pair fine scissors.
1 probe.
4 curved needles.
1 5-inch forceps.

A dissecting case which can be purchased for $3.50 will be found serviceable at home and in the field. It contains:

1 cartilage knife.
1 scalpel.
1 pair of scissors.

1 dissecting point.
1 pair of forceps.
1 hooks and chain.
1 blow-pipe and drill.

If you intend to collect nests and eggs you may consult Chapter VIII.

Care and Treatment of Specimens in the Field.—In shooting a specimen one of the points to keep in view is to injure it *as little as possible*. If the preservation of the skin is your object the specimen demands your care and attention the moment it falls into your hands. Therefore, study well the amount of ammunition you should use in your guns.

The damage to your specimens will depend largely upon the size and quantity of shot, the weight of ball, and the drams of powder used. Shoot to kill, but not to mangle. A well-shot specimen is as good as "a stitch in time," for it will frequently save you untold extra labor in the way of mending broken bones, patching skins, cleaning and substituting hair, feathers, etc. We shall first consider the care and treatment of

Small Mammals.—Skin a small quadruped precisely as I have directed in Chapter IX, and if you desire to make it into the form of a skin the same Chapter will instruct you as to the best shape for transportation from the field (see Plate XLVIII, Fig. 1).

If you expect at any time to *mount the skin of a mammal* by all means preserve it in a *wet* state in the salt and alum solution described on pages 40 and 44. Take into the field with you a lead tank similar to that devised by Prof. Wiley.[1]

Take along with you some No. 19 copper wire, and small lead and pure tin labels about 1x½ inch in size, with a hole punched in one end. Have stamped or embossed on these labels, by pairs, numbers, so that one can be attached to the skin just before placing it into the salt and alum bath. The other label with the corresponding number may be attached to the skull.

Before placing the skin in the salt and alum solution be sure to wash all blood from the hair, and for the first day or two change its position so that the solution will act freely on all parts. While collecting in the field all skins of the smaller mammals should be

1. **Lead Field-Tank.**—This tank can be made cheaply and of any desired size—from two to twelve gallons. It is made of sheet lead and is either round or square in shape, with a large, round opening in the top, the lid being constructed with threads to screw on. I have seen them made with a square opening and the lid arranged to be soldered on when the tank is filled with skins, or previous to shipment. It is fitted in a pine box with iron handles, the lid on hinges which is fastened by means of hasp and padlock. Ordinarily, a four or six gallon tank is sufficiently large, but for an extensive collecting trip into remote regions a twelve-gallon tank is the best size, or two of the smaller ones. Any metal-worker can make these tanks.

preserved in the salt and alum solution and they may afterward be put into the forms of skins or mounted. If this is not practicable, the skins should be treated with arsenical paste or soap and rubbed with equal parts of powdered alum and salt and allowed to dry in the shade.

Large Mammals.— In the case of such mammals as the elephant, rhinoceros and hippopotamus, when of large size, the skin must be cut into three or four sections in order to facilitate handling. They should be treated with a coating of arsenical paste or soap and by rubbing on equal parts of powdered alum and salt and dried in the shade. The leg-bones should be detached, poisoned, and tied together with the skull, and all carefully labeled.

Deer, moose, elk, horse, etc., should have the skins taken off entire, and the leg-bones allowed to remain attached to the hoofs. They should be treated like the larger skins just mentioned because it is not altogether practicable to place many skins of this size in solution while in the field. Fold the skin together as seen in Plate XLVIII, Fig. 2.

The time is not far distant, however, when taxidermists the world over will demand that all skins shipped them from distant localities for the purpose of mounting shall be sent in a *wet state*. The salt and alum pickle then should have the careful study of every field collector, and the salinometer should be one of his most valued instruments.

Birds.—Upon shooting a bird, the first thing to do is to plug its mouth, nose-holes, vent, and the shot-holes with cotton, in order to keep back the blood and juices which are liable to ooze out and soil the plumage. With all the care you may exercise in shooting your specimens blood will frequently soil the plumage, and sometimes badly, too. Mr. L. S. Foster says: "Equal parts by measure of fine white sand and fullers-earth makes a good absorbent for blood. Carry this mixture in a small salt holder, one of the pepper pot style, and use it freely in the field on blood-besprinkled plumages." In your note book record at once the colors of any of the fleshy parts liable to fade by the drying. The bird, if a small one, can now be thrust head foremost into a paper cone and carried in the game bag or collecting box. Chapter V will instruct you how to make what is technically called a "bird skin."

The best way to transport bird skins is in wooden or tin boxes. They should be carefully laid in layers and each one properly labeled. Do not shoot more birds than you can practically make good skins of in a day. If you do you will probably have to resort to Earl's *Solution for Keeping Bird Skins Soft*, for which see page 39.

Reptiles.—The large reptiles should all be skinned as directed in Chapter XIII, and the skins placed in the alcohol solution or in the salt and alum bath. The smaller ones may be preserved entire in spirits by making an opening along the abdomen so that the spirits may have free action. For this purpose use the lead field-tank with the salt and alum brine, or the copper tank with alcoholic solution. The copper tank is made precisely like the lead tank described in foot-note on page 61.

Fishes.—Fishes should be preserved in brine and in alcohol in the same manner as the reptiles—the larger ones should be skinned completely and put in brine. The smaller ones are better preserved entire in the alcohol solution, as directed on page 45, and as described in Chapter XIII.

There is no one, so far as I am aware, who has surpassed Prof. J. S. Wiley in collecting and preserving reptiles and fishes *in the field*. While he constantly attended fish markets he was usually the fisherman himself. Upon capturing a fish he would make a water-color sketch of it, reproducing in the most artistic style every color in the fish which had just been caught. His plan was to immediately make an outline of the fish and paint its actual colors in this outline. Let every collector of fishes follow his example. To be a successful collector of reptiles and fishes you *must* learn to paint in colors the tints which so quickly fade. It is one of the best accomplishments you can acquire.

After making a color-sketch of the specimen to be preserved Prof. Wiley's first procedure was to clean the whole fish with a solution of spirits of turpentine and alum. This was done by washing the entire surface with a stiff brush until the mucus on the fish disappeared. See Chapter XIII.

CHAPTER IV.

SKINNING AND MOUNTING BIRDS.

In this chapter I propose to tell you how to skin and mount birds. With the assistance of the illustrations each procedure will be so clearly depicted that the student will, I believe, about as readily understand the system of work as though he were to see the actual operations performed on the bench. For our first attempt we shall try the American Robin *Merula migratoria* (Linn.), and I care not if it be Mr. Ridgway's Western representative, *Merula migratoria propinqua*—it's a robin just the same. The beginner should study the skeleton of a bird, Plate IX. All the principles of skinning and mounting the robin will be given, while all the *variations* and *exceptions* in the skinning and mounting of other birds from the size of a hummingbird to that of the ostrich will be found chiefly in foot-notes. It will, therefore, make very little difference what kind of a bird you may have in hand to work upon. Perhaps you have carried the bird wrapped in a paper cone in your satchel or collecting box for a half day or more and the rigor mortis has passed off. The cotton in all the shot-holes, mouth, nose-holes, ear cavities and vent should be taken out and carefully renewed, as this will prevent the blood and liquids from soiling the feathers during the process of skinning.[1] A strict observance of this rule in all cases will often save a great amount of labor in cleaning the feathers after the bird is skinned. Have a box of corn meal or plaster of Paris at hand; this should be frequently and profusely sprinkled on the carcass to absorb any blood or grease which is liable to soil the feathers.[2] The first thing to do before you proceed to skin the bird is to take full measurements of the specimen and re-

1. **Filling Ear Cavities.**—As a rule it is not necessary to fill the ear cavities with cotton, except in the case of owls and other birds which have very large ear orifices.

2. **Fastening the Beaks of Birds Together while Skinning.**—In large birds their beaks should be held together while skinning with a piece of cord run through the nose-hole, and under the lower mandible and tied fast. A small piece of bee's wax will hold together the beaks of the majority of small birds. To the beginner this precaution may seem superfluous after having plugged the mouth, nose-holes, vent, etc., with cotton; but it frequently will save him a vast amount of labor in cleaning blood and liquids from specimens that might otherwise come through and stain the feathers.

cord them in your note-book.[1] You may now break the humerus or upper arm bone of each wing with your fingers in order that the wings will hang down out of the way.[2] Lay the bird on its back and sepa-

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1. **Directions for Measurement of Birds.** I cannot recommend any other system of measurement than that given by Dr. Elliott Coues in his matchless work: Key to North American Birds. His directions are as follows:

For large birds, a tape-line showing fourths will do; for smaller ones, a foot-rule graduated for inches and eighths, or better, decimals to hundredths, must be used; and for all nice measurements the dividers are indispensable.

LENGTH.—Distance between the tip of the bill and end of the longest tail-feather. Lay the bird on its back on the ruler on a table; take hold of the bill with one hand and of both legs with the other; pull with reasonable force to get the curve all out of the neck; hold the bird thus with the tip of the bill flush with one end of the ruler, and see where the end of the tail points.

Put the tape-line in place of the ruler, in the same way, for larger birds.

EXTENT.—Distance between the tips of the outspread wings.

They must be fully outstretched, with the bird on its back, crosswise on the ruler, its bill pointing to your breast. Take hold of right and left metacarpus with the thumb and forefinger of your left and right hand, respectively, stretch with reasonable force, getting one wing-tip flush with one end of the ruler, and see how much the other wing-tip reaches. With large birds pull away as hard as you please, and use the table, floor or side of the room; mark the points and apply tape-line.

LENGTH OF WING.—Distance from the carpal angle formed at the bend of the wing to the end of the longest primary.

Get it with compasses for small birds. In birds with a convex wing, do not lay the tape-line over the curve, but under the wing in a straight line. This measurement is the one called for short "the wing."

LENGTH OF TAIL.—Distance from the roots of the rectrices to the end of the longest one. Feel for the pope's nose; in either a fresh or dried specimen there is more or less of a palpable lump into which the tail feathers stick. Guess as near as you can to the middle of this lump; place the end of the ruler opposite this point, and see where the tip of the longest tail-feather comes.

LENGTH OF BILL.—Some take the curve of the upper mandible; others the side of the upper mandible from the feathers; others the gape, etc. I take the *chord of the culmen.* Place one foot of the dividers on the culmen just where the feathers end; no matter whether the culmen runs up on the forehead, or the frontal feathers run out on the culmen, and no matter whether the culmen is straight or curved. Then with me the *length of the bill* is the shortest distance from the point just indicated to the tip of the upper mandible; measure it with the dividers. In a straight bill of course it is the length of the culmen itself; in a curved bill, however, it is quite another thing.

LENGTH OF TARSUS.—Distance between the joint of the tarsus with the leg above, and that with the first phalanx of the middle toe below. Measure it *always* with dividers, and in *front* of the leg.

LENGTH OF TOES.—Distance in a straight line along the upper surface of a toe from the point last indicated to the root of the claw on top. Length of toe is to be taken *without* the claw, unless otherwise specified.

LENGTH OF THE CLAWS.—Distance in a *straight line* from the point last indicated to the tip of the claw.

LENGTH OF HEAD.—Is often a convenient dimension for comparison with the bill. Set one foot of the dividers over the base of the culmen (determined as above) and allow the other to slip snugly down over the arch of the occiput.

2. **Breaking the Humerus in Birds' Wings.**—This is of little importance and entirely a matter of habit. As for myself I prefer never to break the upper arm bone of any bird, even if the wings do come constantly in the way during the process of skinning. It is easier to skin a bird after the rigor mortis has passed off than while it remains in its death stiffness. This comes on more or less speedily according to temperature and climate, and a freshly killed bird at all times bleeds too freely to skin. It should be given time for the blood to coagulate and the muscles to relax.

With a little care and gentle force, after hanging the bird on the hook you can peel the skin down to the shoulder joint and there disjoint it without disturbing the feathers to any great extent.

The best bird artist I ever knew never broke the humerus in any wing in order to facilitate the skinning of the bird. He skinned down the body completely as represented in Fig. 5, Plate X, and exposed both upper arm bones; these were cut off, skinned and cleaned as seen in Fig. 6, Plate X, leaving the other wing attached to the body, skinning it down with the assistance of a second hook.

In the smaller birds it is well enough to cut the wing off at the end of the humerus, where the dotted lines show in the upper portion of Fig. 6, Plate X. In all of the larger birds, however, the humerus should be allowed to remain attached to the ulna and radius as seen in Fig. 6, *p*, Plate X, especially when a bird is to be mounted with the wings spread, which is well illustrated in Plate XXI.

In all of the larger birds, the eagles, the hawks, owls, herons, pelicans, ducks, etc., be sure and leave all the wing-bones remain attached to one another and skin the wing from the outside leaving the secondary feathers attached to the ulna of the forearm as illustrated in Plate XIX, Fig. 7. The reason of this will be further discussed when we are ready to skin the wing of the subject we have on hand.

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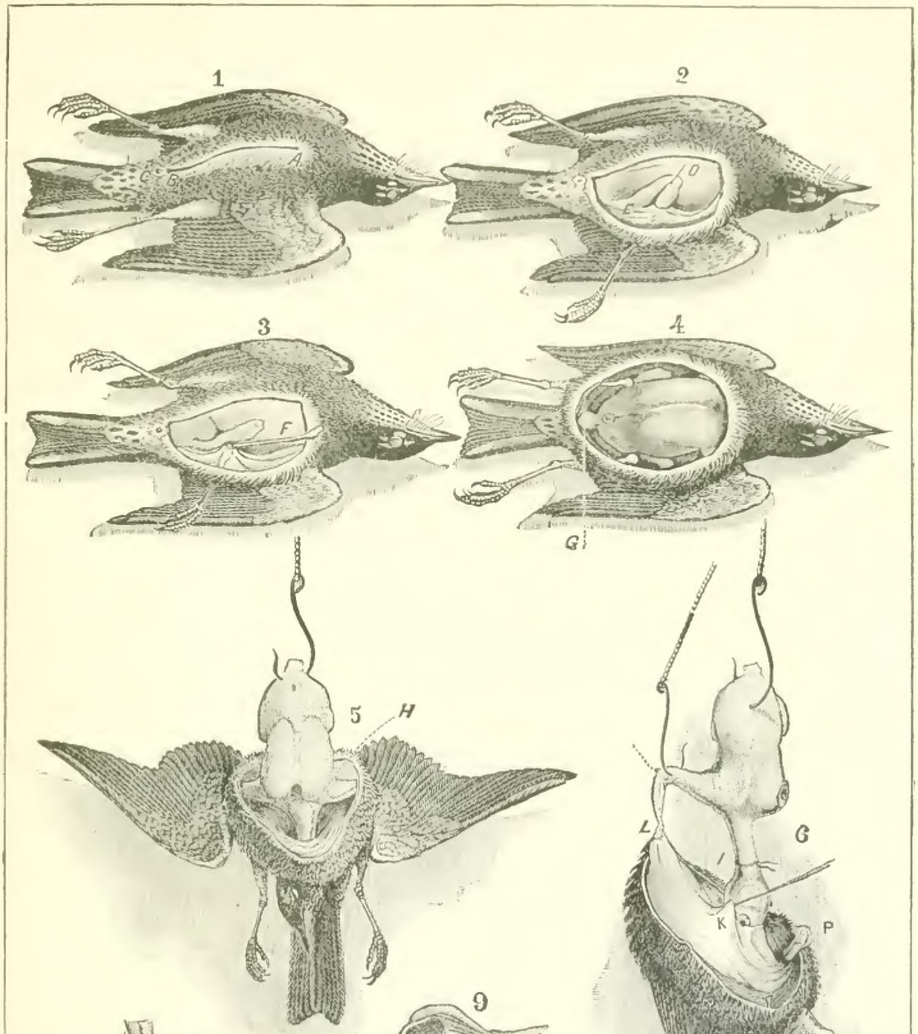
PLATE X.

SKINNING A BIRD.

Fig. 1, first incision *a* to *b*; Fig. 2, severing the leg at the knee-joint; Fig. 3, leg-bone stripped of flesh down to the heel; Fig. 4, *g* showing where to cut through tail-joint or pope's nose; Fig. 5, bird hanging on hook, skinned as far as wings; Fig. 6, skinning wings, taking out ear membrane; Fig. 7, *m* showing where to cut the thin membrane of eye in order to take ball out of socket, *n* where the neck is severed at base of skull; Figs. 8 and 9, proper shape of opening, and where to make it in skull in order to take out the brain.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rate the feathers along the breast, and, with a scalpel or sharp penknife make an incision, beginning high up on the breastbone and down to the vent[1] (Plate X, Fig. 1 *a* to *b*). Do not cut through the wall of the abdomen, for the intestines, blood, etc., will come out and give you trouble. Now raise the skin carefully along the cut until the muscles of the leg are visible; push gently but with sufficient force until the knee-joint protrudes, and cut it off here (Plate X, Fig. 2 *d*), leaving the thigh attached to the body.[2] Most of the cutting from this point until the bird is finished may be done with the scissors. Skin the leg down to the heel, strip the flesh off perfectly clean (Plate X, Fig. 3 *f*) and poison thoroughly with arsenical paste or arsenical soap (see formulas, page 34).[3] Proceed in the same manner with the other leg, then loosen the skin down on the back as far as possible, stand the bird on its breast, bend the tail down and cut carefully through the tail joint or pope's nose (Plate X, Fig. 4 *g*). In doing this you will find it necessary to work slowly and carefully in order to avoid cutting the skin. You may now hang the specimen up on one of the hooks suspended from the ceiling. Be sure, however, to leave enough of the pope's nose to hold the feathers fast. Skin down the body, cut off one of the wings at the shoulder joint, as indicated by the dotted lines in Fig. 5 *h*, Plate X. Strip off the flesh from the humerus or upper arm bone and also the forearm (ulna and radius) or double bones, detaching the secondaries of the wing down to the carpus or wrist joint (Fig. 6 *l*, Plate X). In the smaller birds, like the robin for example, you may cut the wing-bones off at the dotted lines in Fig. 6, Plate X, and leave

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1. **Opening Cut in the Backs of Birds.**—In the grebes, loons, gulls and many of the ducks I shall recommend making the opening cut along the back as this will enable you to preserve with more certainty the beauty of the underparts which in these birds are so much exposed to view.

2. **Skinning the Legs of Birds.**—In skinning the legs of birds the rule is to skin down as far as feathers grew or in all cases to the heel. The legs of many of the owls should be skinned down as far as the base of the toes which is as far as we can reach from the inside. The legs in all hawks and eagles should be skinned to below the heel.

3. **Removing Tendons from Legs of Birds.**—The tendons in the legs of eagles, large hawks, pelicans, flamingoes and large herons, down to the size of the American Bittern *Botaurus lentiginosus* (Montag.), should be taken out so that the wire will pass more easily through the leg. To do this make a cut in the ball of the foot and draw the tendons out by means of a hook turned on the end of a piece of hard wire. If you choose to do so you may put a wooden handle on the wire and make it a permanent tool for your outfit. This whole procedure is well illustrated in Figs. 4 and 5, Plate XVII. After making the slit in the ball of the foot I sometimes cut the tendons where they branch to the toes, take hold of them with pliers and draw them out. It requires much longer time to remove the tendons from a dry skin which you have relaxed than from a fresh bird.

In making up large birds in the form of *skins* the tendons should, by all means be taken out and the legs thoroughly poisoned, both to cure them and protect them against the attacks of insects.

The best plan to follow is illustrated in Plate XIV. After the tendon has been removed run a sharp-pointed wire in at the sole all the way up and through the heel as seen in our illustration. On this wire, at the sole and at the heel place with a brush, all the arsenical paste or arsenical soap that the wire will hold, and then draw the wire up and down until the tarsi has been thoroughly poisoned. I have frequently repeated this operation two and three times, and then coated the outside of the tarsi and toes with the clear arsenical solution. See also page 45.

the double bones of the wing remain intact.[1] Anoint the wing-bones and skin thoroughly with poison and let them drop back in their place. Both wings being detached and skinned we now proceed down the neck until the base of the skull is reached.[2] For good reasons do not pull or stretch the neck skin in this operation. In order to keep back any blood or liquid which is often ready to flow before severing the head from the neck tie a cord firmly about the neck just above the skull, as shown in Plate X, Fig. 6 *i*. Before severing the head from the body we will carefully detach the membrane of the ear by inserting an awl or other pointed instrument under it, and by pulling upward and outward quickly the membrane will come out (Plate X, Fig. 6 *k*). The eyes come next and can be observed through the thin membrane; cut very slowly through this until the eye is exposed, and be careful not to cut through the eye-lids (Fig. 7 *m*, Plate X).[3] Now loosen the skin from the skull until you come down to the base of the mandibles. Scoop out the eye-balls, sever the head from the neck at the base of the skull, as in Fig. 7 *n*, Plate X, taking out with the neck

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1. **Leaving All the Bones in Wings of Birds.**—Never take any of the wing-bones out of any of the larger birds, such as eagles, hawks, owls, loons, pelicans, geese, ducks, large gulls, herons, etc. You can hardly estimate the value there is in leaving all the wing-bones in the larger birds and, I may say, even in the smaller ones. Skin down to the double bones of the wing (ulna and radius) or elbow, clean the flesh thoroughly from the single bone (humerus) and stop there; and if it has been done properly the humerus will be seen as it is in Plate XIX, Fig. 7. After treating both wings alike, and, after you have skinned the bird completely as directed, and it is lying before you, separate the feathers along the under side of the wing, make an incision, take out all the flesh, but leave the secondaries of the wing attached to the ulna. This is clearly illustrated in Plate XIX, Fig. 7. In order to thoroughly clean the entire wing of the flesh an opening between the metacarpal bones should be made. This is also seen in the Fig. just referred to. While it is of great importance to make this cut in order to take out all the flesh and poison the skin and bones thoroughly to the end of the wing, many taxidermists overlook this important point. In order to skin the wing in this manner, make the incision along the under side of the wing as indicated in our drawing, and after having the skin lifted up along both sides of the cut drive pins along its edge into your bench to hold the skin back out of the way while you are removing the flesh. Poison the bones and skin thoroughly, take the pins out and the wings are completely prepared. If the wings are to be spread you should sew this opening up very nicely. In mounting a bird with the wings spread *never* detach the feathers from the ulna of the wing, for you cannot replace them as nature has done; nor can you spread them so regularly if you detach them. In skinning the wings as I have described there are many advantages to be gained. The wings fold up or spread out perfectly; you can also always depend upon getting the proper length of the wing by placing the knob of the humerus in the coracoid hollow or socket which you have made in the artificial body. This is well illustrated in Plate XXI, Figs. 1, 2, 5, and the folding of the wing in the hawk and owl is shown in Figs. 3, 4, Plate XX. There is another point in the philosophy of leaving all the wing-bones in birds. They assist materially in obtaining the proper shape of the back, and it is absolutely impossible to find any artificial structure which will fill their place in this regard, while their solidity is beyond question.

2. **Exceptions in Skinning the Heads of Certain Birds.**—The heads of some birds are too large to pass through the neck-skin, and they must be skinned and treated differently. To skin the heads of woodpeckers, ducks, geese, swan, flamingoes, cranes, ostrich, peacock, etc., an opening cut must be made from the outside as seen in Fig. 5, Plate XIX. Skin down to the base of the bill as usual, cut away the flesh, take out the eyes and brain, poison thoroughly, fill the eye-sockets with cotton and sew up the slit as seen in Fig. 6 of the same plate. This is done, of course, after skinning down as far as possible on the inside. Make a hole in your bench to fit the shape of your bird's bill and rest it in there while skinning the head (Plate XIX, Fig. 5.)

3. **Owls' Eyes**.—Never remove the bony eye-cup in owls. If you take these out your owls will lose their characteristic expression. Dig the eye-ball out with your scalpel and scissors as seen in Plate XVII, Figs. 1, 3. If you desire to do so you can take the eye-cup out and clean it of its contents, as seen in Fig. 2, Plate XVII, but you must put it back in its place. It is far better to leave the eye-cups in place and clean the contents out without disturbing them.

RETURNING THE SKIN OVER THE SKULL.

This illustration shows clearly the manner of returning the skin over the skull.

the tongue. The muscles of the lower mandible and around the skull must be cut away. Now take out the brain. Do not cut the whole back of the skull off in order to get at the brain, as I have seen some taxidermists do; but make an opening at the base of the skull extending over into the roof of the mouth, exactly as we have it pictured in Figs. 8 and 9, Plate X. Scoop out the brain with your brain-spoon or knife, and clean the head all over in a thorough and general manner. Give it a heavy coat all over with arsenical paste or arsenical soap; fill the eye-sockets loosely with balls of clean, white cotton, and the skin is ready to be returned. Before you do this, however, while the skin is lying before you, wrong side out, clean all the particles of flesh and fat from it and poison the skin all over in the most thorough manner. The returning of the skin back over the skull is well illustrated in Plate XI. Let me caution the beginner that he will find some difficulty in performing this operation the first two or three times, especially if he is in haste to do it. Take your time by all means with the first birds, and you will soon learn the knack of returning the skin over the skull. Do not imagine that you can poke the skull straight through the neck-skin without some careful manipulation. Work the skin over gradually, and whenever it becomes rolled up on top of the skull or elsewhere work on the opposite side until the folded portion will clear itself, and suddenly it will pass through and the skin will once more be right side out as seen in Plate XII. The arsenical paste or soap will here be of great assistance in aiding the skin to slip easily over the skull. The skin now being turned right side out, the feathers may be very much disarranged. Take hold of the bill, adjust the feathers with your fingers and spring forceps, and assist them to fall back in their natural position. Insert the blunt end of a darning needle in the eye-hole and rub it along under the skin above the skull (Plate XII), and the skin and feathers will fall back to their natural places. This little procedure, so clearly portrayed in our illustration, is of the greatest importance in adjusting the skin and feathers of a bird's head. You must now with a needle point pluck out the cotton in the eye-sockets to the natural fullness of the eyes, but do not make them bulge out. Make the circle of the eyelids perfectly round, adjust the feathers of the neck carefully, and if all has been done according to directions our robin skin lies before us ready to be mounted as it appears in Plate XIII, Fig. 1.

Mounting Birds.—As we have the robin skinned, we shall now proceed to mount it. The carcass of the bird is lying before you (Plate XIII, Fig. 2). Cut off three pieces of annealed wire No. 18

(which is about the right size for the robin), two of them twice as long as the entire leg, the third long enough to encircle the body lengthwise and extend about an inch and a half beyond the natural neck, as is seen in Plate XIII, Fig. 3. With a file sharpen these wires at one end; make them very sharp, and smooth them off with fine sandpaper. Now encircle the body lengthwise with the longest wire, the sharpened end extending at least an inch and a half beyond the length of the natural neck, as seen in Plate XIII, Fig. 3. Turn the wire over and clinch it at the base of the neck (Plate XIII, Figs. 3 and 4), using considerable force with flat-nosed pliers. You now have the exact shape of the body lengthwise, which is figured in Plate XIII, Fig. 4. Take a sufficient amount of tow to make an artificial body, and form it firmly with your hands until it is about the size of the natural carcass, which is lying before you. Place this tow which you have thus moulded in the wire frame (Plate XIII, Fig. 4). With needle and strong thread sew it through and through, and also sew the wire to the tow all the way around (Plate XIII, Figs. 5, 6 and 7). Take a pair of calipers and measure the *natural* body carefully, and make the artificial one *exactly like it.* Imitate every characteristic of the natural carcass in the artificial one. Sew through and through the artificial body, and make a hollow for the wings to lie in, as seen in Fig. 7, Plate XIII. In a word, imitate nature as closely as possible. Figures 5, 6 and 7 will sufficiently illustrate how this should be done.[1] Now, the next procedure is to sew the wings to the side of the skin so that they will hold firmly to the skin and in exactly the proper place when the bird is mounted. First of all, pull the double wing-bones on the inside of the skin; sew through the bare place in the side of the skin, now through the wing at the fingers, and back again into the skin, and tie it firmly on the inside. This operation is clearly shown in

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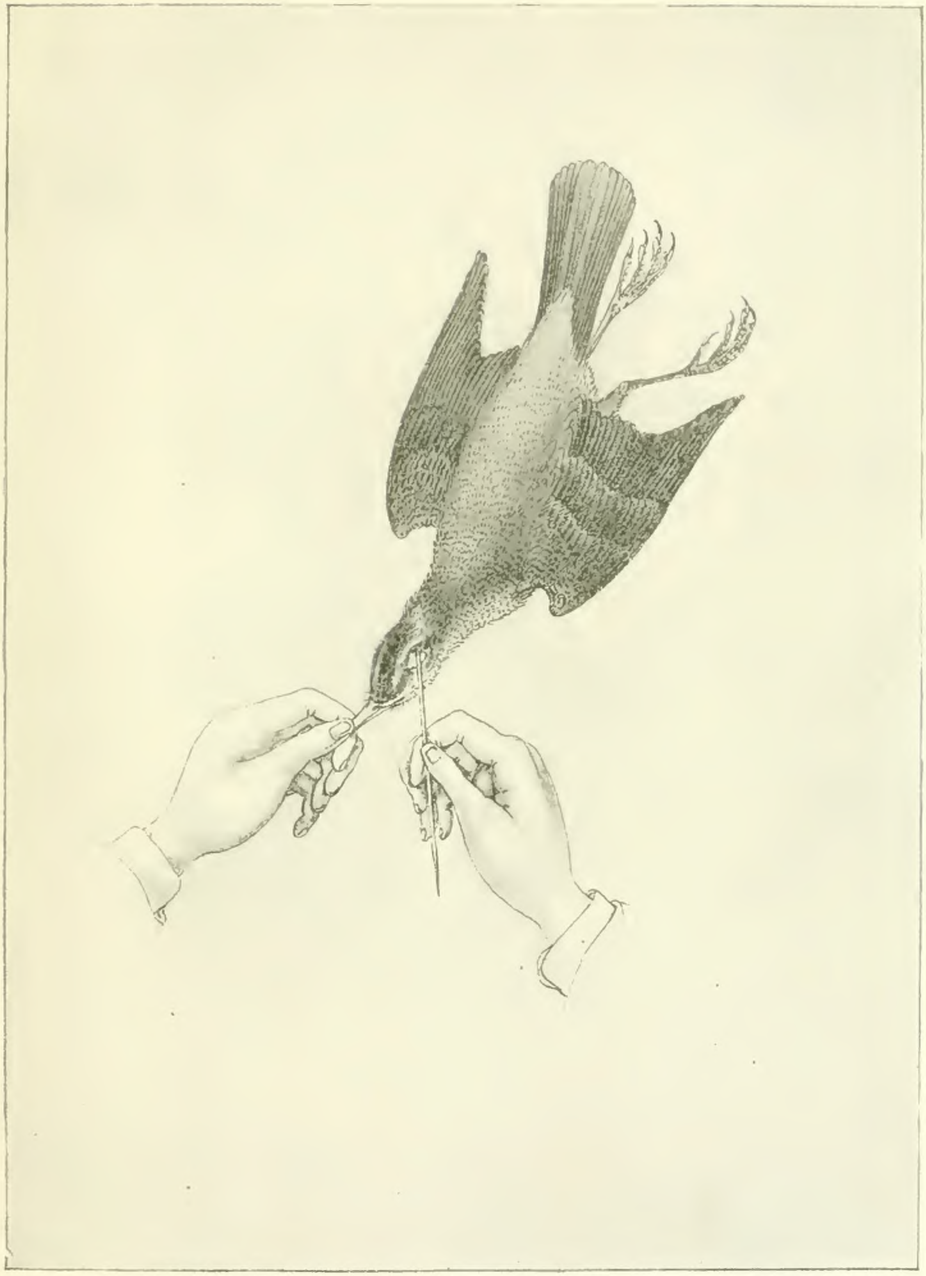
1. **Making Artificial Bodies for Birds.**—I cannot impress the beginner too forcibly on the importance of making the artificial bodies for birds as nearly like the natural ones, both in size and shape, as is possible to make them. After skinning a bird study the carcass critically; note its characteristic shape; observe the hollows where the wings lie; measure it with the calipers all over, measure its circumference around the breast and abdomen, and try to copy the natural body in every detail by sewing it through and through with needle and thread, bringing out in the artificial body every characteristic elevation and hollow. If the artificial body is made with extreme accuracy and the leg and wing bones carefully adjusted to their places, there will be very few stubborn feathers sticking up out of place and the plumage will require little or no winding down.

Make the false body for all birds, except for such as the ostrich, exactly as I have described for the robin. There is a difference, however, in forming the necks in long-necked birds which will be treated separately in its proper place. In large birds you can use excelsior or straw for the core and tow on the outside. Many taxidermists use straw or excelsior alone. In making large bodies a long needle and strong twine is necessary to sew them through and through. While it has been advised that the beginner measure every portion of a bird's body with calipers in order that the artificial body may be made with accuracy, there is one measurement which, with sufficient experience, really need not be taken. It is the one illustrated in Figs. 3 and 4, Plate XIII. You will observe that by encircling the natural body lengthwise with the body-wire you obtain, when carefully done, the exact shape and size of body lengthwise. It is one of the beauties of this method of mounting birds.



ADJUSTING FEATHERS OF THE HEAD

When the skin of a bird has been turned right side out the feathers are usually very much disarranged, especially about the head where the skin has become folded. To adjust the skin over the head, insert the blunt point of a darning needle in the eye-hole and rub it along under the skin above the skull; by this operation the skin and feathers of the head will fall nicely in their place.

Plate XIX, Fig. 3, and if properly done the wings will always remain in their proper place without the aid of pins or sharpened wires.[1] Take one of the smoothly sandpapered wires intended for the legs and run it into the ball of the foot and out at the heel, as seen in Plate XIII, Fig. 8. This operation is well illustrated in Plate XIV. Saturate the wire above the heel and below the sole with the arsenical paste or soap; now draw it up and down half a dozen times in order to allow the poison to penetrate that part of the leg between the sole and heel (the tarsus), for this should be poisoned as well as any portion of the bird. Draw the wire back below the heel and thrust it through to the end of the tibia and wind it with a wrapping of fine tow to replace the muscles of the leg, as seen in Plate XIII, Figs. 9 and 10. Draw the leg with the artificial muscle back to its place, smoothing the feathers nicely on the skin, and proceed with the other leg in a similar manner. The skin now lies before you (Plate XIII, Fig. 10) ready for the reception of the artificial body. Before proceeding, however, see that the entire skin is thoroughly poisoned with the arsenical paste or soap. Make some loose little tow-balls (Plate XIII, Fig. 11) a trifle larger than the natural neck on the carcass before you. Insert the balls in the neck-skin. The number depends upon the length of the neck.[2] You may now take the artificial body and thrust the sharpened neck-wire through these balls of tow and through the skull, as represented in Plate XIII, Fig. 12. Take hold of the leg with the wire in it and thrust the wire through the artificial body and clinch or anchor it, as is represented in Plate XIII, Fig. 13. Locate the wire about the mid-

1. **Fastening the Wings in Birds.**—Many taxidermists fasten the wings of the smaller birds to the artificial body from the outside with sharpened wires or pins. This is proper in eagles, hawks, owls and, in fact, all the larger species, especially when all the wing bones remain intact. To make a substantial and finished job in the smaller species tie the wings to the side of the skin through the bare spot as illustrated in Figs. 3 and 4, Plate XIX, and if you have made the false body with *accuracy* the wings will lie in position without the aid of pointed wires or pins. This method has been practiced for years by Dr. Jasper, and there are none, I am sure, can look upon his mounted birds and skins without observing the supreme accuracy with which the wings fit the body. The secret lies chiefly *in this little point*. Another method answering the same purpose has been devised by Mr. Thomas M. Earl, and it is illustrated in Plate XVII, Fig. 6. It is to fasten a piece of thread at the upper ends of the double wing-bones and draw them together until they are the same distance apart that the width of the back measures; tie them fast there. In order to make the strength and firmness doubly sure both of these methods are often employed, as seen in the several figures of Plate XIII. Either of these, however, employed in making skins of the smaller birds are most excellent in holding the wings to their proper place, and will do away with the use of many sharpened wires and pins.

2. **Making Artificial Necks for Birds.**—I have just described above my method of making the artificial necks in birds with balls of tow. Perhaps most taxidermists make a solid neck of natural thickness and length on the neck-wire, in the same manner they do the body before inserting it in the skin; others simply take a roll of tow of the proper size and insert it in the skull cavity as seen in Figs. 1, 2, 3, and 4, Plate XIX. The solid neck, however, is far preferable to the loose tow because it makes a firmer job, and you can form the neck to better proportions. The advantage in the method I use is that you can lengthen or shorten the neck to suit your own taste, on the same principle of running the center wire through the nose in small quadrupeds. If the balls of tow are made reasonably solid the same strength can be had as in the solid neck.

This is applied to the short-necked birds and not to herons, cranes, etc., where we use the actual bones of the cervical vertebræ over which to form the neck.

dle of the body. Bend the legs parallel with the body; adjust the wings and feathers nicely all over in a general way, pull the skin again and again over the opening, and gradually make it meet as closely as possible. Stick a needle with thread in the right-hand edge of the cut at the beginning of the incision (Plate XIII, Fig. 14) on the *under* side of the opening. Sew over and over, drawing the skin together and adjusting the feathers as you proceed until the opening is completely closed. Now bend the legs to what you may deem a proper angle, and the bird will be lying before you as it is in Plate XV, Fig. 1. Place it on a temporary or permanent T-perch,[1] run a pointed, smoothly sandpapered wire in the tail-joint, and with a little further manipulation, such as filling the throat out, etc., with cotton, your bird will appear as it is figured in Plate XV, Fig. 2. Open the bird's mouth, and with a blunt piece of wire fill the throat out so that it will be smooth and symmetrical. Never allow a specimen to go without filling the throat out perfectly smooth, but not too full. The eyes may be set in immediately, while the lids are soft, or the bird may be allowed to thoroughly dry before setting them. If it is to be allowed to dry the circle of the eyelids should be nicely adjusted and arranged perfectly round and full, but not to bulge out. The advantage of inserting the eyes in dry mounted birds lies in the fact that the skin being stiff and hard one can work about the head with more freedom, and with less delicacy of touch than is required in handling the fresh specimen, and if the eyelids have been properly adjusted in the first place, a much neater job can be made of them in every particular. To soften the eyelids in dry specimens, cut a piece of sponge that will fill the eye-hole up completely; take your tweezers and soak it for a moment in water and then place it in the eye-hole. The lids will soon become soft enough to insert the eye without trouble.[2] Take a piece of soft

1. **Perches.**—It is a good idea to have made, and keep them in readiness, a number of temporary T-shaped stands. The cross-piece on many of them can be set at different angles, to give variety to the positions of the specimens. From these temporary stands the specimens can be transferred to the permanent ones.

2. **Inserting Glass Eyes.**—You may insert glass eyes in your birds on a foundation of putty placed over the cotton in the eye cavity. Absorbent cotton thoroughly saturated with mucilage is likewise good but above all potter's clay mixed with strong glue liquid is the best, or papier-mache.

You may suit your pleasure as to *when* you put in the eyes. I never write or telegraph my dealer that I must have the eyes before the eye-lids of my specimens dry. I prefer to insert them after the bird is thoroughly dry, for reasons given above. Take just as much care to insert the eyes in a bird as you do any portion of the whole operation of mounting. The head is one of the chief beauties of a bird and the setting of the eye has all to do with the expression. When you insert the eye, it should afterwards be nicely cleaned and polished. In fact, be neat and cleanly with all of your specimens, it will add fifty per cent. to their value. It requires care and some experience to properly adjust the eyes in many birds, and especially in the hawks and eagles. If you can obtain a live hawk it will pay you to carefully note how the eyes set in the head—how keen his expression on account of their forward position in the head, and how beautifully the eye-lid fits around the ball of the eye. The latter fact, however, is true of the eyes of all birds, and is one of the nice points which should be shown in your mounted specimens. In leaving a specimen to dry without inserting the eyes, be sure that the eye-lids are rounded and nicely adjusted. Do not leave one of them half closed and the other fully open

PLATE XIII.

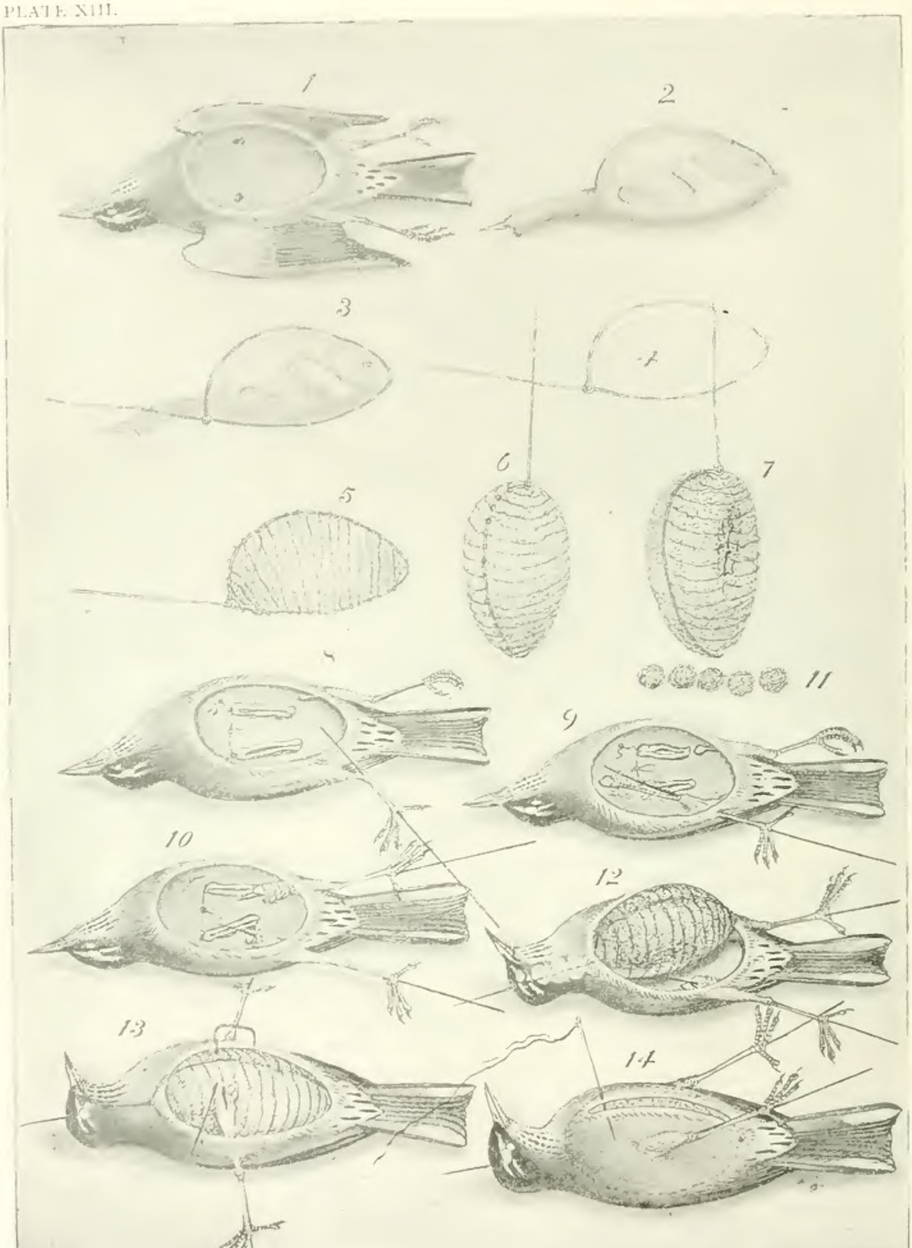


PLATE XIII.

MOUNTING A BIRD.

Fig. 1, skin ready for artificial body, wires, etc.; Fig. 2, natural body as taken out of the skin; Fig. 3, encircling natural body with the body-wire to obtain proper dimensions lengthwise; Fig. 4, showing proper shape and size; Fig. 5, tow sewed and bound in the body-wire, Fig. 6, exhibiting the under portion of artificial body with body-wire sewed fast; Fig. 7, illustrating side and back of artificial body showing hollow where the humerus rests; Fig. 8, skin in shape with wire protruding from heel in order to poison leg between heel and base of toes; Fig. 9, wire inserted to end of tibia and muscles replaced with tow; Fig. 10, both legs made and pulled back in position; Fig. 11, balls of tow for the neck; Fig. 12, balls of tow inserted in neck and artificial body adjusted ready for reception of wires; Fig. 13, leg-wires inserted in body, and showing manner of anchoring them; Fig. 14, sewing up the opening.

putty of the required size, place it in the eye above the cotton, and the artificial eye of the proper size and color over it; adjust the eyelids carefully and the bird is ready for the final touches. The next procedure in the mounting of our robin is wrapping it with thread. Do this with the soft thread from the bobbin, which you can get at the cotton mills, called copse, or No. 40 thread. Wind it carefully wherever there are any feathers out of order, or wherever there seems to be a break in the symmetrical outline of the mounted bird.[1] Look at it from the head, tail and both sides; make the outline easy and graceful, and wind it so that the feathers will lie like they do in life—alike on both sides. Now cut two pieces of pasteboard for a tail band; adjust the tail feathers and pin the two pieces of pasteboard across the tail as shown in Plate XV, Fig. 3. These will rest on the wire used for a tail support. Your specimen is now ready to put away until thoroughly dry. Instead of using the strips of card-board to hold the tail feathers in place many taxidermists sharpen and sandpaper smoothly a piece of wire of the proper size and pass it through each quill at the base of the tail. The feathers are then arranged to suit the attitude of the specimen. This can be done on the smallest birds.

Another Method of Mounting Birds.—We shall here depart from the regular mode of skinning and mounting birds, and use another method having advantages which the usual procedure does not obtain. Some will perhaps adopt this method altogether and use it in preference to the former which we have already fully described and illustrated. We shall term it the "breast-cut" method for, instead of making the

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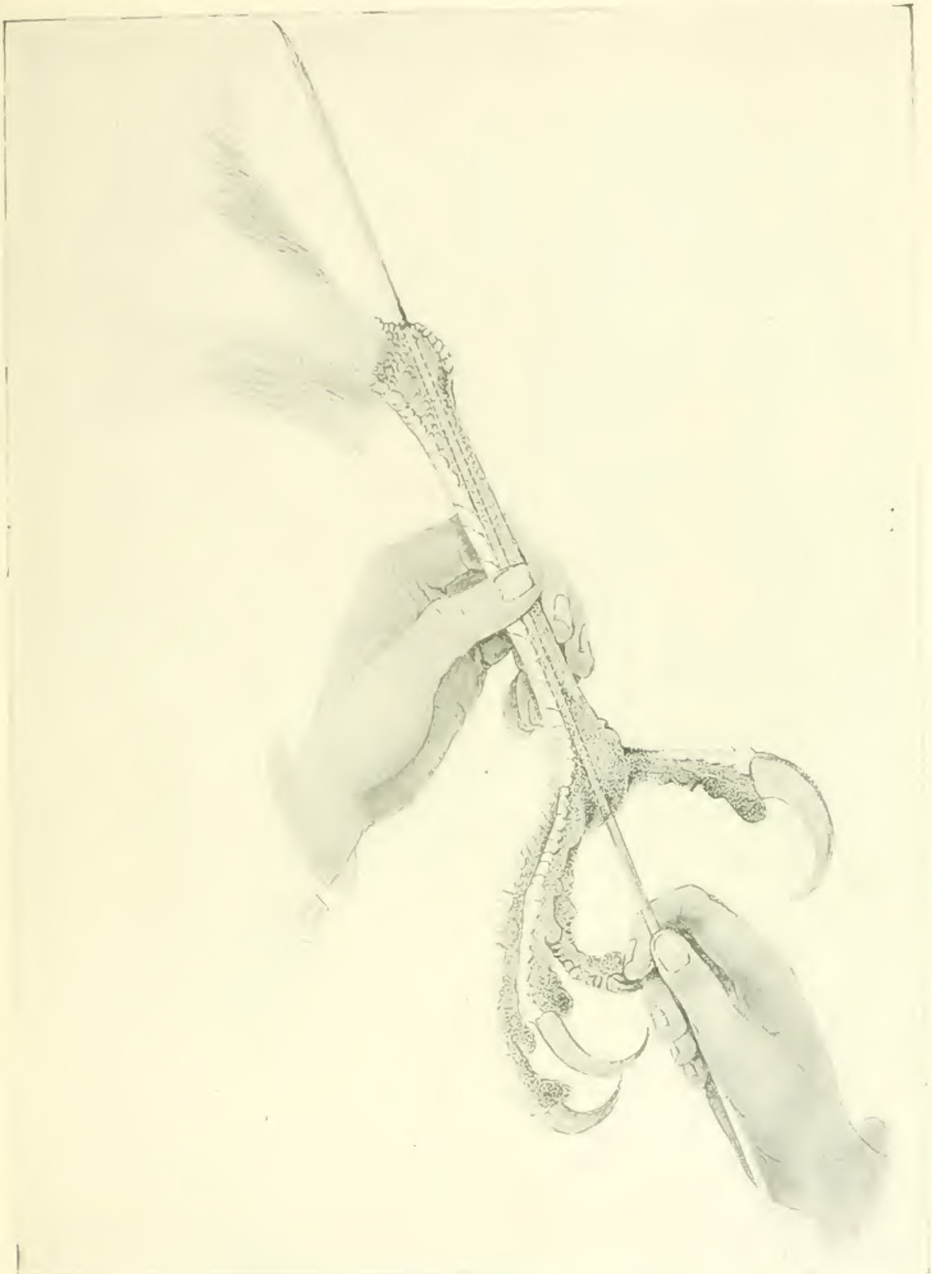
1 **Winding Birds' Feathers.**—Prof. J. S Wiley, in a pamphlet entitled *The Preparation and Preservation of Objects of Natural History*, published in 1855, dwells at length on the arrangement and winding of birds' feathers. He advises the use of three hooked wires along the back and belly and the supporting neck-wire to be hooked at the top of the head. Mr. Frederic S. Webster, in a paper read before the members of the Society of American Taxidermists in 1881, advocates a similar method.

Our Plate XVI represents two figures of a hawk; the upper one is supposed to be properly wound with the aid of hooked wires; the lower, with simply sharpened wires stuck in it here and there, illustrates a bird badly wound, the threads being too tightly drawn, making the symmetry or outline of the whole bird very imperfect. The object of the hooked wires, as Professor Wiley says, "is to wind the thread over them and bring sufficient pressure down on the feathers that stubbornly stick up and to hold them in place till the skin is dry; to miss those that lie perfectly natural or need little or no pressure at all." Every taxidermist has his own method of winding birds' feathers and he varies his modes of procedure in every case according to circumstances—to suit the condition and attitude of the specimen under treatment. In my first efforts I employed the assistance of hooked wires to bring my birds into shape, but now I seldom have to resort to them. To obtain symmetry in our specimens a general and careful wrapping is necessary. The feathers that require pressure to hold them down are usually those that have sprung up on account of some irregularity in the shape of the false body, or too much filling, or because of some misplacement or disarrangement of the wing or leg bones. Take the utmost care in making the artificial body. Do not make it too large; do not make an elevation where there should be a hollow; anchor the legs in the proper place in the body; in the smaller birds sew or tie the wings in the proper place so that the feathers will not stick up at the shoulders, which is usually such a troublesome place for the amateur to work over. Study the bird and note how the feathers cover the bare places on the body and you will soon know the way they must be adjusted in order to obtain the smoothness that nature gave them. In this a careful study of Plate VIII may assist you abdominal cut in skinning, we begin the opening incision far up on the breast and stop at the end of the breast bone (Plate XVII, Fig. 7 *a* to *b*). Loosen the skin from the breast down to the wings and neck, cut the wings and neck off close to the body and skin them in the usual way (Plate XVII, Fig. 8). Now skin down the back a little and then hang the bird up on the hook at the point where you have cut off the neck. Skin down to the legs and cut them off as usual at the knee joints, stripping the flesh off down to the heel. Skin over the neck and head and treat them as previously directed. Now having the robin before you as in Plate XVII, Fig. 6, and in Plate XVIII, Fig. 1, it is ready for the artificial body. Take a piece of annealed wire and encircle the natural body lengthwise and clinch it at the neck. This is in order to obtain the correct dimensions of the body for future use as you will notice directly. Now take the long sharpened and smooth wire which is intended for the body-wire and encircle the carcass lengthwise as shown in Plate XVIII, Fig. 2, bending it straight across, however, about three-quarters of the way down on the carcass, where the dotted lines are in Fig 2. If you have carried the directions out fully you will have an outline form in the wire similar to Fig. 3, Plate XVIII. Take a quantity of tow and mould it with your hands to about the proper size, place it in the frame and sew it through and through, as directed for the usual way. You will now have a three-quarters portion of the artificial body made. By measuring or comparing this with the wire which you encircled lengthwise around the carcass to obtain its size you can easily mark with a file how much should be allowed for the lower or abdominal portion of the body. You can cut it apart and bend and clinch it where you have marked it, thus making the shape of the lower portion of the artificial body as seen in Fig. 3, Plate XVIII. Put tow within this frame and sew it as before directed. Place in the balls of tow for the neck, as usual; take hold of the large portion of the artificial body which you have just made and thrust the pointed wire through the balls of tow in the neck and through the skull. Now run the wires of the legs into and through the artificial body, clinching them on the respective opposite sides in the usual manner, as is illustrated in Plate XIII, Fig. 13. When a beginner skins a bird and mounts it, using the abdominal cut, he often, indeed, almost invariably finds great difficulty in sewing up the opening so that it will be neatly and perfectly done — in fact, this is one of the constant defects in mounted birds, and it is here that the work is slighted or neglected, even by those who have long experience in the matter. The feathers high up along the ventral tract are more abundant and compact than they are lower down, making the opening cut along the breast more easy to close than that along the abdominal region, while the latter is preserved intact.

Mounting Birds with Wings Spread.—In skinning a bird that is to have its wings spread leave in all the wing-bones. Skin the humerus down to the elbow, strip it of its flesh and open the forearm on the outside underneath; take out all the muscles and tendons, but leave the secondaries attached to the ulna. This can be clearly seen in Plate XIX, Fig. 7. Skin the bird otherwise as previously directed in skinning the robin. The artificial body for birds that are to have the wings spread should be made solid and compact in order to secure the many wires that must be thrust into it. In birds of prey the muscles of the leg should be well developed. Make the artificial body exactly like the natural one. If you will examine the skeleton of the eagle in Plate IX you will observe that the humerus is attached to the large stout bone called the coraciod, which joins the sternum or breast-bone. There is always a neatly rounded hollow where you sever the humerus from the coraciod bone. This must be emphasized strongly in the artificial body as seen in Fig. 1, Plate XXI. It should be strongly developed in all artificial bodies where all the wing-bones are to remain intact. The wire which is to be used in the wing should be well sandpapered and oiled in order that it may slip along the joints of the wing and also through the cords which are to hold the wires close to the bone. Sharpen the wire at both ends. It should be strong enough to support the weight of the wing and long enough to project beyond where the first primaries begin to grow, after having anchored it in the body as represented in Fig. 5, Plate XXI. Make it perfectly straight and polish it well. Lift the opening of the skin and pass the wire up along the humerus and out between the ulna and radius to the carpal joint, thence under the skin of the metacarpal bones, until it appears where the first primaries begin to develop. All this is clearly shown in Figs. 2 and 4, Plate XXI. Tie the wire to the humerus and to the radius, and if you have properly skinned the wing as shown in Fig. 7, Plate XIX, you may also tie the wire fast to the metacarpal bones. In large birds the flesh around these bones should always be taken out. Make the wire fit snugly against the wing-bones. Now fill the neck with balls of tow to the proper length and thickness. Take the artificial body in hand and force the neck-wire through these and out in the center of the head as seen in Fig. 2, Plate XXI. Place the knob of the humerus in the coraciod hollow which you have made in the body, and force the wire through the body, and clinch or



WIRING AND POISONING THE TARSUS.

The tarsus of the leg should be poisoned as well as any portion of the bird's skin, and it is done as here illustrated. Saturate the wire with arsenical paste (see recipe, page 15) above the heel and at the ball of the foot. Draw the wire up and down several times until the poison has penetrated the tarsus. Now draw the wire back below the heel and then continue it up along the tibia and form the leg as seen in Plate XIII.

anchor it firmly as seen in Figs. 2 and 5, Plate XXI. Some taxidermists bend the wire at its point (Fig. 3, Plate XXI) and clinch it under the metacarpal bones. Having inserted the wires of the wings, replace the fleshy portion of each wing with tow and sew the openings up neatly. The art of giving a natural poise to the body and proper bend and elevation of wings all remains with the operator. This must be done after the bird has been placed on a temporary perch. If it is to be in full flight the feet must be drawn up and almost concealed in the feathers; if grasping prey, place the object at once underneath the talons before the feet begin to dry.

The feathers of the wing should be held in their proper place by pinning card-board over them, as represented in Fig. 2, Plate XXI. The tail-feathers of all large birds should be wired by running a piece of small wire through each feather at the flat part of the quill near the body, and should also have card-board pinned across them, and then spread in position.

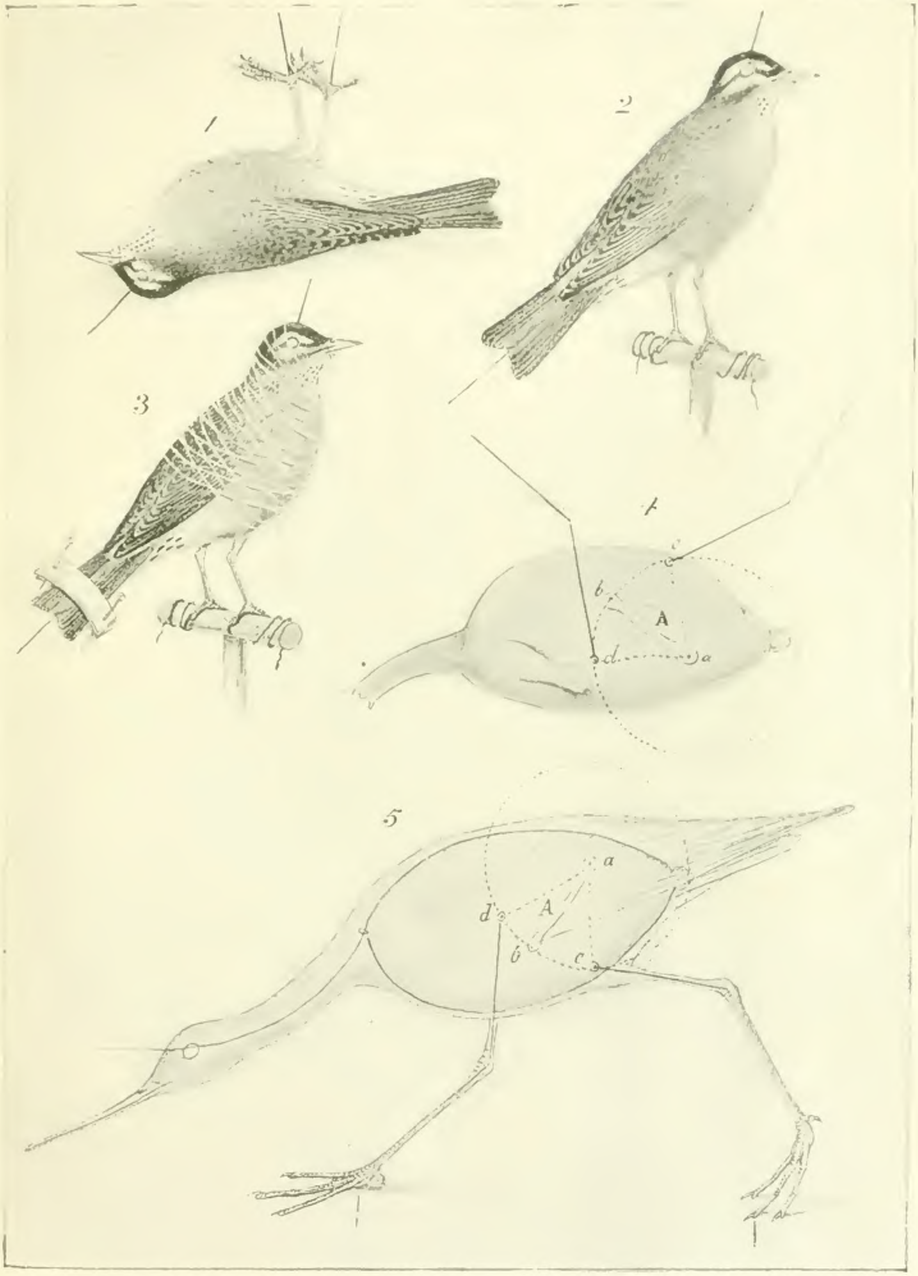
Mounting Long-necked Birds.—I use only one method in mounting long-necked birds, and I will match it against any method that has heretofore been devised. My venerable instructor in taxidermy, Dr. Theodore Jasper, has, for thirty-five years, mounted the herons, etc., on this same principle. In securing the best results it is the simplest and most practical method known. Prof. J. S. Wiley and many others have used a similar method but not exactly like the one I shall describe. It is applied to birds that are heron-like, from the size of the Least Bittern *Botaurus exilis* (Gmel.) and upwards; in any of the true cranes, in the ostrich, emu and the like. The necks of the herons are long, thin and flat, and the angular joints of the neck vertebræ are often visible through the thin coat of feathers. To imitate nature what is better in this case than to use the bony structure of the neck itself? Try it, and you will never waste time on experimenting with other methods.

Skin your heron exactly as I have directed in this chapter, and after having cut the cervical vertebræ off at the base of the skull, sever it where it joins the body as we have it illustrated in Fig. 1, Plate XXII. You now have in your hands the bony structure and muscles of the neck, the wind-pipe, etc. Clean this vertebræ of its flesh and it will appear as in Fig. 2, Plate XXII. Do not disjoint the vertebræ; leave them remain attached to one another, and clean them thoroughly and poison the whole well. Sharpen a piece of annealed wire at both ends; make this wire long enough so that you can anchor it in the artificial body as seen in Fig. 4, Plate XXII, and also long

PLATE XV.

FINISHING A MOUNTED BIRD. WALKING ATTITUDES.

Fig 1, robin with legs bent in shape ready for perch; Fig. 2, robin on temporary perch with wire in tail for support; Fig. 3, robin with thread winding; tail band; Figs. 4 and 5, showing position of femur (A) which, in the natural body, can not describe more than one-quarter of a circle. In stepping or running attitudes the leg, which is to set forward, should be anchored in the artificial body about as far up as the femur would reach in the circle (*d* and *d*); the leg that is to drop backward should be placed far down in the circle as seen in *c* of both figures. Where the end of the middle toe is to barely touch the ground (Fig. 5) the wire should be run from the inside of the skin to point of toe, so that no "visible means of support" will be seen when fastened on the stand. See section, *Stepping and Running Attitudes*, page 96.


1
2
3
4
c
b
A
d
a
5
a
d
A
b
c

enough to protrude from the skull. Make it exactly as represented in Fig. 3. Now run this wire straight *through the center* of this cervical vertebræ and leave it project out an inch or two, according to the size of your bird, and stick a small piece of cork on the sharpened end as in Fig. 3, Plate XXII, to keep your hands from being injured with the sharp point of the wire while you are making the neck. You may now wrap this neck skeleton with fine tow to replace the flesh; bind it down with thread, and just before inserting it in the neck-skin cover the whole with clay. The clay should have a mixture of stiff glue liquid. The windpipe which moves so easily from one side to the other can be imitated by taking a small piece of annealed wire, winding it with tow and anchoring or sewing it at the upper and lower end of the neck. In making the false body carry out the same instructions to form it as given in mounting of the robin, except, of course, that when you take the size of the body lengthwise with wire you leave off the neck-wire which is used in the short-necked birds. After carefully forming the neck of your heron anchor it firmly in the proper place on the artificial body. You can see how this should be done by examining Fig. 4, Plate XXII. Be very particular in making the false body for your herons as you should in all others, imitating every hollow and elevation. If your heron is to stand on one leg the wire in the leg that is to support the body should be heavier, and if the bird is to be placed in a walking position with one of the large toes just touching the ground, sharpen the wire that is to go in this leg at both ends, and run it in from the inside to very nearly the end of the great toe and let it come out at this point so that there will be no visible supporting wire from the leg when fastened on the stand, as seen in Fig. 5, Plate XV, and Fig. 5, Plate XXII.

Skinning and Mounting Colossal Birds.—The ostriches, emus, and cassowaries, on account of their immense size, require special treatment in their skinning and mounting. The opening cut must be begun high up on the breast and continued to the vent. Make another incision across the abdominal region from one leg to the other; continue this cut down the inside of the leg and down to the ball of the foot, if it be an ostrich. Through this opening you can remove the tendons and muscles and detach the skin of the leg all the way around the bone. Sever the legs at the knee-joint and cure the skin with arsenical paste or arsenical soap and a little powdered alum and salt. Skin over the tail and down the back till the wings are reached, detach the humerus from the body and strip it of its flesh, leaving the other portion of the wing to be skinned from the outside as seen in

Plate XIX, Fig. 7, and as I advise in the foot-note on page 42. Skin down the neck as far as possible, for the head of an ostrich cannot pass through the skin of the neck. Detach the cervical vertebræ as near to the head as possible without breaking any of the bones, as we must use them in forming the neck. Turn the skin back and make an opening cut in the back of the head and far enough down the neck to take out that portion which remains (Plate XIX, Fig. 5), and after you have skinned and cleaned this part of the neck and head and have thoroughly poisoned them, fill the eye-sockets with cotton, but do not yet sew the opening up as seen in Plate XIX, Fig. 6, and as recommended in foot-note on page 70, for through this opening we can more easily adjust the skin of the neck over the clay-covered vertebræ and form the muscles of the head, etc., than we could were it closed. Sew the opening up when this has been done. As we now have the skin off, cured with arsenical paste and powdered alum, we will wrap it in a damp blanket, for it will take two days at least to complete the specimen, and it is necessary to have the skin soft and pliable when we place it on the manikin, which we shall now begin to build. Make a center board exactly the shape of the contour of the body which lies before you. The shape of the ostrich body is illustrated precisely in our Plate XXIII. Cut three square holes in this center board for the purpose of sewing the tow through and through as figured in Plate XXIII (*a*, *b*, *c*) to build out the manikin. Now lay the skin out on the floor and arrange the legs in the position you desire to have the bird appear when mounted—standing, running or stepping. The latter is the attitude in our plate. Take a piece of large-sized annealed wire and obtain the exact position of the legs by placing the wire along the leg-bones and follow closely and neatly every bend in the joints down to the sole of the foot, precisely as we have it in our illustration (Plate XXIII). Out of half-inch round iron rods make from these patterns their counterparts in form; at the same time have them threaded at both ends and provided with nuts and washers. If you cannot do this yourself have your blacksmith do it for you. Now, if you will examine figure *d* in our plate you will see that the leg-irons are to be fastened in an iron square which resembles a hinge open at right angle. Three of the holes made in this square are to fasten it on the center board with screws or bolts; the other three are made large enough for the reception of leg-irons. We make three holes for the leg-irons, but, of course, only use one. The other two are made for emergency—in case you have placed the iron square too far forward or backward you can take the nut off and

WINDING BIRDS.

Fig. 1, winding the plumage of birds by means of hooked wires; hawk properly wound; Fig. 2, hawk badly wound, threads drawn too tight, spoiling the symmetry or outline; Fig. 3, shape of hooked wire (see foot-note, page 82).

shift the leg-irons into either one of these holes which will suit the position of the leg best. Even after your manikin is standing complete it is an easy matter to change the position of the leg forward or backward by this simple device. Place one nut on the threaded end of the leg-irons, so that it will come below on the iron square, and, having adjusted the leg-iron to place, screw the nut on top firmly down on the square. Make the side of the square which is to hold the leg-irons broad enough so that the legs will be held out from the center board sufficiently far enough to make the proper thickness of the body. I shall speak more of the value of this square in the mounting of quadrupeds. For additional strength you can place blocks snugly underneath the leg-irons and fasten them on the center board and then drive staples over the leg-irons into the blocks. Tie the leg-bones to the rods with wire—copper is best. Now fasten a heavy size of annealed or copper wire on the center board for the neck support, and, after cleaning the neck vertebræ thoroughly, string it all on this neck-wire. Now form the body of tow or excelsior ; make it solid by sewing through and through with a long needle and strong twine, and model the whole in clay containing chopped tow and a thin glue liquid. Form the large muscles of the leg in a similar manner. Replace the flesh of the neck and the windpipe with a wrapping of fine tow and a coating of the clay. You will discover that you can form the muscles around the head better with clay than you can with any other substance. Do this through the opening which you have made in the back of the head and neck. The manikin at this stage is ready for the skin. The tendons and muscles of the legs to the ends of the toes should be replaced with clay and sewn up.

It will be seen from the above that all colossal birds are mounted on what we shall term the *dermoplastic* method—the skin being arranged over a clay-covered manikin, as is the case with the large and the short-haired mammals.

Legs in Raptores.—The best mounted hawks, eagles and owls I ever saw were those mounted with all the leg-bones remaining attached to one another. Take for example the illustrations in Plate XX. If you will carefully examine each one of the figures you will see at once the philosophy of the whole arrangement. By leaving the femur and tibia connected and replacing the muscles nicely with fine tow and anchoring the wire at a point where the femur is attached to the body, you can bend the leg into shape, as seen in Fig. 1. This method gives to the legs the prominence which is characteristic of those parts in the *Raptores*, or birds of prey. Should you prefer, in the usual way, to detach the bones at the knee in the rapacious birds, and yet desire to develop the femur, you can anchor the wire where the femur joins the body, draw the leg out on the wire and leave it the length of the femur inside the skin, bend at the knee-joint and fill in around the wire to make the muscles of the femur the right size. Figs. 3 and 4 of the hawk and owl with the imaginary outline of feathers will give a very clear idea how the legs and wings are placed in these birds and how the leg-wires should be inserted and bent.

More About Mounting Hawks, Owls, etc.—There appears to be as much mechanical ingenuity required in the mounting of hawks, owls, etc., as there is in the construction of the manikin for the ostrich. The following is another method of Dr. Theodore Jasper for obtaining a more life-like appearance in hawks and owls when they are to be represented in anger (Plate XXXVIII, Fig. 2) at which time the feathers of the breast, back and wings stand out loosely. When the bird has been skinned, thoroughly poisoned, and is ready for the false body, give the inside of the skin a very thick coating of potter's clay, especially along the spinal or dorsal tract of the back (Fig. 4, B, Plate VIII) and along the ventral tract of the breast or underparts (Fig. 7, A, Plate 8). Cover this clay-coating with any kind of old, thin cloth in order to keep it from adhering to the artificial body when inserted. The clay acts as a cushion in which the ends of the quills rest and when the feathers are lifted and arranged in any position, they will remain so without any other support. When a bird is to be represented in a fierce and enraged attitude, at which time the feathers stand out all over the body, there is no other method in the world better than this. It also makes a more lasting piece of work.

Stepping and Running Attitudes.—Some of the worst examples of bird-mounting are to be seen in those specimens which taxidermists attempt to pose in the act of stepping or running. Let us examine the arrangement of the legs in Figs. 4 and 5, Plate XV. If you could turn the femur (*a*) completely around like a clock-hand it would of course describe a circle. In life, however, the femur can move just so far and no farther. If you will examine the natural body after skinning the bird and move the femur as far as possible up and down you will discover that it cannot describe more than one-quarter of a circle, as seen in Fig. 4 *c* to *d* in our plate. If the bird is to make a long stride the leg that is to drop backward should be anchored very low down in the artificial body, and the one which is to come forward should be placed high up in the circle (see Figs. 4 and 5). The pose of the body has

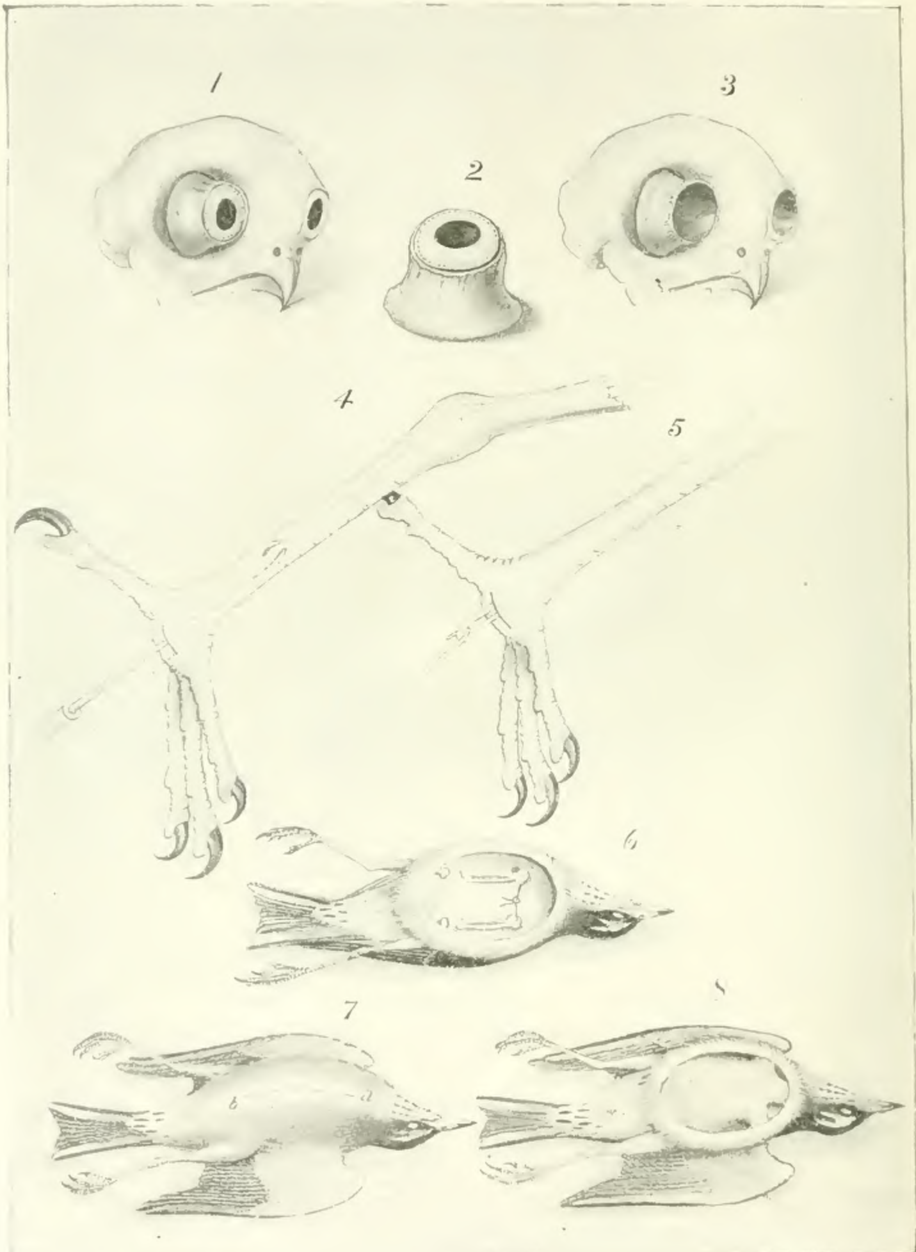

1
2
3
4
5
6
7
8
b
a

PLATE XVII.

OWLS' EYES. TENDONS IN LEGS. BREAST-CUT METHOD.

Fig. 1, represents an owl's head with eyes intact. If you take the eye-cup out to clean it inside and out (Fig. 2) be sure and place it back in the skull (Fig. 3), for it preserves the expression of the face. Most taxidermists never remove the eye-cups from the skull, but simply leave them remain in place and clean the contents out (see foot-note, page 70).

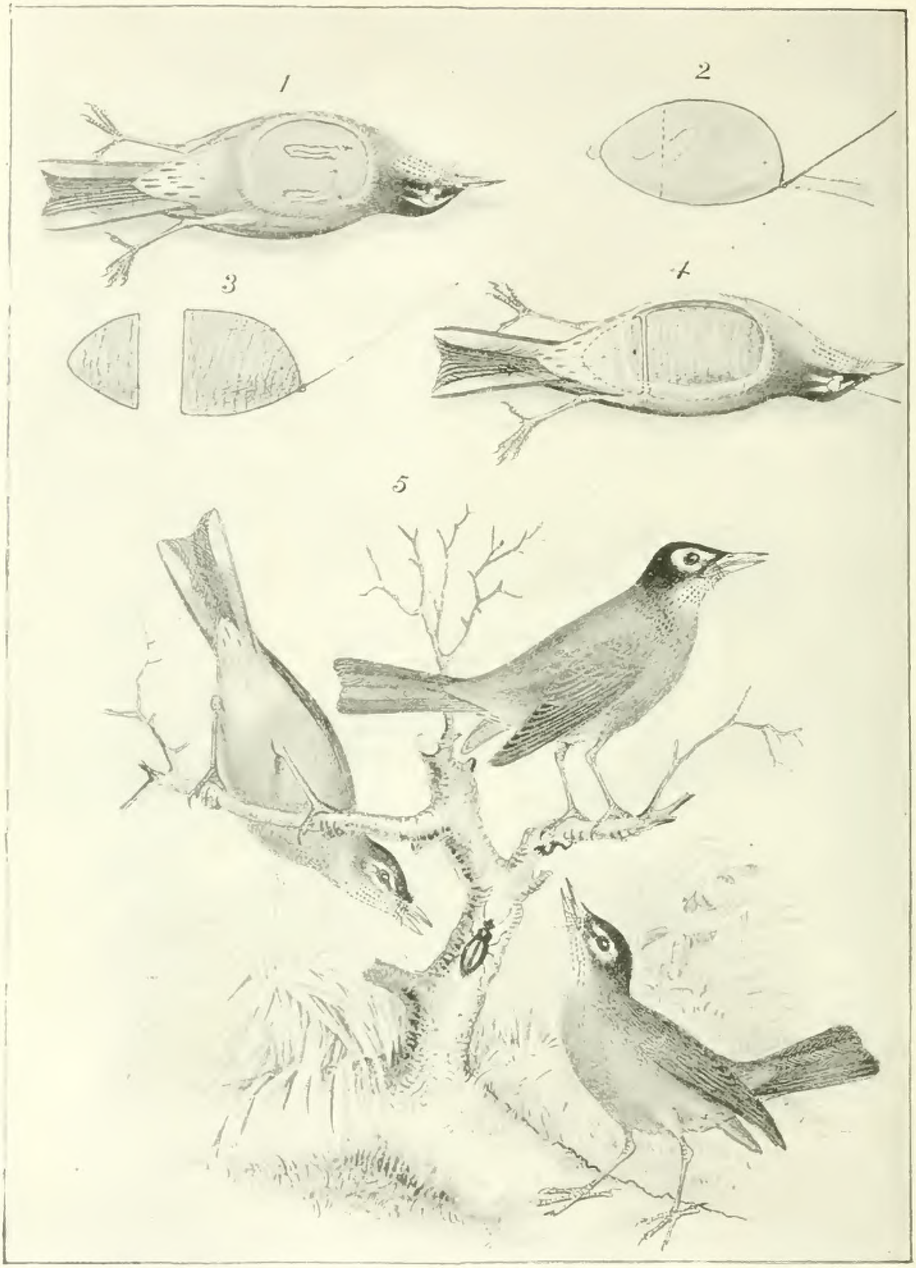
Figs. 4 and 5, illustrate a manner of taking out the tendons in the legs of large birds, by making an incision in the ball of the foot and pulling the tendons out with a hooked wire. Some take hold of the tendons with flat-nosed pliers and draw them out.

Fig. 6, shows the skin of a robin ready for mounting, prepared by the breast-cut method; Fig. 7, first incision in the breast-cut procedure; Fig. 8, skin loosened, neck and wings ready to be severed in the breast-cut process (see *Another Method of Mounting Birds*, page 82).

a great deal to do with the natural attitude of the bird arranged in this position. If you are to place the bird in a running attitude, with the toes of one foot barely touching the ground, sharpen both ends of the wire which is to support the leg whose toes are thus to be adjusted. Instead of forcing it up through the sole, pass the wire on the inside of the skin of the leg clear to the end of the middle toe, as seen in Fig. 5. When the bird is fastened on a stand, no wire leg-supports are visible. This is also illustrated in Plate XLI.

While this automatic principle is found in all birds, it is more noticeable in long-legged ones, and by the application of these principles, formed on the basis of the natural structure, any attitude or angle can be obtained; whether the bird is gracefully stooping to drink or running with outstretched legs. The same principle can be applied to all the smaller birds. For example, the little warbler with one foot on the top of a slanting twig and the other farther down the branch can, with this method, be produced with most gratifying results. It is far better than any of the methods which I have seen, for there is no guess-work about it.

Hummingbirds.—These diminutive creatures really require no other treatment in skinning than that given for the robin in this chapter, and illustrated in Plate X. There is, however, so little flesh in the wings of a hummingbird that many taxidermists consider it unnecessary to skin the wing farther than the full length of the humerus, or upper arm bone. At this point the wings should be well poisoned with the arsenical paste (see formula, page 34). The false body should be made exactly as described for the robin and as illustrated in Plate XIII. If the wings are to be spread a small wire should be run through each wing into the body for support. The tail should be spread with strips of thin card-board as seen in Plate XV, Fig. 3. The bird should be placed in a bed of clean sheet cotton and the feathers of the wings and tail spread and nicely adjusted. Groups of these tiny birds may be mounted with the wings spread, or in various other attitudes. A pair may be mounted, one hovering over a flower or just approaching the nest, while the other, male or female, may be arranged in a quiet, sitting posture near the nest. The wire which supports the hummingbird when flying is usually anchored in the body and brought out immediately under the tail; when in a sitting attitude the supporting wire is allowed to come farther forward in the body, the feet being arranged on each side on the perch while the wire is hidden with a small piece of moss or lichen. The accessories in the way of leaves, branches, etc., for groups of hummingbirds should be natural and ele-



BREAST-CUT METHOD OF MOUNTING BIRDS.

Fig. 1. skin of robin ready for reception of artificial body; Fig. 2, taking measurement of the natural carcass lengthwise with wire; Fig. 3, showing the front three-quarters section of the artificial body and how made, and also the one-third abdominal portion.

Fig. 4, the three-quarters and abdominal sections of the artificial body in place in the skin.

Fig. 5, robin group in various attitudes.

gant, corresponding with the gorgeous colors of the birds themselves. The best work I ever saw done in hummingbirds was where the legs were wired with small wire as is done in the larger birds. These were in sitting attitudes, the heads being turned, wings slightly raised, tail spread and other characteristic arrangements were made to diversify their postures.

Painting Discolored Parts of Birds.—Soon after a bird has been mounted (and likewise in making up skins) the colors of the feet, legs, beak and bare places about the head begin to fade, and finally disappear. They must be restored by artificial colors, tube paints being the best for this purpose. The paints should be squeezed out on the palette and *thinned with turpentine only*, so that the paint will not have a varnished appearance, for very few birds, except in wet conditions, have a glossy texture to the parts which should be painted.

In coloring the soft, spongy feet of an eagle or hawk, or the caruncular head of a vulture, the paint should be put on by *stippling*, not by strokes. Cut the bristles of the brush off square in the middle so that it will have a flat or stubby end; with this put the paint on by dotting, covering the surface wherever coloring is required, being careful not to lay the pigment on so thick that the divisions of the scutella and the tubercular processes will be invisible.

The best time to paint the discolored parts of a bird is, just as soon as it has been mounted—before the colors have faded, if possible. You can paint over these at this time, and even if you are a trifle color-blind you can be sure of approaching near the correct tint. The colors used in obtaining the various tints are given on page 52. If you intend to wait until the specimen is dry before painting, you will have to make a color sketch of the parts before they have faded, or depend upon your memory which, for the beginner, is a hazardous thing to do, unless the bird is a familiar one.

If you have mended a broken bill or scutellum with papier-maché give the maché a coating of either white or French *shellac varnish* to form a non-absorbent surface for the paint to lay upon. Papier-maché will absorb several coats of paint which will change its texture and, as the painted surface should be uniform, the use of shellac as a body is apparent. For the uses of various kinds of varnishes see page 53.

Combs, Wattles, Etc.—The combs and wattles of fowls may be reproduced with sheet lead covered with papier-maché. Cut the comb neatly from the head, lay it on a piece of sheet lead or copper; cut a piece out the exact pattern of the comb and cover it with papier-maché to the proper thickness and form. Replace the comb on the head with maché, which will stick fast if carefully done.

The wattles, if large, may be made in the same manner; if small, can be formed with papier-maché alone, or upon thin card-board. The coloring should be laid upon a body of shellac as directed for painting other discolored parts.

To Imitate Blood.—Blood or flesh wounds may be imitated by thickly painting on vermilion and red lead mixed with varnish. Torn flesh, fresh blood and coagulated blood differ in tint, and they are best obtained by modeling the parts in wax colors to suit the tint, which is either vermilion, madder brown or madder lake, blended with one or the other. Should you represent a vulture tearing open a sheep you may reproduce the liver, wind-pipe and other organs by modeling them in papier-maché and covering them with colored wax of the proper tint.

Mending Broken Bones.—It very frequently happens that in shooting birds and quadrupeds some of the bones are broken—so badly too sometimes that they must be substituted entirely by artificial ones. Ordinarily, however, they can be neatly mended, and where you depend upon the length of the bone to obtain the exact length of the leg, etc., it is of the utmost importance, and the same may be said in preserving the shape of the head. The manner of mending bones is well illustrated in Plate XXIV. When a skull is badly cracked, stitch the broken sections together with strong thread, as seen in Figs. 1 and 2. Fill the cavity of the skull with fine tow, which will answer as a cushion for the broken pieces to rest on. If one-half of the skull is so badly crushed that it is impossible to mend it, then make that portion of tow, as represented in Fig. 3. When the leg-bone is broken, splice it by inserting a piece of wood into the bones and bind it around firmly with strong thread or light copper wire (Figs. 4 and 5). If the upper portion of the tibia is completely gone, take a piece of wire of the proper thickness and length, and, with your round-nosed pliers, turn a loop on one end, insert the other into the portion of the bone remaining and wrap it strongly with thread or very light wire (see Fig. 6). A similar construction is used in mending broken wing-bones (Figs. 7 and 8), and also the beak, as in Fig. 9. If the bill is entirely gone, build it out with papier-maché and paint it as directed on page 103.

CHAPTER V.

THE MAKING UP OF BIRDS' SKINS.

What is technically known to ornithologists and taxidermists as a "bird skin" is one constructed more or less artificially to conform to the general shape of the actual dead bird. It is intended for *scientific study*, because a mounted bird is not so easily handled, and a collection of them ordinarily occupies too much space. The shapes into which these skins are made all depend upon the structural peculiarities of the specimen in hand.

To make up a clean, shapely, well-prepared bird skin requires considerable experience and practice. Facility and speed will come with both. I have already described in detail the manner in which a bird should be skinned.

In these directions we shall again take up the robin as our example and skin it exactly as I have directed in Chapter IV, and, if it be any other species much larger, you will, as before, refer to the footnotes in case there be any variations or exceptions to the general rule. as for instance, skinning the heads of woodpeckers, ducks, skinning the wing by an opening cut along the underside of the wing in large birds, etc. Do not fail to take full measurements, ascertain the sex, etc., before beginning as before recommended.

Having skinned the specimen it lies before you exactly as you see it in Plate XIII, Fig. 1, ready for the filling. Some taxidermists fill the neck with tow (Plate XIX, Figs. 1 and 2) before turning the skin back. I prefer always to fill the neck after the skin has been returned over the skull. Poison the entire skin thoroughly. Make a roll of fine tow the thickness of the natural neck and longer than the entire neck and body; insert one end of this into the cavity of the skull and let the other extend as far as the tail. Many do not allow the neck roll to extend farther down than shown in Figs. 3 and 4, Plate XIX. The wing-bones in very small birds need not be wrapped with cotton. In all cases the leg-bones should have a wrapping of cotton or fine tow; for the small ones cotton will do; but tow should be used in the large ones. Cotton will answer for the body-filling in the small birds, but

PLATE XIX.

VARIATIONS AND EXCEPTIONS IN SKINNING BIRDS.

The first four figures in this plate must not be considered as "exceptions" to the general rule for skinning birds.

In the shape that Figs. 1 to 4 appear they are prepared for what is technically called "skins," in this way, that the neck-filling is inserted in the cavity of the skull before returning the skin over the skull to its proper place. I believe it is by far the best method, however, to insert the neck-filling after the skin has been returned over the skull.

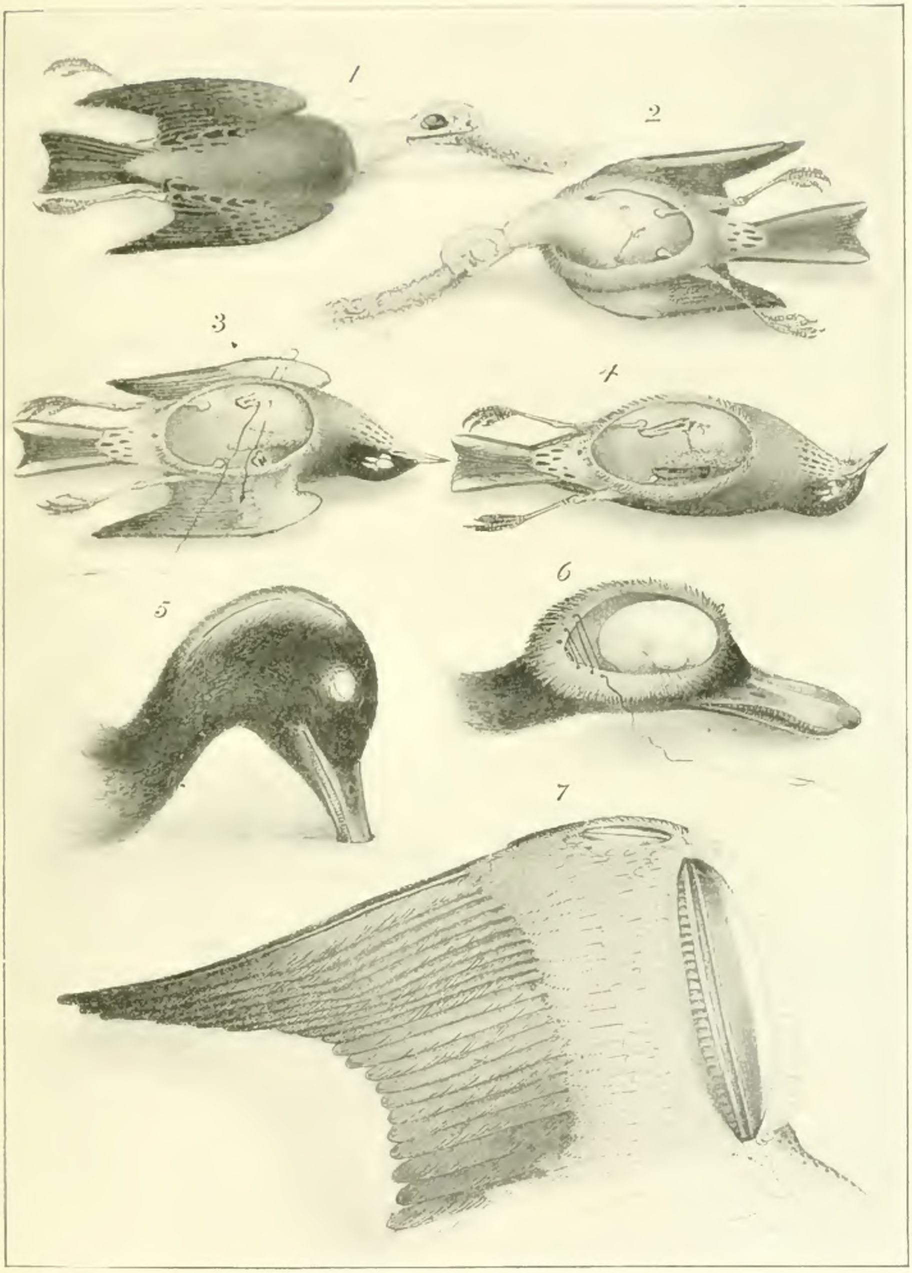
Fig. 3, fastening the wing to the skin by sewing through the bare spot in the side of the skin, through the lower joint of the phalanges and back again through the skin, tying it fast on the inside. See foot-note, page 77.

The neck-filling in Figs. 3 and 4 is placed in the necks of birds in this shape when they are to be made up into skins.

Fig. 5, incision in the head of a duck for the purpose of skinning it. This must be done in all birds whose skulls will not pass through the skin of the neck, such as the heads of the woodpeckers, ducks, geese, swan, flamingos, cranes, ostrich, etc.

Fig. 6, sewing up the opening in the head. See foot-note, page 70.

Fig. 7, showing how to skin the wing from the outside, by making a cut underneath from the elbow to the carpal joint Take out the muscles and tendons without detaching the secondaries from the ulna. In large birds the flesh between the metacarpal bones should be removed in the same manner. See foot-note, page 70.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tow is the thing to use in the larger ones. This should be made in one mass, rather firmly moulded into something like the shape of the bird's body or trunk, but rather less in bulk. Insert this into the skin until it fits nicely, bring the edges of the incision together and the skin is about completed. In some cases the opening is held together by taking one or two stitches with a needle and thread.

The usual fault of beginners is in using too much stuffing, thus making the skin to "bulge out" in the wrong places, especially between the shoulders and along the neck. Never make the neck of a skin too long. The specimen is usually meant to lie on its back with the head drawn down near the body. It only remains to "set" the specimen in a shapely manner by folding the wings neatly, adjusting the head and neck, bringing the legs together and crossing them. The throat of the bird should be filled with cotton and the skin can now be labeled and placed in a drying-board.

These are found very useful in forming or moulding the shape of the skin. They are made by gluing or tacking pieces of thin wood of the same size on a board, equal distances apart. Pieces of *heavy* paper are fitted between the cross-boards and glued or tacked in position, so as to form semi-cylindrical grooves (Plate XXV, Figs. 1 and 2). Tin or zinc can be used for making drying-boards for large birds. The old-fashioned paper cone, in which you thrust the bird head foremost, pinning the cone on the wall while the bird is drying, is an excellent method in some cases. All birds with crests should have the head turned slightly to one side and their crests raised. This is illustrated in Plate XXVII, Figs. 1 and 2.

Ducks, herons, geese and all other long-necked birds should, when placed to dry, rest upon the breast with the head and neck placed upon the back. The feet of the long-legged waders should be placed underneath the breast. This is beautifully illustrated in Plate XXVII, Figs. 3, 5 and 6, in skins of the Great Blue Heron, Avocet and Marbled Godwit. In Fig. 4 of the same plate we have an illustration of the skin of the Hooded Merganser, which has just as long a neck as some of the ducks. When preparing a long-necked skin in this manner always wrap tow to the natural thickness of the neck around a piece of wire, anchor it in the skull cavity and form the body-filling around it. All long-necked birds should be treated in this manner, no matter how you place the neck. It will often prevent them from becoming broken off. The opening in all large skins should be neatly sewn up. All skins prepared for the cabinet and all specimens mounted should have a label attached to the legs giving the species, sex, locality, date of collection, etc. In many adult birds the sex can be determined by the color of the plumage. In most cases the body should be examined to make sure of the sex of the specimen. The testes of the male and the ovaries of the female lie in the same position in the small of the back, close to the kidneys, and may easily be reached by cutting through the wall of the abdomen on one side and pushing the intestines out of the way. The testes of the male are a pair of yellowish bodies lying close together (Plate XXVIII, Fig. 2). The ovary is a mass of small spheres (Plate XXVIII, Fig. 1). In the breeding season both these organs are subject to such enlargement that they become very conspicuous, and differ so much in appearance that they cannot be mistaken. At other seasons of the year they can only be recognized upon close examination. The male is denoted by the sign of Mars (♂), the female by the sign of Venus (♀), or the right leg is crossed over the left to indicate the male, and the left over the right to denote the female.

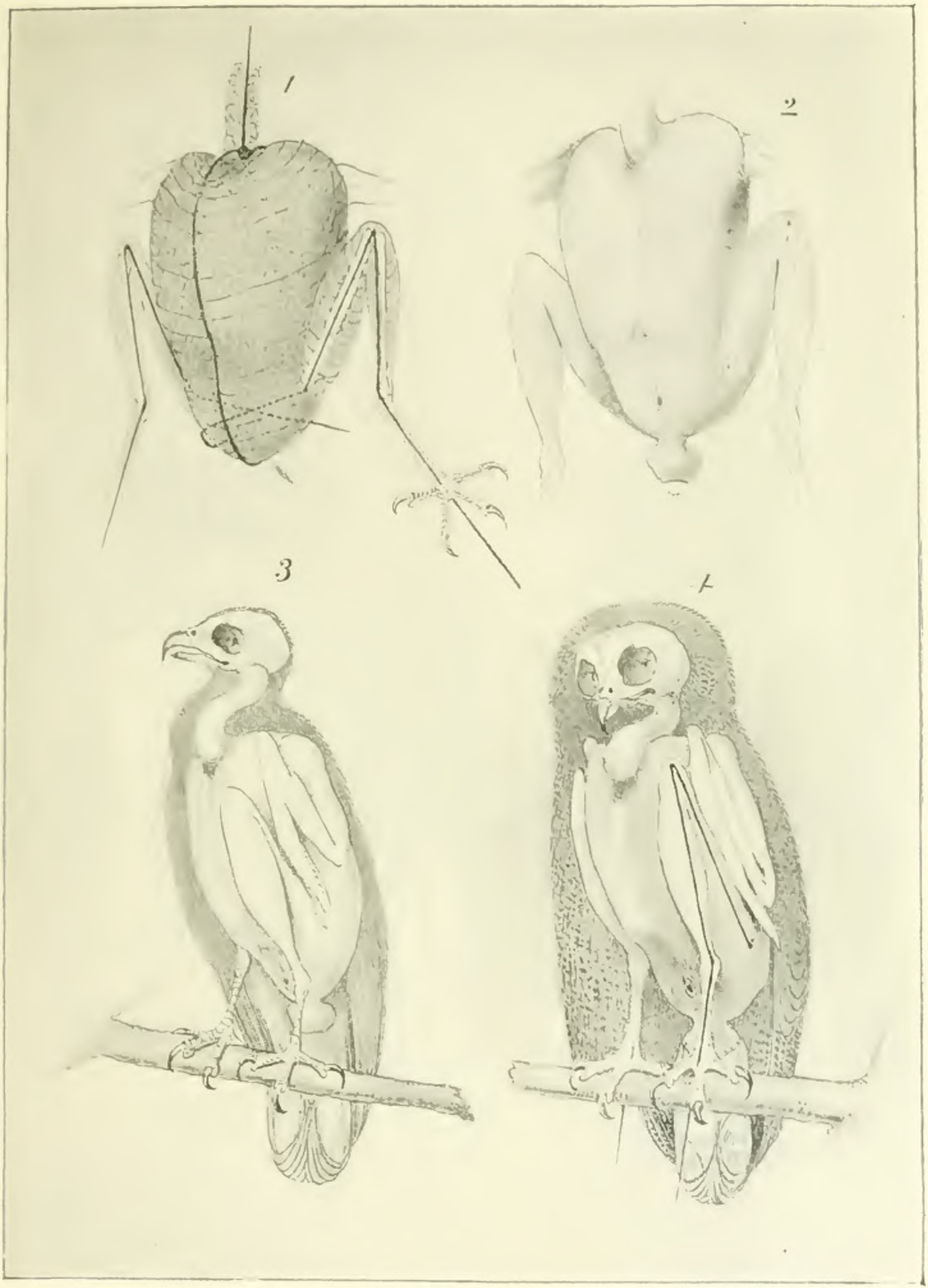
The best method in the world for laying skins away in the cabinet is to wrap them in sheet cotton batting, allowing the label to be seen when placed in the cabinet drawer (see Figs. 1 and 2, Plate XXVI). When collecting in the field in remote regions you may fill the body of the skin with leaves, dry grass or paper, when tow or cotton cannot be obtained, but never with wool or hair.

It is essential for the preservation of skins to use nothing for the filling that can be attacked by insects.

Some years ago I very nearly ruined my reputation as a taxidermist by attempting to mount five hundred bird skins, from the Holy Land, which were filled with old woolen clothing of the Arabs and the hair of quadrupeds. Upon these the moths had feasted and become fat and robust. The skins and feathers had next received their attention. The havoc they wrought is indescribable.

One evening after a desperate struggle with the hundredth specimen of these bunches of hides and feathers I was indulging in reveries of stern realities—how patience will sometimes pause—how ingenuity will stagger when invention fails—how time as well as love's labor is sometimes lost.

I sat in my study till the last slanting sunbeams were gilding the walls—till the objects before me became indistinct in the twilight, and in fancy saw Job in one corner of my workshop smiling at my impatience, and heard Shakespeare by his side whispering, "What fools these mortals be!"



LEGS AND WINGS IN RAPTORES.

Fig. 2, represents the natural body of a hawk with the legs attached as in life. The end of the humerus is also intact.

Fig. 1 shows exactly how the legs should be made in hawks and owls by leaving the thigh bone attached to the tibia.

Figs. 3 and 4 illustrate clearly the muscular system in hawks and owls, exact position of the legs and wings and how these members should be arranged in the mounted specimens.

CHAPTER VI.

CLEANING BIRDS' FEATHERS; RELAXING SKINS.

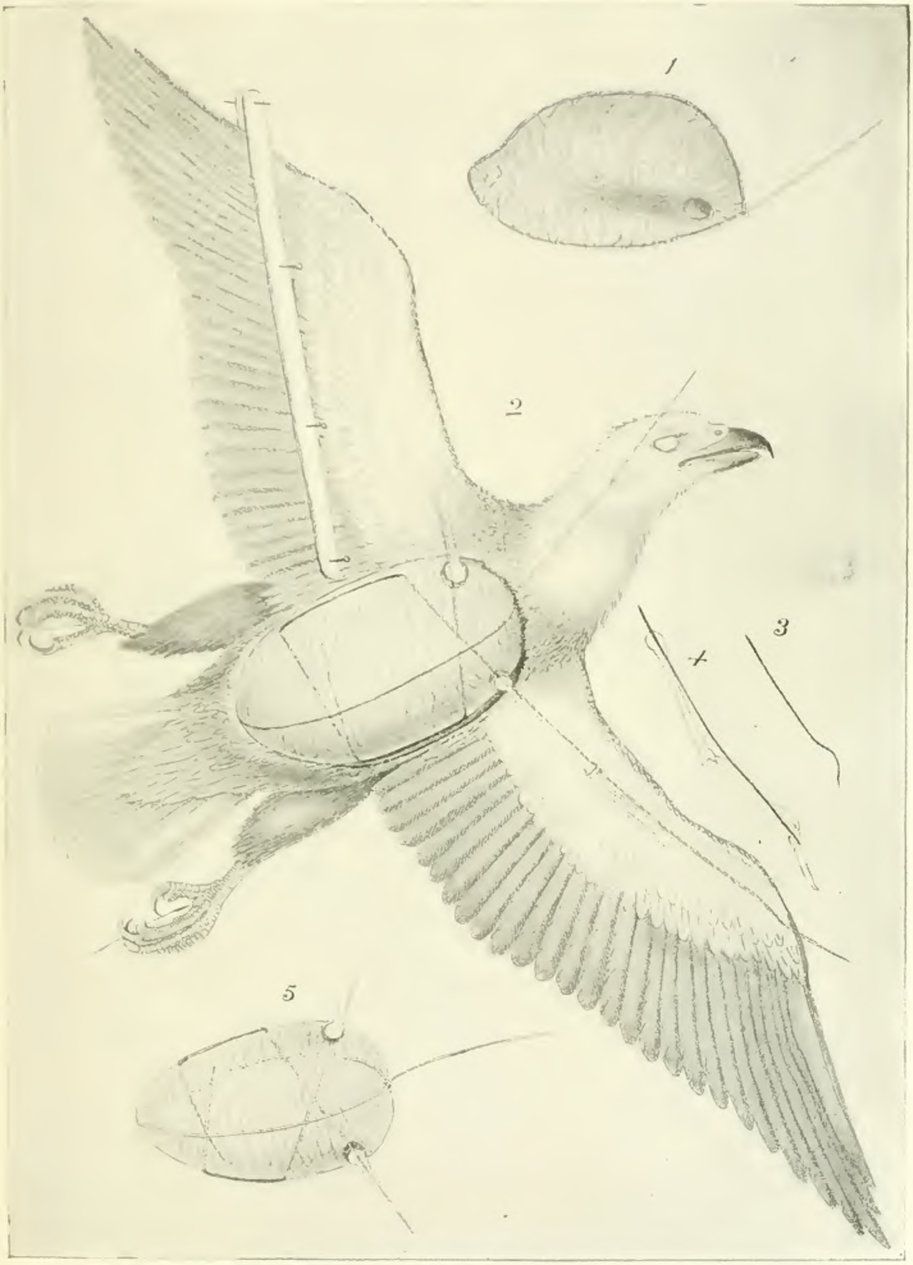
Cleaning Birds' Feathers.—To remove grease and blood stains from the plumage of birds is a simple matter when once understood; the chief requisites being spirits of turpentine, plaster of Paris, patience and perseverance. For our example we will take an old duck skin, the plumage of which has, in many places turned a rusty yellow from the grease that has come out through the openings and shot-holes. It is one of those skins which, instead of being thoroughly treated in the first place, was, by the carelessness of some one, allowed to go imperfectly cleaned. This skin is several years old, the grease has penetrated every quill, and the feathers are matted, making it a difficult subject to clean. It is, in fact, often impossible to effectually efface grease stains from skins of this description. We will first relax the skin as directed below and then proceed with the cleaning. With a soft sponge saturated with turpentine wash the feathers carefully, rubbing with the grain, lifting them when necessary to get at their base. Use pressure when required. Continue this course of treatment until the stains are removed. The turpentine will cut and dissolve the greasy substances. It is a good idea to first wet the sponge with warm water before soaking it with turpentine. Now get out your plaster box, spread the bird out and completely cover it with plaster of Paris and allow the skin to remain covered until the plaster has absorbed the turpentine. When this is done take the skin out and shake it several times. Now whip the skin with a slender rattan or stick to get the plaster out of the feathers, dressing and arranging them with your fingers. Cover it again with more clean plaster and again take it out and work with the plumage until it obtains its natural fluffy appearance. It is best to perform the cleansing operation where there is a current of air, and the specimen should be beaten and brushed until every particle of plaster disappeared. If not thoroughly beaten out it will fall on the pedestal when the specimen is thoroughly dry. Upon a very old greasy skin this entire operation must sometimes be performed *three* or *four* times before the grease stains will totally disappear, and frequently then, after all our painstaking and labor we are compelled to give it up in disgust. The time to take out blood stains and grease is when the skin is fresh. Never, upon any consideration allow a bird skin or a mounted specimen to leave your hands with a thick coat of fat on the inside and blood stains on the feathers. While skinning fat birds use plenty of corn meal and plaster, scrape the fat all loose and allow the plaster and meal to absorb it. Scrape it again and again, put in more clean meal and plaster until every vestige of fat has disappeared. Use the home-made scraper described on page 16. If the feathers are soiled with grease and stained with blood treat them with turpentine and dry them as above directed with plaster. Do not allow a specimen to leave your hands without being thoroughly and properly cleaned. I have removed grease from the inside of very fat skins by an application of hot sand and plaster—using the white sand and applying it abundantly in the same manner described for the meal and plaster. When blood is hard dried upon feathers it is almost impossible to efface it. When it is a bad case we frequently have to pull the feathers out that are stained and replace them with others from the same bird. I have removed old stains from feathers with very satisfactory results in the following manner: Take a quantity of water and alcohol—about half of each; wash the stained parts with this and then apply a thin paste of corn-starch to them and allow it to remain there until dry.

The best time to clean the feathers of a bird that is to be mounted is just before it is placed upon its perch.

Relaxing Bird Skins.—There are many ways in which a dry bird skin may be relaxed and made ready to mount, and nearly every taxidermist has his own method. I consider the following method the simplest, easiest and most effective:

The skin should be opened and the entire filling removed. Tear some cotton cloth into strips from an inch to two inches in width, wet them thoroughly in warm water and wrap them around the leg and foot until they are covered with several thicknesses of the wet cloth. Lift up the wing and put two or three thicknesses of wet cloth around the joint, and also between the wing and body. Put some wet rags inside the skin, wrap the whole skin completely in several thicknesses of wet cloth and lay the skin aside. If the bird is not larger than a robin, the skin will be soft enough to mount in about twelve or fourteen hours.

It is necessary to place all birds above the size of the robin under the head of *large birds*, for the reason that the legs, being large and thick in comparison with the skin of the body, require longer treatment. The legs of some birds require several days' soaking, and were the skin



BIRDS WITH SPREAD WINGS.

Fig. 1, the artificial body of an eagle, with the characteristic coracoid socket, in which the end of the humerus should rest in all birds mounted with spread wings.

Figs. 2, 4 and 5 illustrate the whole system of wiring the bones of the wing, anchoring the wing wires in the artificial body, etc. See page 84.

of the body relaxed for the same length of time it would macerate and the feathers would come out. The legs of large birds must, therefore, be started first in the relaxing process.

Take, for example, the skin of a pheasant: wrap the feet and legs with wet cloths as described above, and let the skin lie without other wrapping for one day. At the end of this time the joints can be bent somewhat, and they should be manipulated until they bend easily. When this can be done, put wet cloths around the joints of the wings—in the body, neck and head, and wrap the whole skin in a wet cloth. At the end of the second day the entire skin will be soft. The next step is to scrape all the hard parts of the skin and manipulate it until it is as pliable as when fresh.

This process applies, with slight modifications, to all large bird skins, but the larger the bird, the longer it will take to relax. Sometimes the wings require soaking half as long as the legs in a very large bird. By the above process, skins may be softened and made ready to mount according to their size, about as follows: Wren to robin, in twelve to fourteen hours; ruffed grouse, two days; great blue heron, three days; bald eagle, four days; skins which are but a few months old will soften in about half the time they would require were they five years old.

There is a mistaken idea among many taxidermists that to soften a skin is all that is necessary. There is a wide difference between softening a skin and relaxing it. The smallest and thinnest skins must be worked and manipulated with the fingers if not with the scraper until they are perfectly relaxed or pliable. The fibers of the skin which have become contracted in drying must be stretched to their natural proportions. This requires a tedious amount of manipulation, involving the utmost patience and care. If you will carefully study Plate VIII, you will discover where the patches of feathers grow. It is on these tracts the scraper should be vigorously used until the feathers become movable at their base, and until all parts of the skin become as pliable as when it was taken from the carcass.

When we come in contact with old dry skins of such birds as the pelican, swan, eagle, etc., we must use the toothed scraper vigorously in order to cut the fibre and make the skin perfectly pliable. It means constant hard work for any man to mount dry skins.

The quality of the skin however has a great deal to do with the success attained in its mounting. With a *good* skin—and, I mean one made by a taxidermist who knows what a good skin is—there is little difficulty in obtaining satisfactory results.

Another Method of Softening Skins.—Here is a most efficacious method of softening bird skins. It is the device of a French taxidermist who lived in the latter part of the last century, and it has been employed more or less ever since, especially by many of the older taxerdermists and ornithologists.

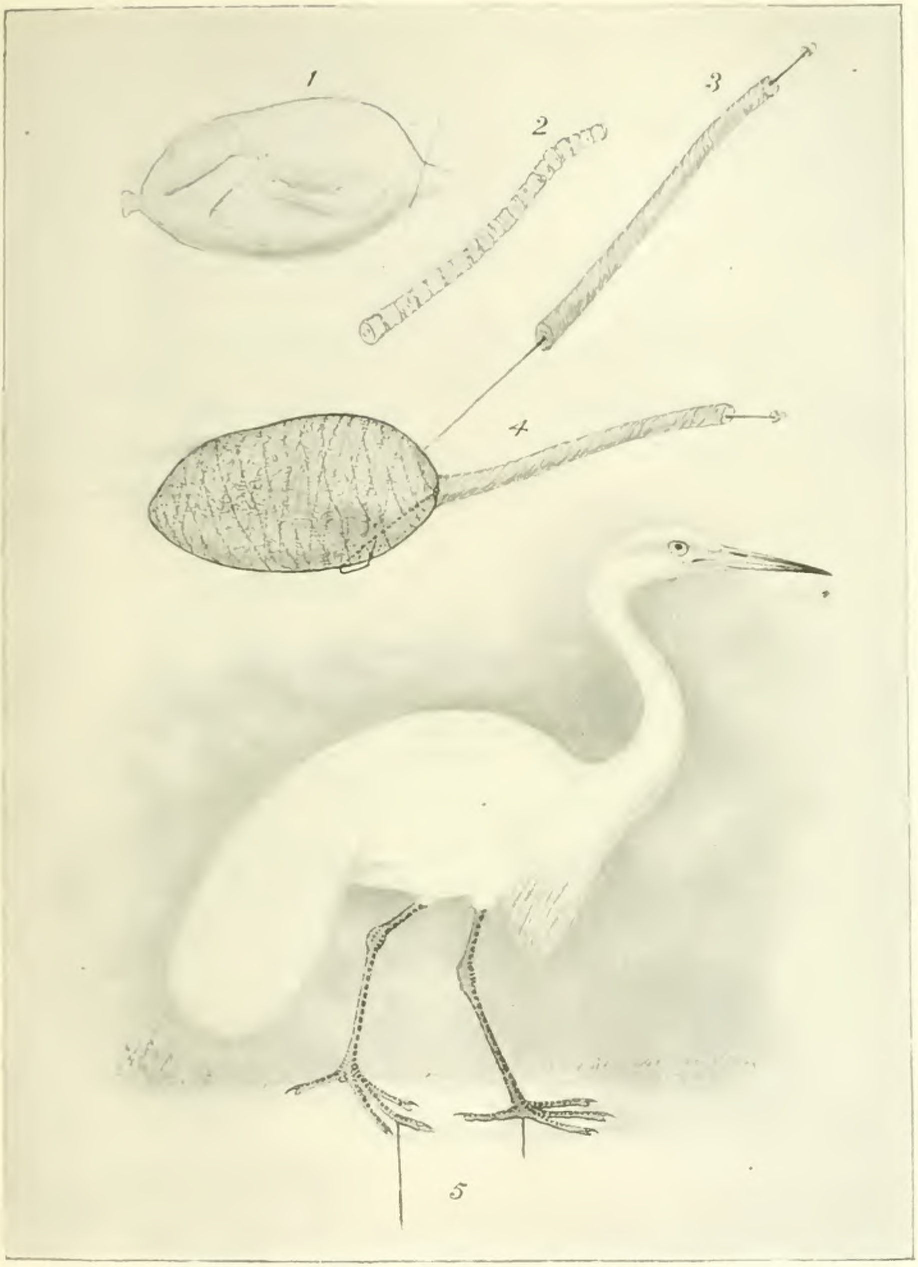
A box is made of convenient size, the top of which, without hinges and fastenings, is free to be lifted off. The sides, top and bottom within are lined with a coating of plaster of Paris, two or three inches thick. When skins are to be softened, fill the box with water, and allow it to stand until the water has been absorbed by the plaster. If the plaster does not take up all the water within twelve or fifteen hours, pour off that which remains. Take out the filling in the skins and place them in the box. The lid should be made to fit tightly in a groove cut in the plaster. It is necessary before placing the skins in the box to soften their feet and wing-joints, and some taxidermists give the entire skin the usual wrapping of wet rags before placing them within the box. It is sometimes desirable when working on fresh birds to lay them away in a half finished condition over night or for a day or two. This plaster box will be found a most excellent receptacle for the purpose of keeping the skins in a soft, pliable condition until work can be resumed on them again.

The general method pursued in mounting dry skins is, of course, the same as that practiced upon fresh specimens. Difficulty is often experienced in the placing of the soft, annealed leg-wires in position from the dry and shriveled condition of the tarsi. This may be overcome by first making a hole with the drill (Fig. 2, Plate II).

Hot Water Bath for Relaxing.—Mr. William Brewster, the ornithologist, under the title of "A New Wrinkle in Taxidermy," in Messrs. Southwick & Jencks' *Random Notes on Natural History*, Vol. II, No. 1, describes his experience with hot water for relaxing:

"Wishing to turn a mounted bird into a skin, and having but a limited time to devote to the task, I tried an experiment. Taking a funnel and inserting the pointed end in the stuffing between the edges of the skin on the abdomen, I poured in a quantity of hot water (nearly boiling hot), taking care to regulate the injection so that it should be rather slowly absorbed by the stuffing, and holding the bird at various angles, that every portion of the interior might become soaked. The effect was magical; the skin quickly relaxed, and within fifteen minutes I could bend the neck and make other required changes without any risk of a break.

"My first experiment was with a gull; afterward I tried other



LONG-NECKED BIRDS.

Fig. 1, natural body, showing where to sever the cervical vertebræ from the body; Fig. 2, neck vertebræ stripped of its flesh; Fig. 3, cervical vertebræ with neck-wire run through it and wrapped with fine tow to replace the flesh. Cork on end to keep point of wire from catching in skin while the artificial neck is being inserted in skin; Fig. 4, artificial neck anchored in artificial body. See page 87.

Fig. 5, European Great White Egret, *Herodias alba*.

birds, both large and small, with equal success. I found also that the plan worked equally well with skins which had been overstuffed or otherwise badly made. In a very few minutes they would become nearly as tractable as when freshly taken from the birds, and much more so than I have ever succeeded in making them by the use of a damping-box. The only difficulty experienced was that the water, especially if turned in too fast, would escape through shot holes and other rents in the skin, thus wetting the plumage in places. Of course after the required improvements or changes have been made the stuffing is so thoroughly saturated that the skin must be placed in a very warm place to dry. I dried mine most successfully by placing them on a furnace register and leaving them exposed to the full blast of heat for several days."

CHAPTER VII.

HINTS ON THE FORMS AND ATTITUDES OF BIRDS; ACCESSORIES; GROUPING, ETC.

Do not allow your mounted specimens to look like *stuffed* ones. Make them such marvels in symmetry of form and expressive in character of attitude that the most critical will declare that "*this is truly art* of a high order." The song or the cry of the birds and their movements may be lacking, but let every other element which enters into their structures stand out as life-like as it is in your power to make them.

Some are intuitively gifted in this line of work, others can approach near to the ideal only after long years of patient study and experience. But, in the beginning, do the best you can. Among your first efforts may be found specimens which will have the imprint of extraordinary ability.

Of all the models of taxidermic skill in birds and mammals, the productions of my venerable teacher, Dr. Theodore Jasper, surpass anything of their kind I have ever seen. They possess the same grace, ease and elegance which are portrayed in the illustrations of this work, and they fairly rival some of the examples in the plastic arts. His mounted specimens, while not great in number, will stand as monuments to his inimitable genius.

The study of the birds in life is the only true way to obtain a knowledge of their forms and attitudes. The field-glass or opera-glass must often be employed in making these observations. In all mounted specimens one of the chief beauties is symmetry of outline. No harsh lines should appear in your work. If you will critically observe the forms of even the most grotesque looking birds you will discover in them lines of grace and beauty. Give to every bird with running or stepping movements the ease of posture and the tilt of body which will correspond to the action you intend to represent. See to it that the legs do not come abruptly out from a wrong place in the body and throw the bird out of its equilibrium and disarrange the feathers at

PLATE XXIII.

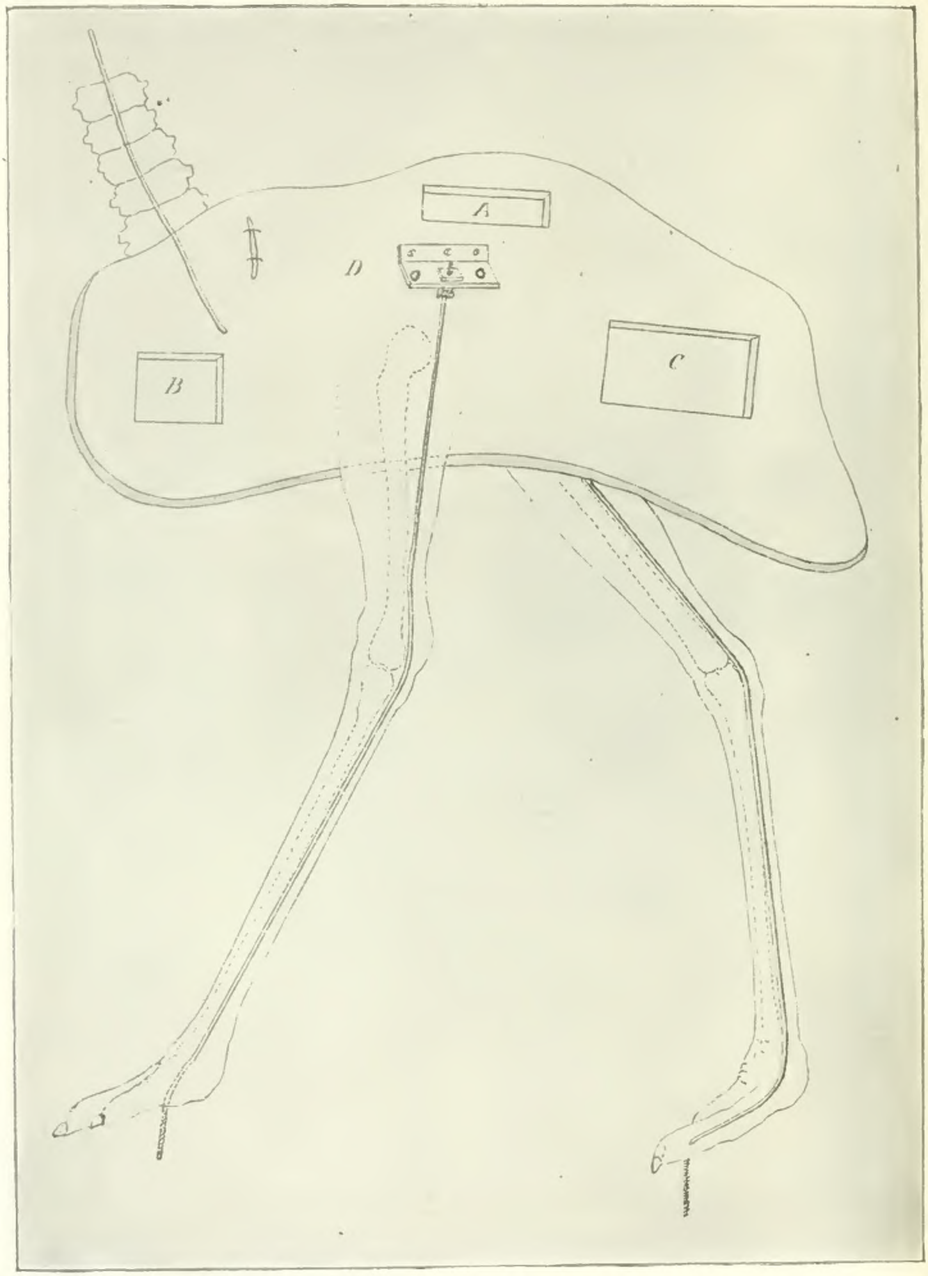


PLATE XXIII.

MOUNTING COLOSSAL BIRDS—THE OSTRICH.

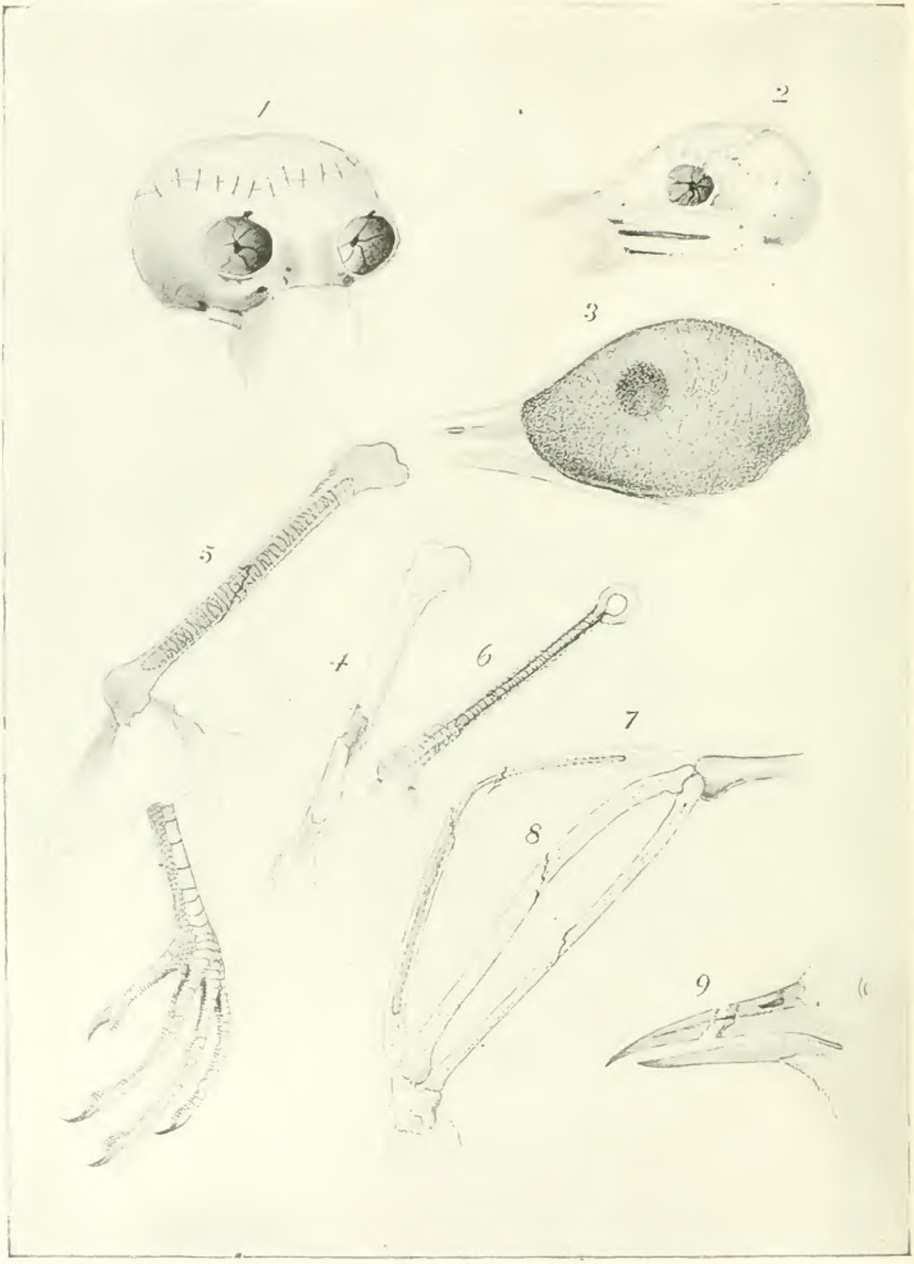
This plate illustrates the whole ground-work on which to build an ostrich manikin. The outline of its curiously shaped trunk was taken from the actual carcass after skinning. A, B, C are square holes cut in the center-board for the purpose of sewing through and through the tow which is laid on to build out the body which is afterward coated with clay. D is the iron square which is made like a hinge open at right angle; three holes are drilled in one side of it for the purpose of fastening it to the center-board and three are made for the leg-irons; one of these only is used, two being in readiness in case the leg happens to be placed too far forward or backward it can easily be changed, even when the manikin is finished. See page 91.

that point. Observe how gracefully and symmetrically the legs of all birds come from the body, and how beautifully the feathers form around the thigh. Do not allow the heels of your birds to be spread as far apart as their feet. If your specimen is to assume a stepping or running attitude, read carefully what has been said on this subject on page 96, and study Figs. 4 and 5, Plate XV. How often do we see the postures of mounted birds distorted—herons and rails stepping off like ducks—sandpipers, snipe, tell-tail and plover, running or stooping to drink and catching at aquatic insects in the most unnatural postures, entirely contrary to the anatomy of the birds; which, in nature, when in motion, are so graceful, and which hold that marvelous symmetry of outline so necessary to be attained before we can claim any approach to perfection in our work. The directions for *Mounting Long-necked Birds*, page 87, and illustrated in Plate XXII, will guide you in obtaining the best results in the cranes and herons and others of their character who walk by placing one foot in front of another. The ducks and geese walk pigeon-toed—hence the wabbling motion in their gait. These are beautifully illustrated in various figures of Plates XXIX, XXXI, XXXII, and XXXIII. The Canada goose, for example, in Plate XXXII, shows very clearly the natural position of the legs and feet in these birds and the gait they assume.

It has been my habit to make actual drawings of the foot-prints of sandpipers, plovers and other water birds which I happened to find in the mud at the edge of ponds, etc. This is the best way to obtain the actual distance of their strides.

In grouping and arranging a collection of mounted birds attention should, in the first place, be paid to giving each specimen a characteristic attitude, which will show to the best advantage some peculiarity in the bird's external anatomy. Many of the beauties of a bird's plumage are hidden when the wings are closed, as in the case of the male Rose-breasted Grosbeak, which has a belt of red extending across the breast and wings, and which, when the wings are closed, leaves only the rose color of the breast visible. If one goatsucker is mounted sitting lengthwise on a branch, another should be arranged with outstretched wings, mouth wide open in the act of catching an insect. One swallow-tailed kite may be placed in a quiet attitude, while another should be displayed in mid-air with a small reptile in its talons (Plate XXXVII, Fig. 3). The little wrens, chickadees, sparrows and finches, etc., may be given innumerable characteristic attitudes, some of which are figured in Plate XXXIX. There is no other class of birds which can be mounted with better effect than the cranes, herons and ibises.

PLATE XXIV.



MENDING BROKEN BONES.

Illustrating the various ways of mending bones which accidentally become broken by shot or otherwise. See page 105.

They are the embodiment of all that is graceful and beautiful in bird-life. Groups of herons can be poised in attitudes sufficiently varied to illustrate every phase in their life history. A male and female with young, for example, may be arranged about their flat nest of sticks on the trunk of a tree; on the ground one may be standing on one leg with its head resting upon its shoulders, another preening his plumes, while his neighbor is silently watching for prey in the shallow water, and another with outstretched neck, legs and wings has taken flight over the marsh of reeds and rushes.

A solitary Wood Ibis on a stump in a lonely swamp, with a painted background, is, when properly delineated, one of the most picturesque scenes the taxidermist can devise (Fig. 4, Plate XXXIII).

The hawks, figured in Plates XXXV and XXXVI, illustrate some striking attitudes of the various species. In museum groups it does well enough to arrange some of these birds in the "spread-eagle style," but for the most part they should be mounted so as to exhibit some peculiar trait or characteristic of the species. Passive attitudes are preferable for owls. Some of the best positions, however, in which I have seen these birds placed are those representing anger, similar to the Great Horned Owl when attacked by other birds (Fig. 2, Plate XXXVIII). When more fiercely enraged the feathers of his breast, wings and back stand out loosely, his head is drawn in and the bill is open in the act of snapping. The best method to obtain these results is described on page 96.

Owls with young in the hollows of trees represent a striking and picturesque scene. Groups of birds of any class, when arranged with due regard to their forms, attitudes and natural surroundings are, in themselves, intensely interesting and instructive.

The excellence of all groups is judged according to the qualities found in the following points: *Form, attitude, naturalness of colored parts, adjustment of wings, angle of legs, centre of gravity, smoothness, neatness of finish, quality and arrangement of natural or artificial surroundings.* If your conceptions of all these have the touch of the true artist and student of nature your work will be admired and studied by the most indifferent observer.

Where the design is to promote the knowledge of the peculiarities of a species there is nothing which will assist more quickly in throwing light on its life habits than to see the specimen elegantly mounted in its natural surroundings. The more elaborate and costly the flower, branch, rock or ground-work, the more impressive it will be. The work on the specimen, however, must correspond to the accessories and *vice versa*. Let your specimens be the chief objects in the group. The accessories used should not overshadow or obscure the specimen, or in any way tend to throw it into the background.

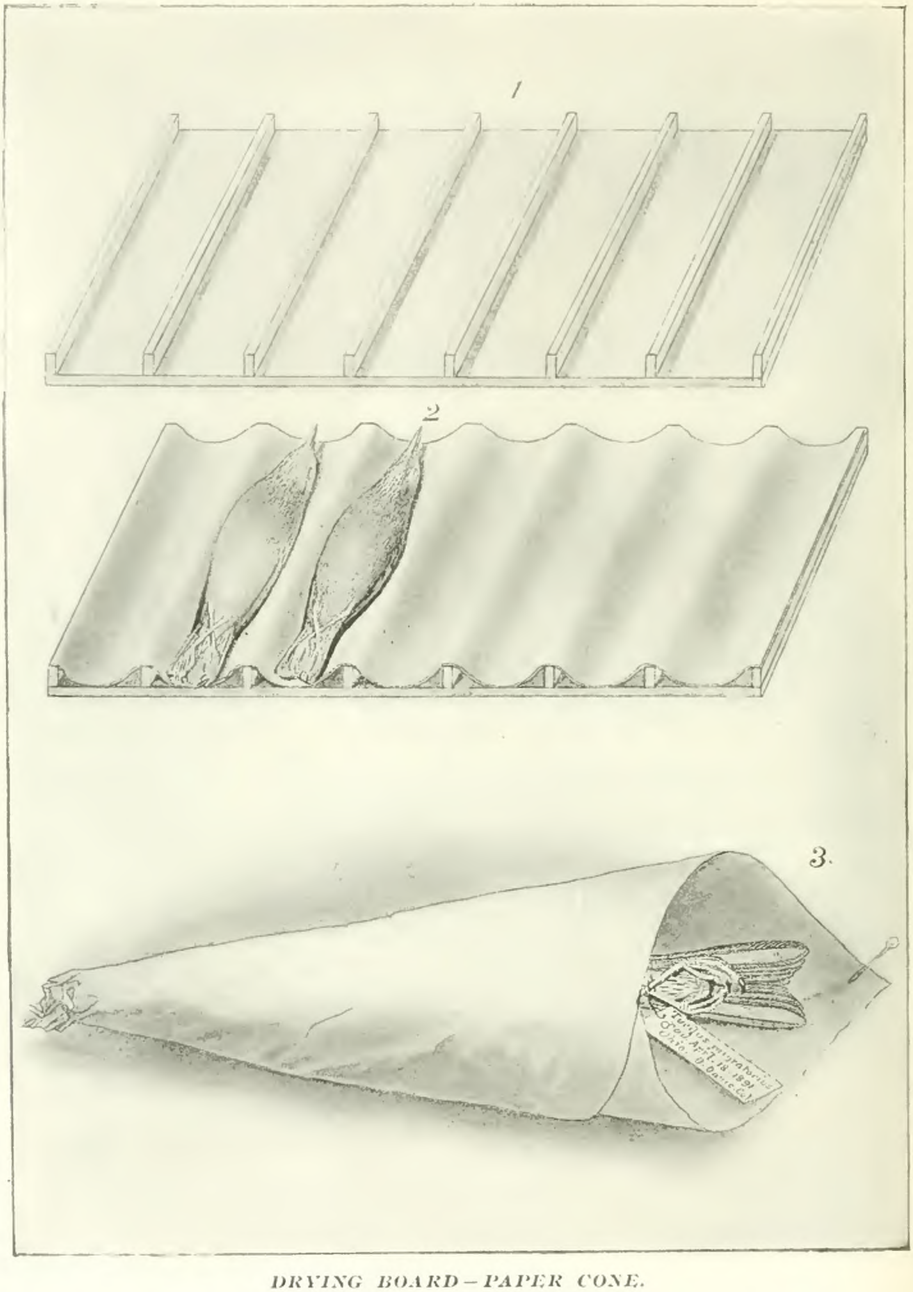
The *forms* and *attitudes* of birds figured in our Plates XXIX to XXXIX inclusive are characteristic of the species they illustrate and they exemplify the peculiarities of a number of families of the North American Avi-fauna. The actual environments of the species are also delineated. These surroundings are all of such a nature that they may be reproduced by artificial structures for single pieces or for large groups in museums. The methods of making artificial rock-work, branches, etc., are fully discussed in Chapter II.

The accessories used, in all cases, should be of good quality, and all artificial materials should be selected with the greatest care. Where the object is to imitate nature closely the more costly accessories are, by far, the best to use. Cheapness never entered into a high standard of art. It costs labor, skill and time to imitate nature and when you make artificial branches or ground-work bear this in mind. When you purchase a leaf or a flower to decorate your scenes buy the most natural and elegant that the market affords. Make your prices such that you can lavish all the time and money necessary to attain your ends—and if you have the ability it means the highest standard of art. When you imitate ice do not use common tallow and plaster of Paris, as I have seen some slovenly taxidermists do; make ice scenes with transparent paraffine, which is very cheap and can be purchased from any dealer in artists' materials. Icicles can be obtained from your dealer in naturalists' supplies. Water effects may be produced with plate glass through which the bottom of the stream or pond can be seen. In selecting glass cases for your specimens, let them be neat, and tastefully made. The most elegant cases I have seen have a light frame of ebonized wood and are placed on a table of the same material. Some of the finest groups of birds are arranged in wall cases with painted back-grounds.

Whatever you design in mounted birds, let them be so arranged that each scene will serve as an object lesson representing some phase in the life history of the species. If you are building a museum for instruction, the best way to interest and instruct is with scenes fresh from the fields of nature.

It is easy to imagine the sensation of the occasional visitor to many of our public museums, when he beholds the specimens mounted on the old-fashioned turned T-perch or flat stand. The situation can

PLATE XXV.



DRYING BOARD—PAPER CONE.

Fig. 1, board with thin strips of wood for cross pieces placed at equal distances which are covered with heavy paper, zinc or tin in a semi-cylindrical form for moulding the shape of the back of a bird skin while drying, as in Fig. 2.

The paper cone in which the old ornithologists used to dry their bird skins is as good as ever in many cases (Fig. 3).

be taken in at a glance. The innumerable rows of birds stand like columns of immovable troops and leave but one impression — that of immense numbers and their soldier-like appearance.

It is gratifying to know, however, that a number of the principal scientific museums of the world are breaking away from the old style of mounting their zoölogical specimens, and we can now look upon groups of mammals, birds, reptiles and fishes with surroundings which are illustrative of their peculiar habits. It has been proven by the groups in these museums that they are of as much interest to the scientist as they are instructive to the public. In the British Museum groups of birds are now being arranged with great care as to life-like attitudes, while the surroundings are reproduced by natural and artificial accessories; many of the artificial plants and flowers being of a rich and costly design.

No person can visit the American Museum of Natural History in New York without being greatly impressed with the high order of art infused into the bird groups arranged in that institution by Mr. Jeness Richardson. Every accessory that was necessary to make up each one of these charming woodland scenes has either been carried from the field of nature or manufactured to represent the natural abode of the species. Among the studies which struck me most favorably in this collection (and I must confess it is a mere matter of choice) were the grouping and arrangement of some of our common birds. The designs are all characteristic of the life-habits of the species they represent, while the various forms and attitudes of the birds are all that can possibly be desired. The nest has been collected on its branch with its surroundings as well as the perforated tree-trunk, the home of the woodpecker; the ground-nesting birds are at home in the tussocks of grass, as natural as art can make them. These are chiefly arranged in cases suitable to the size and design of the group. The cases are placed on neat tables; the frame-work of these and the tables are black or ebonized, giving to the whole an elegant finish.

Our National Museum at Washington contains a number of these highly interesting bird groups, all of which are most beautifully wrought. Many of them are by members of the Society of American Taxidermists. The mammal groups in this institution are the finest to be seen in this country. The most notable of these, which I shall mention in Chapter XI, are the work of Mr. William T. Hornaday, the representative American taxidermist. While his line of work has been chiefly confined to mammals he has likewise produced unexcelled examples of mounted birds. I can recall one of his efforts which has always pleased me, entitled, "Does your mother know you're out?" representing a Scarlet Ibis stalking along the bank of a tropical river; he comes suddenly upon a tiny alligator which has just emerged from its shell. Two other alligator eggs lie half buried in the sand ready to hatch. This scene is arranged in a glass case of suitable dimensions, and it has a painted background representing a picture in those tropical regions which the Scarlet Ibis inhabits.

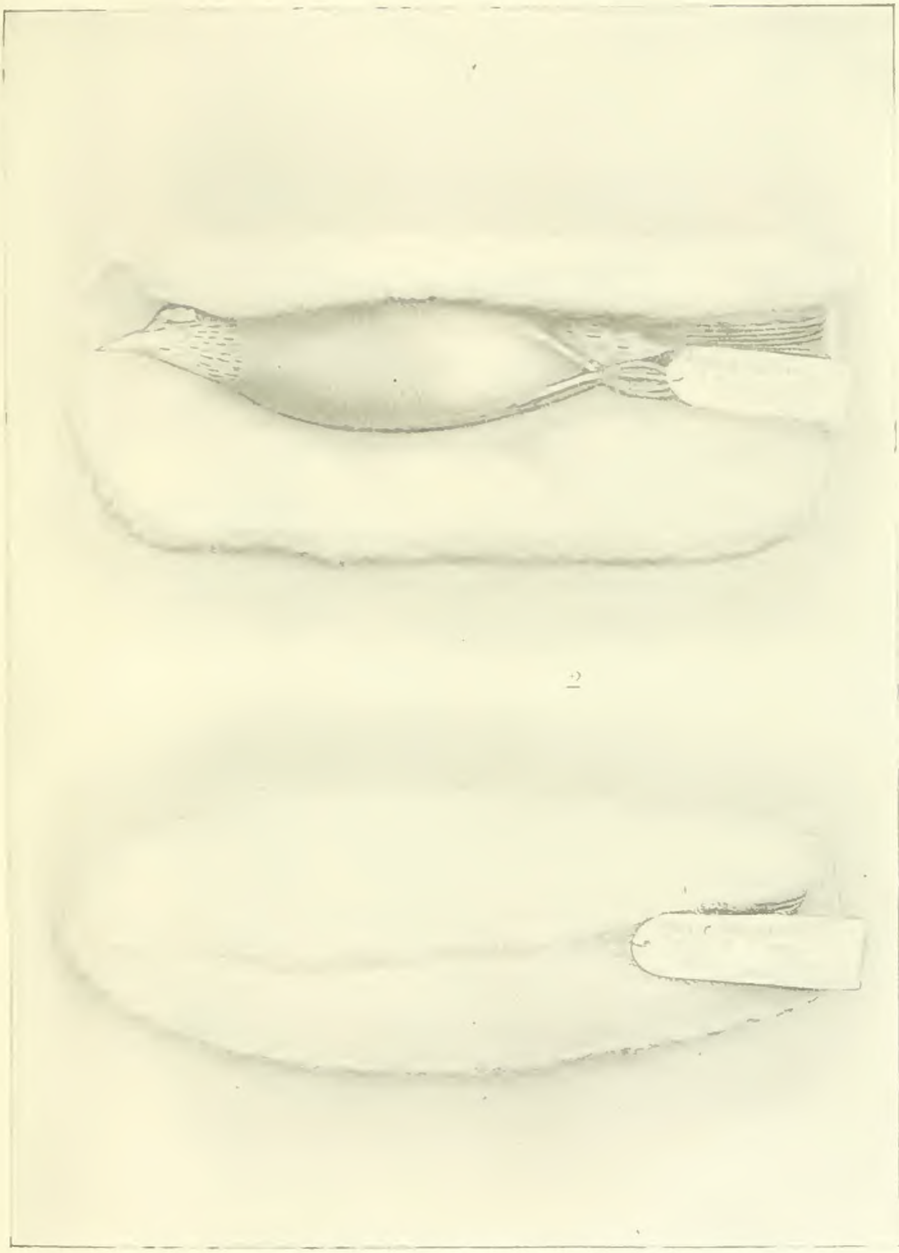
Some of the most attractive bird groups in the National Museum illustrating the peculiar habits of the species are those of the California Woodpeckers and their store-house; Swallow-tailed Kite, feeding; Carolina Paroquets, roosting; Prairie Chickens, courting; Jacanas, walking on lily pads; the curious Bower birds and their exquisitely formed play-house; the Lyre birds and the dancing mound of the male; the dove-cot with a number of species of domestic pigeons in characteristic active attitudes. These are all so charmingly and artistically wrought that the most skillful critic would almost lose his critical powers upon beholding the striking likenesses they bear to the ideal and the real.

At the second exhibition of the Society of American Taxidermists Mr. Frederic S. Webster produced his well-known group entitled "The Flamingo at Home." It is a group of three flamingos, and near the edge of a tropical lagoon a female has built her elevated nest of mud and grass, and, in a half standing posture, is covering her eggs. The nest is of the conventional type, molded according to the description and measurements given by Audubon. At the left of the nest a stately male flamingo on the bank is stepping into the water, while on the right another large male bird is stooping down, intently watching a small turtle which has just been discovered at the bottom of the water. The accessories, a dwarf palmetto and aquatic plants, are purposely few in number, and many desirable features in color have been omitted for the sake of preserving the entire naturalness of the surroundings.

In the frontispiece of this work will be seen a group of two flamingos prepared by the writer on the same principle as those just described.

Mr. Frederic S. Webster's examples of single mounted specimens and of groups may be cited as models of their kind, and they have justly placed him in the front rank of the bird taxidermists of this country. He has likewise won an equal reputation in the originality of designs in artistic and ornamental taxidermy.

Another one who has displayed skill and ability in taxidermy is



WRAPPING SKINS FOR THE CABINET.

When you desire to place skins in cabinet drawers, the two figures in this plate illustrate by far the best method of wrapping in cotton.

Mr. Frederic A. Lucas, and many of his pieces exhibited at the exhibitions of Society of American Taxidermists called forth universal praise and admiration. Among the bird groups in the National Museum is one entitled "An Interrupted Dinner," by Mr. Lucas. A Red-tailed Hawk has just killed a partridge, and has scarcely begun to devour it when a Goshawk swoops down upon him with outstretched talons to seize the quarry. The hawk has turned upon his back, shielding his prey with one wing, and, with open beak and talons is ready to receive his assailant, who hovers in mid-air immediately above him. The hawk in mid-air is supported by a wire which passes up along the tail feathers into the body.

Plate LXXXVII of this work is "The Wounded Gull," representing a Great Black-back Gull which has just been wounded, throwing up one wing and screaming, while the blood is oozing from the wing that is broken. It is the work of Mr. Frank B. Webster, of Hyde Park, Massachusetts, and is an admirable design well executed. There is but one thing that this gull lacks—the scream or notes of distress. This, with a number of herons, ibises, hawks, owls, grouse, and other birds arranged with natural surroundings by Mr. Webster, are in the writer's collection, and many of them are equal to some of the best work I have ever seen.

It is with especial pride that I call attention to the artistic taxidermic work which I have recently seen prepared by Mr. Charles K. Reed, of Worcester, Massachusetts. Fortunately for Mr. Reed, he is his own artist in every particular, and can paint his own backgrounds and arrange his accessories with far more than ordinary ability, while the forms and attitudes of his mounted specimens are equal in every respect to the beauty of his landscapes.

I refer in particular to the groups of birds, small quadrupeds and those of fishes which this artist arranges in convex glasses, and which are placed in massive frames to be hung on walls like pictures. The foreground is made of a cutting from the natural twig, or trunk from the tree on which the bird would perch, and, if it be a ground-bird, the foreground is made up of artificial or natural materials on which the bird rests, and the background is painted. When properly worked up by the artist the effect is charming, and when I recall to mind Mr. Reed's Snowy Owl scene, that of the Kingfisher, the group of Ruffed Grouse and young, the Bob-whites, the scene of squirrels at home, the Golden Plovers, the bunch of trout, etc., we feel that no adequate idea can be formed of the beauty and naturalness of these designs from any photographic pictures that may be produced, as in our Plates LXXXV and LXXXVI.

The true artist in these pieces can surround his mounted specimens with all the images of creation. Those beautiful realities, the rivers, the mountains, the trees, the green prairie, the sky and the sea, can be worked in as backgrounds from the rich treasury of colors of the palette.

The convex glasses have flat corners and fit nicely into a frame. The sizes range from 10 x 14 inches, for birds the size of a quail, woodcock, etc., to 22 x 28 inches for large gulls, ducks, hawks, owls, etc.

CHAPTER VIII.

COLLECTING BIRDS' NESTS AND EGGS.

This chapter is taken in part from the writer's *Nests and Eggs of North American Birds*.[1]

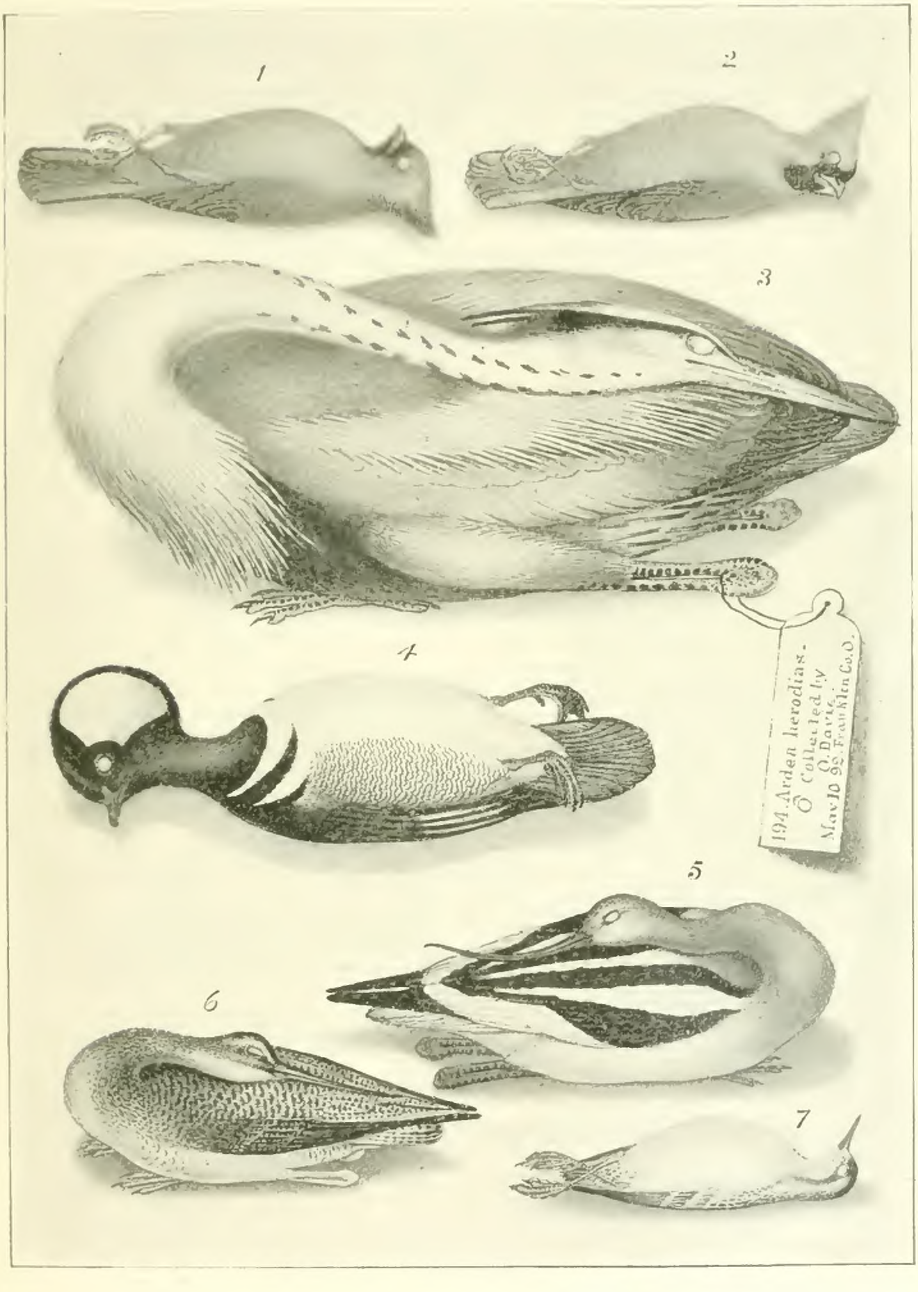
In making a collection of mounted birds, or when they are made into the forms of skins for the drawers of a cabinet, it is often desirable to collect their nests and eggs for the purpose of obtaining a knowledge of their nesting habits. The nest with its eggs in the bough of a tree or in a bush with the parent birds, when artistically executed, reveals at once a most interesting chapter in the life history of the species. It is always best, when possible, to preserve the nest intact on its branch, and when the arrangement of the group is made, additional artificial surroundings or natural accessories can be added. In the case of woodpeckers a section of the tree trunk may be removed to expose the nesting burrow and eggs. Many birds build no nest whatever, simply depositing their eggs in a hollow of the sand, on the earth in a furrowed field, on bare rocks, or in hollows in the sod. The murres deposit their eggs on the flat rocks, while some of the gulls and terns lay them in hollows of the sand; snipe, plovers and sandpipers deposit their eggs in hollows of the ground; the goatsuckers seek the shelter of some dense thicket and lay their eggs on the bare ground or on leaves midst old logs. The Nighthawk *Chordeiles virginianus* (Gmel) now commonly deposits its eggs on the flat tin or gravel roofs of high buildings in cities and sometimes on bare rocks; but it chiefly resorts to the ground for breeding purposes, like others of the family. In collecting the eggs of these species and in grouping them the nest or place must be imitated with the natural surroundings—the actual sand, dirt, sod, etc., should be taken from the spot and arranged so as to exactly imitate the place where the eggs were deposited. The ground-nesting birds that build nests which can be transported are quite numerous and, when properly handled, make some of the most interesting studies the taxidermist can devise. Prominent among

1. Nests and Eggs of North American Birds. The fourth edition; introduction by J. Parker Norris. Illustrations by Theodore Jasper, A. M., M. D., and W. Otto Emerson. Columbus, O., 1889.

PLATE XXVII.

MODELS FOR BIRD SKINS.

The seven figures in this plate illustrate the forms in which the various kinds of bird skins should be made, Figs. 1 and 2, Cardinal *Cardinalis cardinalis* Linn.), with heads turned and crests slightly raised; Fig. 3, Great Blue Heron *Ardea herodias* (Linn.), showing how the skins of long-necked and long-legged birds should be folded; Fig 4, Hooded Merganser *Lophodytes cucullatus* (Linn.); Fig. 5, American Avocet *Recurvirostra americana* Gm.; Fig. 6, Marbled Godwit *Limosa fedoa* (Linn.); Fig. 7, Northern Phalarope *Phalaropus lobatus* (Linn.). All skins should have a label attached to them. It should contain the name of the species, locality where taken, date of capture and sex as seen in Fig. 3. Measurements and notes of interest may be recorded on the other side of tag and in a record book, the numbers corresponding with those on the labels of your specimens. Besides your own number (called the collector's number) the label on the skin, if a North American species, should bear the number from the American Ornithologists' Union Check-list.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194. Ardea herodias.
♂ Collected by
O. Davis.
May 10 98. Franklin Co. O.

these are some remarkable nests of the North American species, such as that of Bachman's Sparrow *Peucæa æstivalis bachmanii* (Aud.), which is distinctly roofed over or domed; and a closely allied species, the Texas Sparrow *Embernagra rufivirgata*, Lawr, constructs a similar nest. The Meadowlark *Sturnella magna* (Linn.), builds its nest in a thick tuft of grass; it is usually formed with a covered entrance in the surrounding withered grass, through which a hidden and sometimes winding path is made. The typical nest of the Oven-bird *Seiurus aurocapillus* (Linn.), is roofed or domed, with an entrance more or less to one side, like the mouth of an oven.

When a nest is very fragile and liable to fall apart, it is always advisable to carefully wrap it with thread or light wire to hold it together, as seen in Fig. 10, Plate XLIII. If you use thread, get it as near the color of the outside materials of the nest as you can. Nests which have been removed from the branch on which they were placed can be displayed in cases on a wire standard made similar to the one in Plate XLIII, Fig. 9. This is the style employed by Captain Bendire for the arrangement of nests in the National Museum collection. The label can be glued to one of the edges of the block in which this standard is fastened.

If you are desirous of making a collection of eggs of the birds of any locality, the following directions may aid you:

Remember that an egg has no scientific or financial value if it has no name. Therefore, be *very particular* to identify all eggs collected. If you do not, you will have, in many respects, a worthless collection. If the eggs in a nest are strange or unknown to you, do not touch them until you have procured the parent bird. If you cannot skin the bird, preserve its head, wings and feet until you can have them identified. The student of oology should *by all means learn* to skin birds and put them in proper shape. He will then make few mistakes in his data.

Empty the contents of an egg through *one* smoothly drilled hole in the side, and drill it as small as can be got along with. Force the contents out by blowing into the hole with a blow-pipe. Do not make holes at the ends of an egg for the purpose of blowing out the contents. Do not hold it too tightly in your fingers, for, if it breaks, you will learn at once that a thing of beauty is *not always* a joy forever. If the embryo is partially or fully developed it will require time and patience to completely remove it. Sometimes incubation is so far advanced that the shell has become very tender and it should be strengthened by covering the entire egg with court plaster. The hole must necessarily be made larger, and the embryo should be extracted a little at a time with an embryo hook or forceps, and cut in pieces with fine, narrow-bladed scissors. If the egg is valuable fill it with water and set it aside until decomposition makes the embryo more easily to extract.

After the egg is blown it should be thoroughly rinsed by taking water into the mouth and spurting it through the blow-pipe.

Some oologists who have weak lungs fasten a piece of small rubber hose to a tank of water. The blow-pipe is fastened to the end of the hose and the contents of the egg are forced out with water instead of wind.

Eggs, as a rule, should be kept in sets; a "set" being those taken from any one nest; and each one of a set should bear a number referring to a corresponding one in a note-book where full particulars of the nest and eggs should be given. A printed label or data blank similar to the following diagram is also necessary:

Collector's No......... A. O. U. No.........
Name...
Collected by...
Locality...
Date...
Set............ Identity..... .... Incubation...............
Nest...
Measurements of Eggs...

For illustration, the blank lines of the label should be filled in the following manner: Collector's No. 126, which should be written on each egg of the set. A. O. U. No. 447. Name, Arkansas Kingbird *Tyrannus verticalis* Say. Collected by J. L. Clemmons. Locality, San Diego, California. Date, June 2, 1881. Set, $\frac{1}{4}$ (indicating that the number of eggs in this set is four). Identity, bird shot. Incubation, begun. Nest, made of coarse sticks and twigs, lined with hair and cotton, placed in an "Australian Gum Tree," twenty feet from the ground. Measurements of eggs, .94 x .63, .92 x .63, .95 x .64, .95 x .63 inches. Each egg in the set should have the collector's number and, if North American, also that of the American Ornithologists' Union. Check List[1] written with lead pencil or India ink on the egg. All these data should be carefully written and the label placed in the cabinet with the eggs. If there are several sets of the same species, the collector should have his own number to distinguish the sets. The label with

1. The Code of Nomenclature and Check-list of North American Birds. Adopted by the American Ornithologists' Union. Being the report of the Committee of the Union on Classification and Nomenclature. New York, American Ornithologists' Union, 1886. [L. S. Foster, 35 Pine Street, N. Y.]

PLATE XXVIII.

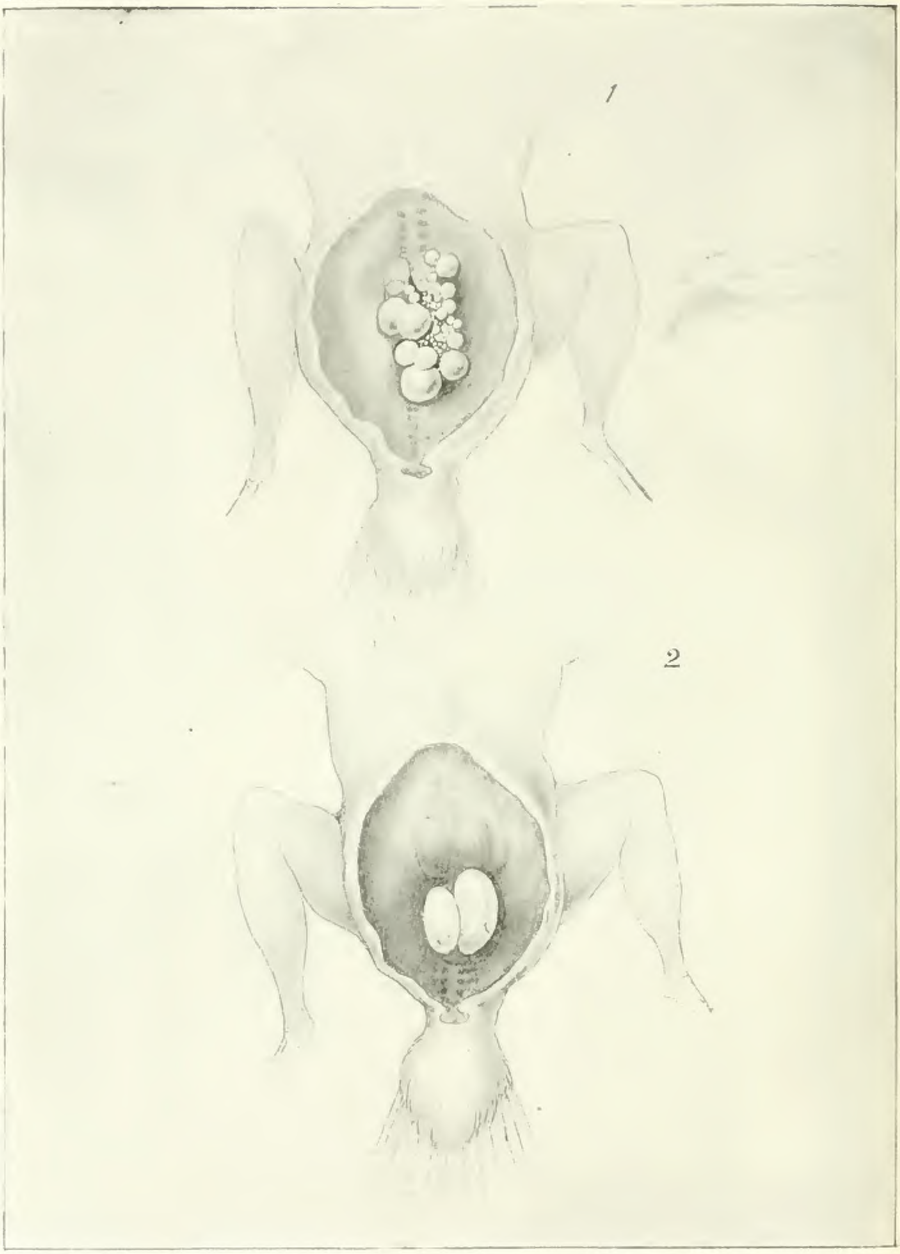


PLATE XXVIII.

ASCERTAINING THE SEXES OF BIRDS.

I shall here quote what I say on this subject in Chapter V, *The Making Up of Birds' Skins:*

All skins prepared for the cabinet, and all mounted specimens should have a label attached to the legs, giving the species, sex, locality, date of collection, etc. In many adult birds the sex can be determined by the color of the plumage. In most cases the body should be examined to make sure of the sex of the specimen. The testes of the male and the ovaries of the female lie in the same position in the small of the back, close to the kidneys, and may easily be reached by cutting through the wall of the abdomen on one side and pushing the intestines out of the way. The testes of the male are a pair of yellowish bodies lying close together, Fig. 2, The ovary is a mass of small spheres, Fig. 1. In the breeding season both these organs are subject to such enlargement that they become very conspicuous, and differ so much in appearance that they cannot be mistaken. At other seasons of the year they can only be recognized upon close examination. The male is denoted by the sign of Mars (♂), the female by the sign of Venus (♀), or the right leg is crossed over the left to indicate the male, and the left over the right to denote the female.

It would be well for those who desire to caponize fowls to give this plate some study.

full data should *always* accompany the set in making exchanges. Besides the above particulars the note-book should be filled with memoranda devoted to the records of nests found and examined; the general nature of the surroundings; the precise color and condition of the eggs when found, as all these fade quickly from the memory.

I shall here recommend taking the measurements of all sets of eggs and recording the same in your note-book and on the label. It will assist in keeping each set together and will add more to their interest and value. To facilitate the measuring of a large series of eggs for records in my *Nests and Eggs of North American Birds*, I designed for my private use an *oological rule*[1] with a scale of inches and hundredths on one side and a scale of millimetres on the other. It is so simply constructed that a child can read the measurements when they are once registered. It also answers the purpose for taking measurements of the smaller ornithological specimens.

In climbing high trees, climbing irons are often used. A wooden or tin box, filled with cotton, should be taken up with you; in this, securely place the eggs before descending the tree.

When eggs are to be shipped by mail or express they should never be packed in anything but wooden or tin boxes. Each egg should be wrapped in cotton and bound tightly with thread and then wrapped in tissue paper. Place them in layers in the box with bits of cotton between each egg. The bottom, sides and end of the box are often lined with sheet cotton which is still better protection.

In all ordinary cases collections of eggs are preserved in the drawers of a cabinet. These are divided by partitions, and each section partially filled with grated cork or boxwood sawdust, in which the eggs are placed. Every collector should adopt some method of arranging eggs in the cabinet, and a system of classification should at all times be followed.

The very best trays or boxes ever designed for keeping eggs in the drawers of a cabinet or for exhibition purposes are those manufactured by E. J. Schaefer, No. 338 Second street, New Orleans, Louisiana. They are neatly made of paste-board and the sides and bottom are ingeniously cushioned with strips of sheet cotton. Each box has a lid on which the label can be pasted. These boxes are made to suit all sizes of eggs, and range in price from $2.50 to $8.00 per hundred, according to size.

Oological Instruments.—In our Plate XLIII are figured the various instruments used in the collecting and the preparation of birds'

1 This rule will shortly be manufactured and will be for sale by dealers in naturalists' supplies.

eggs. The egg drills are made with octagon handles six inches long, as represented by Fig. 1. The sizes of the burrs, as will be seen in Figs. 1 to 6, range from 3-32 inch to 16-32 inch. The following is a list of the essential oological instruments, with their prices:

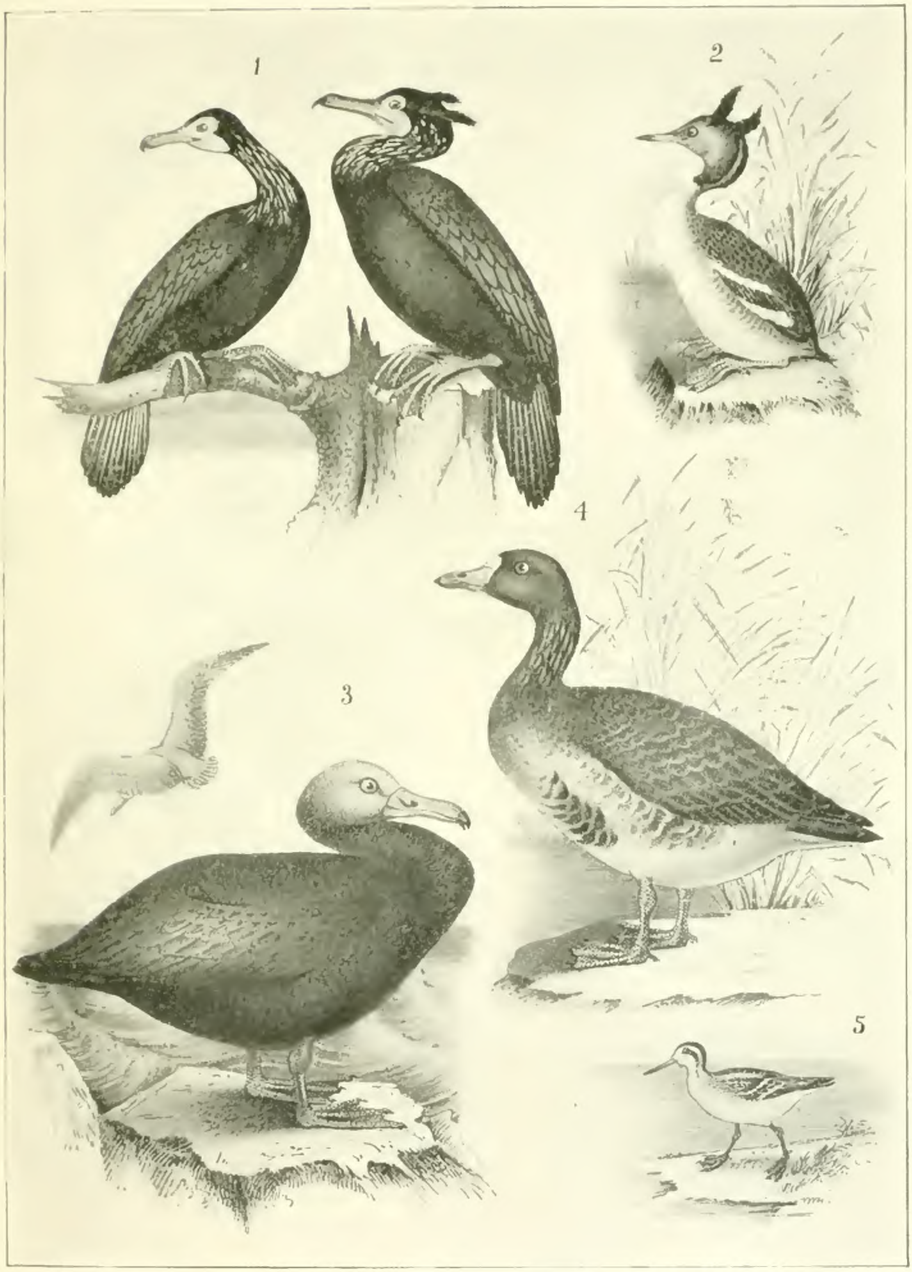
Egg drill No. 1, 3-32 inch burr	$0 25
" " " 2, 5-32 " "	0 35
" " " 3, 6-32 " "	0 50
" " " 4, 8-32 " "	0 75
" " " 5, 12-32 " "	1 00
" " " 6, 16-32 " "	1 50
" " " 1016, common, short	0 20
Blow-pipe	0 25
Climbing irons	3 50
Embryo hook	0 25
Embryo scissors	$0 25 to 1 50
Spring forceps, fine	0 75 to 1 25
Davie's oological rule	

If you are just beginning to make a collection of eggs, two or three drills are all that are necessary for ordinary purposes, Nos. 1, 3 and 5 being the most desirable sizes. If you are to make an extensive collecting trip to remote regions, the entire outfit enumerated above should be taken with you.

PLATE XXIX.

FORMS AND ATTITUDES.

Fig. 1, Cormorants; Fig. 2, Horned Grebe *Colymbus auritus* Linn.; Fig. 3, Sooty Albatross *Phœbetria fuliginosa* (Gm.); Fig. 4, American White-fronted Goose *Anser albifrons gambeli* (Hartl.); Fig. 5, Northern Phalarope *Phalaropus lobatus* (Linn.).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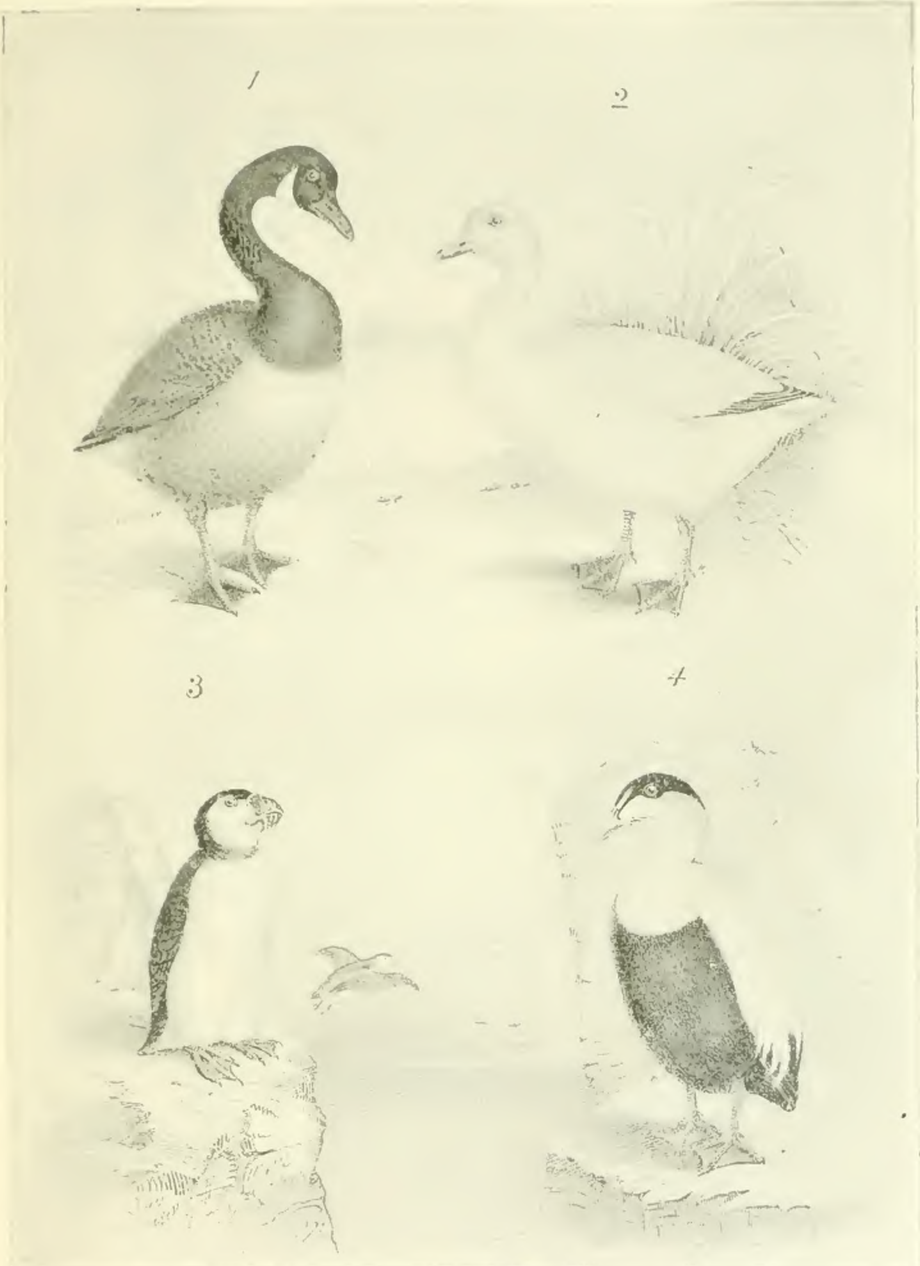
FORMS AND ATTITUDES.

Fig. 1, Black or Short-tailed Tern *Hydrochelidon nigra surinamensis* (Gmel.); Fig. 2, Caspian Tern *Sterna tschegrava* Lepech.; Fig. 3, American Herring Gull *Larus argentatus smithsonianus* Coues; Fig. 4, Black Skimmer *Rynchops nigra* Linn.

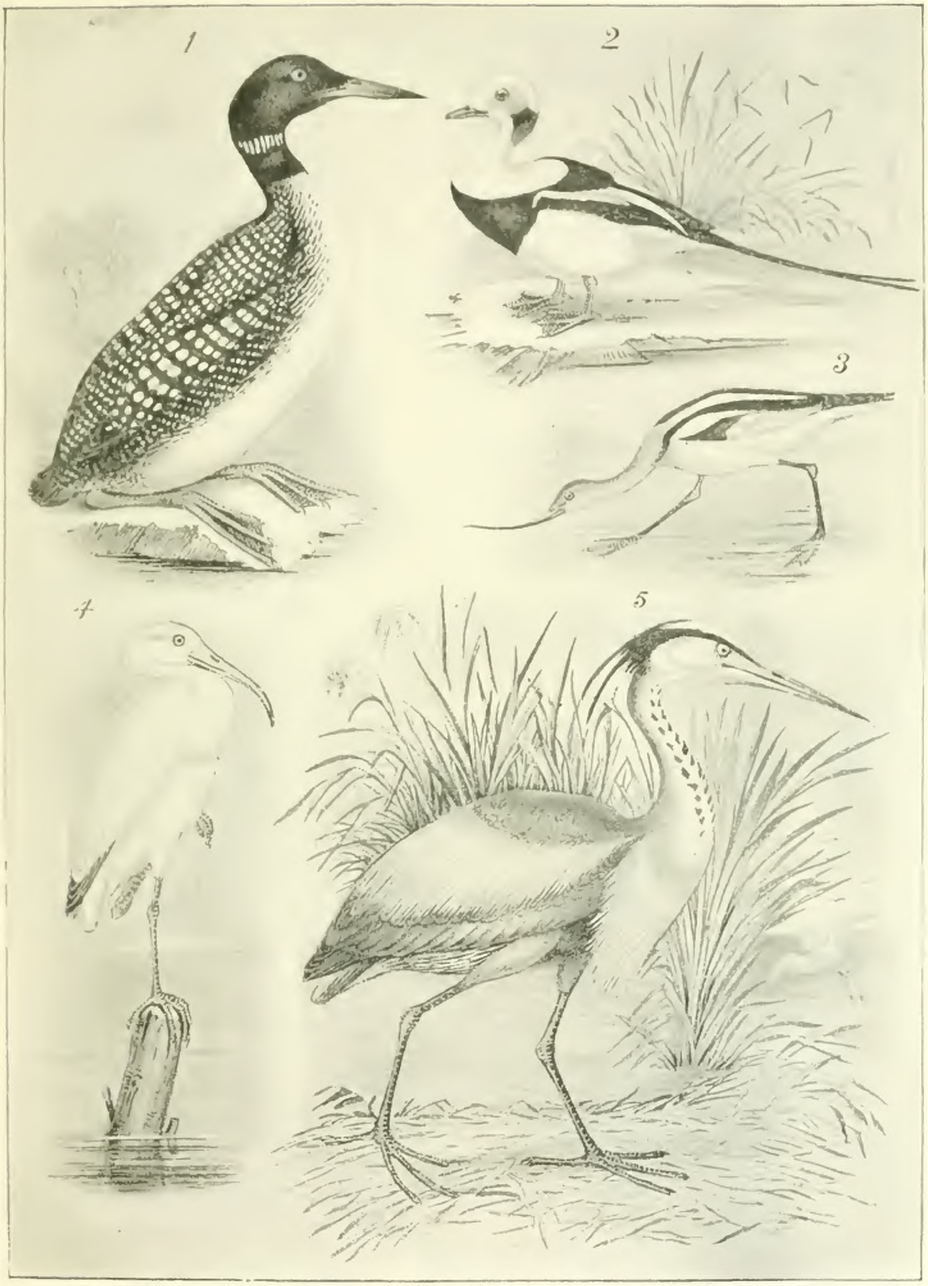
FORMS AND ATTITUDES.

Fig. 1, Redhead *Aythya americana* (Eyt.); Fig. 2, Green-winged Teal *Anas carolinensis* Gmelin.; Fig. 3 Swan.



FORMS AND ATTITUDES.

Fig. 1, Canada Goose *Branta canadensis* (Linn.); Fig. 2, Greater Snow Goose *Chen hyperborea nivalis* (Forst.); Fig. 3, Puffin *Fratercula arctica* (Linn.); American or Greenland Eider *Somateria mollissima borealis* Brehm.

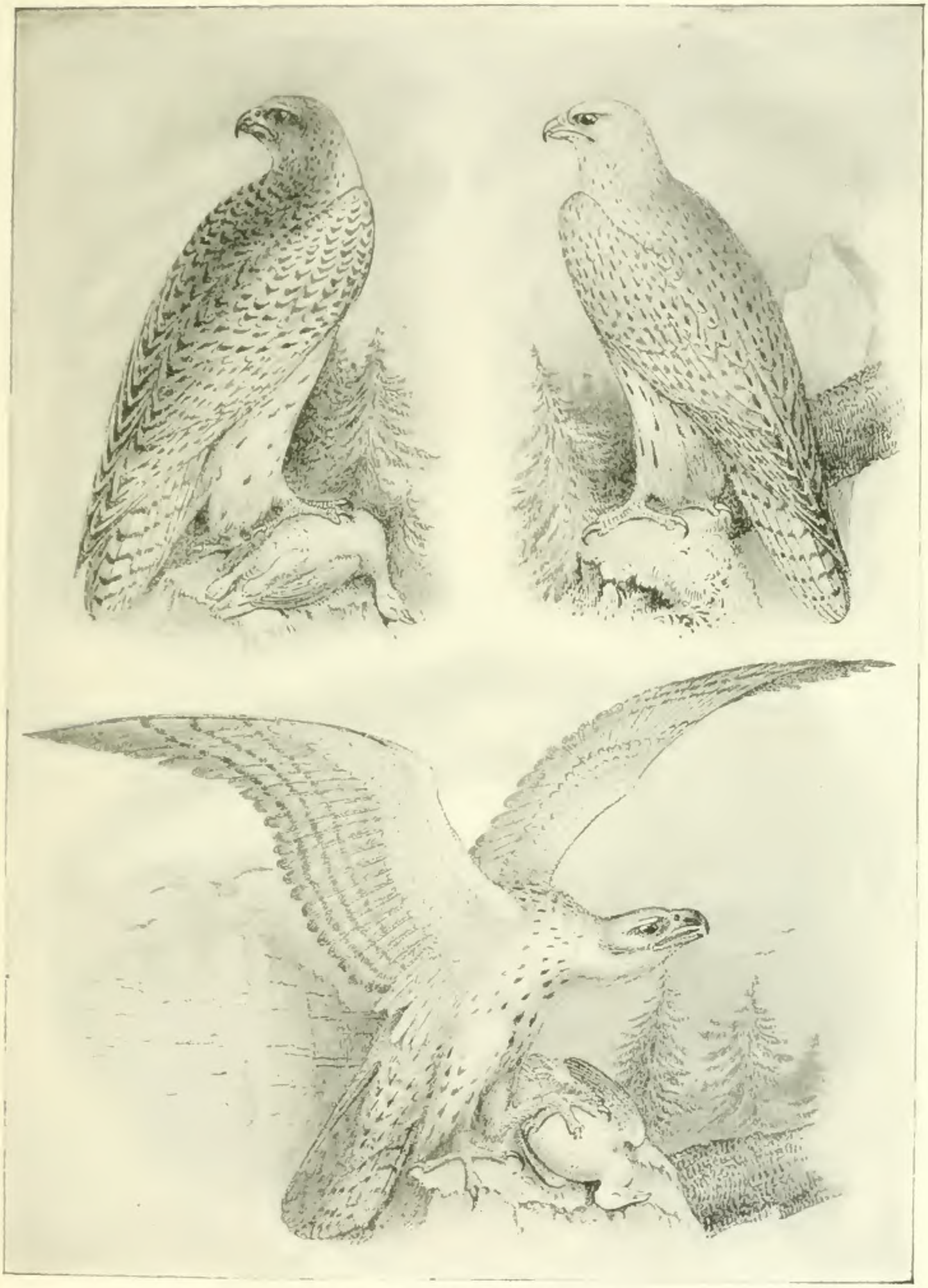


FORMS AND ATTITUDES.

Fig. 1, Loon *Urinator imber* (Gunn.); Fig. 2, Old-squaw or Long-tailed Duck *Clangula hyemalis* (Linn.); Fig. 3, American Avocet *Recurvirostra americana* Gm.; Fig. 4, White Ibis *Guara alba* (Linn.); Fig. 5, Great Blue Heron *Ardea herodias* Linn.

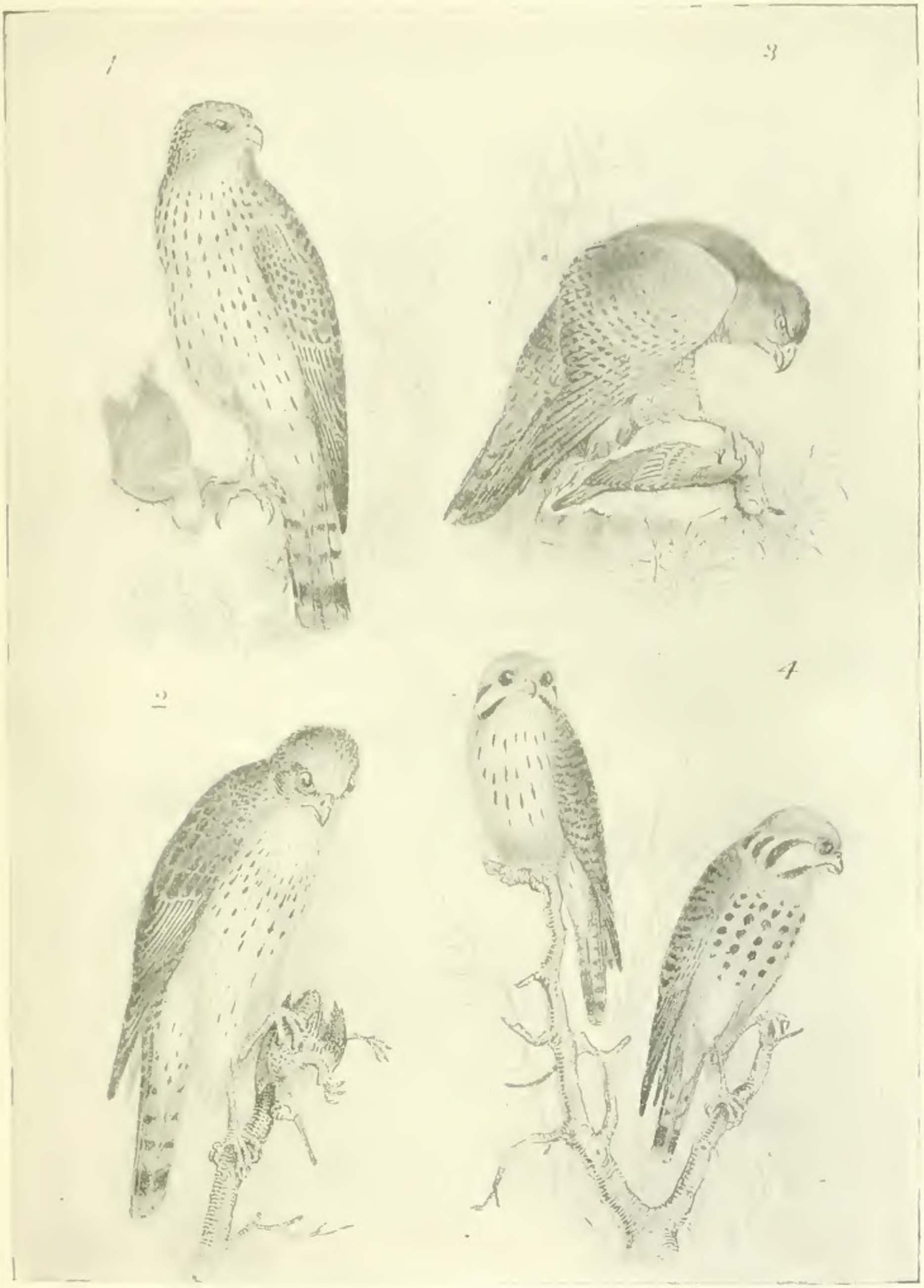
FORMS AND ATTITUDES.

Fig. 1, Least Bittern *Botaurus exilis* (Gmel.); Fig. 2, Semipalmated Ring Plover *Ægialitis semipalmata* Bonap.; Fig. 3, Whooping Crane *Grus americana* (Linn.).



FORMS AND ATTITUDES.

Group of Greenland or White Gyrfalcons *Falco islandus* Brunn.

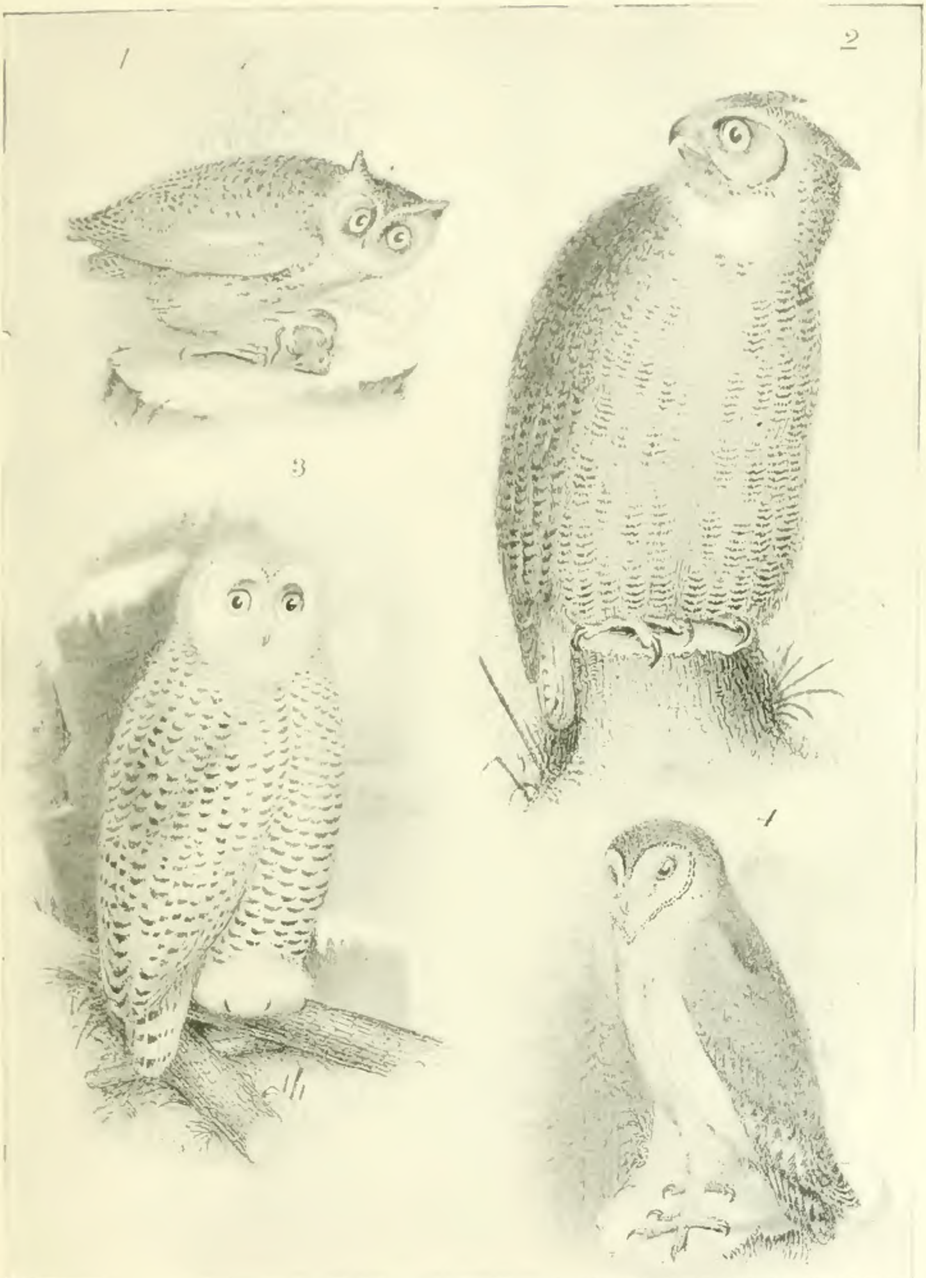


FORMS AND ATTITUDES.

Figs. 1, 2, American Goshawk *Accipiter atricapillus* (Wils.); Fig. 3, Cooper's Hawk *Accipiter cooperi* (Bonap.); Fig. 4, American Sparrow Hawks *Falco sparverius* Linn.

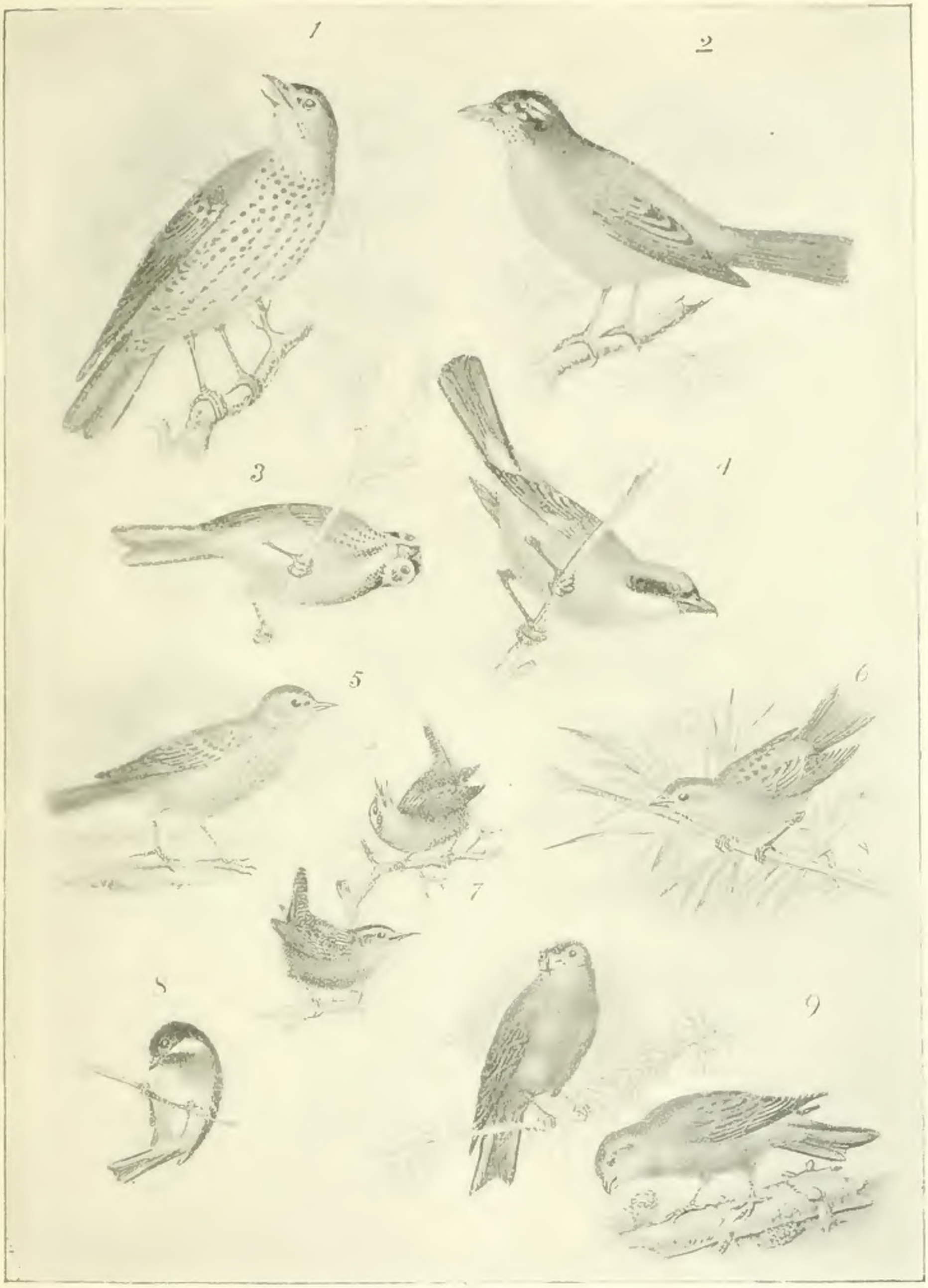
FORMS AND ATTITUDES.

Fig. 1, Great Blue Heron *Ardea herodias* Linn.; Fig. 2, Ivory-billed Woodpecker *Campephilus principalis* (Linn.); Fig. 3, Swallow-tailed Kite *Elanoides forficatus* (Linn.); Fig 4, White-breasted Nuthatch *Sitta carolinensis* Lath.



FORMS AND ATTITUDES.

Fig. 1, Screech Owl *Megascops asio* (Linn.); Fig. 2, Great Horned Owl *Bubo virginianus* (Gmel.); Fig. 3, Snowy Owl *Nyctea nyctea* (Linn.); Fig. 4, American Barn Owl *Strix practincola* Bonap.



FORMS AND ATTITUDES.

Fig. 1, Thrush; Fig. 2, American Robin *Merula migratoria* (Linn.); Fig. 3, Meadow Pipit *Anthus pratensis* (Linn.); Fig. 4, White-rumped Shrike, Butcher-bird *Lanius ludovicianus excubitorides* (Swains.); Fig. 5, American Titlark *Anthus pensilvanicus* (Lath.); Fig. 6, Sharp-tailed Sparrow *Ammodramus caudacutus* (Gmel.); Fig. 7, House Wren *Troglodytes aedon* (Viell.); Fig. 8, Chickadee *Parus atricapillus* Linn.; Fig. 9, American Crossbills *Loxia curvirostra minor* (Brehm).

FORMS AND ATTITUDES.

American White-fronted Goose *Anser albifrons gambeli* (Hartl.), mounted by the author.

FORMS AND ATTITUDES.

Greater Yellow-legs *Totanus melanoleucus* (Gmel.), mounted by the author.

FORMS AND ATTITUDES.

Cooper's Hawk *Accipiter cooperi* (Bonap.), mounted by the author.

PLATE XLIII

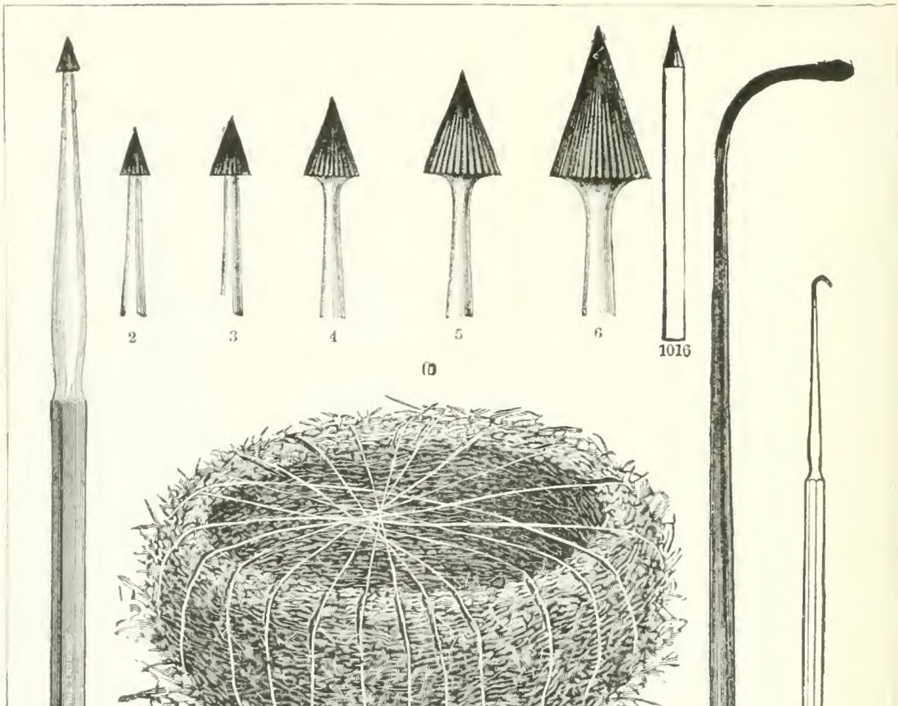


PLATE XLIII.

OOLOGICAL INSTRUMENTS, ETC.

In this plate are figured various instruments used in the collecting of birds' eggs. The egg drills are made with octagon handles six inches long as represented in Fig. 1. The sizes of the burrs, as will be seen in Figs. 1 to 6, range from 3-32 inch to 16-32 inch. These can be obtained from any dealer in naturalists' supplies at the following prices, as already quoted on page 149:

Egg drill No.	1,	3-32 inch burr	$0 25
" " "	2,	5-32 " "	0 35
" " "	3,	6-32 " "	0 50
" " "	4,	8-32 " "	0 75
" " "	5,	12-32 " "	1 00
" " "	6,	16-32 " "	1 50
" " "	1016,	common, short	0 20
Blow-pipe, No. 7			0 25
Embryo hook, No. 8			0 25

CHAPTER IX.

SKINNING AND MOUNTING SMALL MAMMALS AND THOSE OF THE LARGER SPECIMENS IN WHICH IT IS UNNECESSARY TO EMPLOY THE DERMOPLASTIC METHOD; MAKING UP DRY SKINS AND RELAXING THEM.

The drawings in our Plates XLIV, XLV, XLVI, XLVII and XLVIII were made from specimens of fine, large fox squirrels in actual course of preparation; we shall, therefore, try for our first effort in the skinning and mounting of small mammals, the same kind of a subject. In describing the various procedures I shall follow the arrangement which has been carried out in Chapter IV—*Skinning and Mounting Birds*—all the variations and exceptions to the general rule will be found in foot-notes.

The list of mammals which can be skinned and mounted under these directions is a very large one, embracing as it does mice, moles, shrews, squirrels, bats, weasels, minks, otters, beavers, opossums, rabbits, muskrats, skunks, ground-hogs, raccoons, martins, badgers, cats, foxes, wolves, and dogs with heavy coats of hair, and monkeys.

While the specimens under consideration require far less delicacy of touch than do birds in their preparation, the skill necessary for the skinning and mounting of mammals is, from the nature of their structures, of a different character, and, as a rule, the methods employed must be modified according to the peculiarities of the subject in hand.

Before we begin to skin a quadruped full and accurate measurements should be taken;[1] the color of the eyes should be carefully noted, and likewise the bare portions of skin or fleshy appendages.

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1. **Measurements of Small Mammals.**—The following are the most valuable measurements:

The TOTAL LENGTH is the distance between the tip of the nose and the end of the tail vertebræ. It is taken by laying the animal on a board, with its nose against a pin or upright post, and by straightening the back and tail by extending the hind legs with one hand while holding the head with the other; a pin is then driven into the board at the end of the vertebræ.

The LENGTH OF TAIL is the length of the caudal vertebræ. It is taken by erecting the tail at a right angle to the back, and placing one point of the dividers on the backbone at the very root of the tail, the other at the tip end of the vertebræ.

The HIND FOOT is measured by placing one point of the dividers against the end of the heel (*calcaneum*), the other at the tip of the longest claw, the foot being flattened for this purpose.

Make the opening incision as we have it indicated in Fig. 1, Plate XLIV, beginning at a point between the fore legs and continuing to the vent, but not through it.[1] Lift the skin until you can see where the legs join the body; sever them at these points, which are clearly seen in the skinned carcass, Fig. 3, Plate XLIV. Now skin them down to the end of the toes and strip them of their flesh.[2] Having cleaned the legs of their flesh we now loosen the skin down on the back a little and cut the tail vertebræ off at its base. Form a loop on a piece of strong cord and fasten it over the end of the stump of the tail vertebræ. By fixing the other end of the cord to some stationary object and by placing the tail stump between two sticks and pulling steadily the entire caudal vertebræ will slip out.[3]

Having thus far followed the directions, continue to peel the skin down the back until the base of the skull is visible. Here you will shortly discover the ears. Sever the ears by cutting slowly and carefully close to the head and, presently, the eyes will appear through the thin membrane. At this point work slowly lest in the first efforts you may cut the eyelids. Cut through the transparent membrane and the eyeball will be exposed. The best manner to skin over the eyes of a quadruped, and especially the large ones, is to place the fore finger under the skin of the eye and pull with sufficient force to make the eyeball visible through the thin membrane. You will then either cut through the membrane properly and around the eyelid or into your finger; so be careful. Most taxidermists, however, resort to this method of skinning over the eyes. Now skin to the lips and cut them away from the skull, and also sever the nose by cutting through its cartilege. You will now have the skin turned wrong side out; the carcass will be lying before you as it appears in Fig. 3, Plate XLIV. Before reversing the skin pare the lips down thin; skin the

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1. **The Opening Incision.**—If the animal be a male, or if it possesses abdominal pouches, the opening cut should be made to one side of the testicles or pouches as seen in Fig. 1, Plate XLIV, and these organs should be carefully skinned so that their character can be preserved. If your subject be a monkey of any description make the opening cut along the back.

2. **Skinning the Feet of Small Mammals.**—All mammals having fleshy feet should have the sole of the foot opened its full length, beginning from the end of the middle toe. The foot may then be completely skinned and thoroughly poisoned. In order to skin with facility the feet of a fox, or those of mammals larger, it is necessary to extend the cut nearly all the way to the carpus joint and heel. The toes and fingers in the feet and hands of all monkeys and apes must be opened from the outside and skinned entirely to the tips. The opening cuts are shown in the foot of the chimpanzee, Fig. 4, Plate LXVIII.

3. **Skinning the Tail.**—I shall recommend this method of skinning the tail in such mammals as squirrels, weasels, minks, skunks, ground-hogs, raccoons, etc., but those having fleshy or flat tails like the opossum, kangaroo, muskrat, beaver, fox, dog and monkey, the tail must be slit open on the underside, beginning just below the vent and continued to within a half inch of the end of the tail. When the whole animal is skinned the carcass will be seen as it appears in Fig. 3, Plate XLIV.

ears to the tips[1] and *remove every particle of flesh and fat from the entire skin.* Be careful in cutting the flesh away from the lips of a quadruped that has whiskers. If you cut too deep the whiskers will come out. Be sure and pare the lips down thin. When the skin has been returned right side out wash any blood stains off with warm water and a sponge. *Do not allow any blood or grease to dry on the hair, for it is next to impossible to efface it after it becomes hard and dry.*' A French taxidermist wrote this caution in 1752, and many of his followers have since spent hours of fruitless labor upon the careless work of others.

If the skin has been treated according to the directions here given it will appear before you as seen in Fig. 2, Plate XLIV.

We must now sever the head from the carcass, clean the muscles from the skull, take out the eyes and tongue. Flatten a piece of wire at one end, make it hook-shaped, and draw the brain out through the occipital opening. In most of the common mammals it will do well enough to cut a larger opening and take the brain out with a brain spoon or other instrument; but under no consideration cut the whole back of the skull off to get at the brain. Now see that the skull is thoroughly cleaned and poisoned. When this has been done you are ready to prepare the skin as you may desire; either to make it up into a dry form or preserve it in a wet state in the salt and alum solution as directed on page 40.

In this chapter I shall discuss the making up of dry skins of the small mammals, but for the present we shall take from the salt and alum bath our fine, large fox squirrel skin. We shall proceed to mount it. Look carefully over the entire inside of the skin for shot holes or cuts of any kind and neatly sew them up,[2] and be sure to clean off any particles of flesh or fat which have, in the first cleaning, been overlooked. Give the skin a heavy coating of arsenical paste (see recipe, page 34) and then rub on a mixture of two-thirds powdered alum and one-third arsenic.

In our Plates XLV and XLVI are figured two methods of wiring small quadrupeds. I use both systems, according to circumstances. The former was recommended by M. B. Stollas, the French taxidermist, in 1801, and by Prof. Wiley in 1855. The latter is a system of wiring which is also the invention of a French taxidermist who published the method in 1758. The best mounted small quadrupeds I ever saw were constructed upon the system of wiring illustrated in

1 In Chapter X the manner of skinning the ears and lips of quadrupeds will be fully described.

2 The surgeon's needle which threads from the top is by far the best to use in sewing up mammal skins.

Plate XLVI. However, I shall recommend to the beginner the method of wiring as figured in Plate XLV. Let us lay the skin out full length on our work bench or table and cut a piece of No. 15 annealed wire (see *sizes of wire for mammals*, page 5) six inches longer than the entire length of the animal from the tip of its nose to the end of its tail. This is the *center* wire. Now measure the leg bones and cut off four more pieces of wire of the same size so that they will reach from the ends of the leg bones inside the skin to five inches beyond the sole of the foot. Straighten these wires and polish them with sandpaper, as bright as a darning needle. We shall now begin to form one of the hind legs by first passing the wire in at the sole of the foot and up along the leg bones, allowing it to project two inches beyond the upper end of the femur inside of the skin, and three inches beyond the sole of the foot. Now bend the wire until it fits snugly along the leg bones, and tie it fast, first to the bones of the foot and next to the tibia and fibula (see skeleton of greyhound, Plate XLIX).[1] Form the muscles of the leg, beginning to wrap fine, long fibre tow around the bones of the foot; here the wrapping should be very slight as the upper portion of these bones are almost bare of flesh. Now wrap tow around the tibia and fibula, but be careful not to build on too much, for near the heel the muscles are spare and must be given only a slight wrapping; the tibia lies close to the skin, and for this reason the wrapping over the front of the tibia must be very slight. Higher up between the heel and knee the muscles are heavier and must be built out stronger. The knee, however, is bare of flesh and requires a very slight wrapping or none; the skin should lay immediately above it as seen in Figs. 1 and 4, Plate XLVI. We are now ready to form the muscles of the upper portions of the thigh, which really go to make up the lower portions of the back of the animal. Remember that as far as the muscles extend, the limb is flat on the inside and rounded on the outside. To make up the muscles around the thigh bone, roll up a small ball of tow and place it on the outside between the femur and the leg wire and wrap tow around it until the thigh has attained its proper size and rotundity on the outside and its flatness on the inside. Work with it until you have built it out and formed the thigh according to your ideal of it. When you have proceeded this far with the leg draw it back

1. **Wiring the Legs in Small Mammals.**—One of the very best methods of wiring the legs in small quadrupeds is illustrated in the various figures of Plate XLVI. In Figs. 1 and 4 the system is shown very clearly. Instead of tying the wire fast to the bones of the leg the end of the femur is fastened to the wire: the wire is also fastened to the bones of the foot. The leg bones are then given the proper bend and the muscles of the leg are built out to their proper size. By this method the tibia will lay along close to the skin, and the knee, which is bare of flesh, will also lay in a similar position. The fore legs are wired on the same principle, by tying the end of the humerus to the wire.

into the skin and observe how the leg fits in the skin. If your judgment tells you that it is too flat or too rounded turn the skin back and correct the error whatever it may be. When the form of the leg has reached your ideal, give the tow leg a coating of thin clay, and coat the leg skin with arsenical paste, and the artificial leg will slip easily back into the skin. In forming the legs make them compact but not too hard, winding the tow with thread or cord until the proper strength and solidity is obtained. Make the fore legs in the same manner described for the hind legs; when all has been done, and just before sewing up the slits in the soles of the feet, replace the flesh which you have cut away with clay (see uses of potter's clay, page 45). See that each hind leg and fore leg match each other in size and shape.

We shall now turn our attention to the skull and replace the muscles with clay; this is shown in Figs. 4, 5 and 6, Plate XLIV. The most careful work is necessary here for the muscles of the head should be developed as perfectly, if possible, as they were when the skin was taken from the head. If you have made a drawing or a cast refer to either constantly. Replace the muscles with potter's clay and glue-water mixed with fine chopped tow. Lay the head aside to dry while we struggle with the center wire which supports the tail, and is the entire backbone of the animal and takes the place of the center board which we employ in mounting short-haired and large mammals.

Take hold of the center wire which runs up through the middle of the animal and out of its nose as seen in Plate XLV, and begin to form the tail by winding fine tow on the small point of the wire, gradually enlarging as you proceed until you have reached its natural thickness all the way to its base. In order to have the wire pass on a straight line through the left or right nasal cavity make a hole in the back of the skull just below the occipital opening. Now put plenty of arsenical paste on the skin and insert the skull in the skin of the head. Lay the skin out and adjust the leg wires inside the skin so that they will

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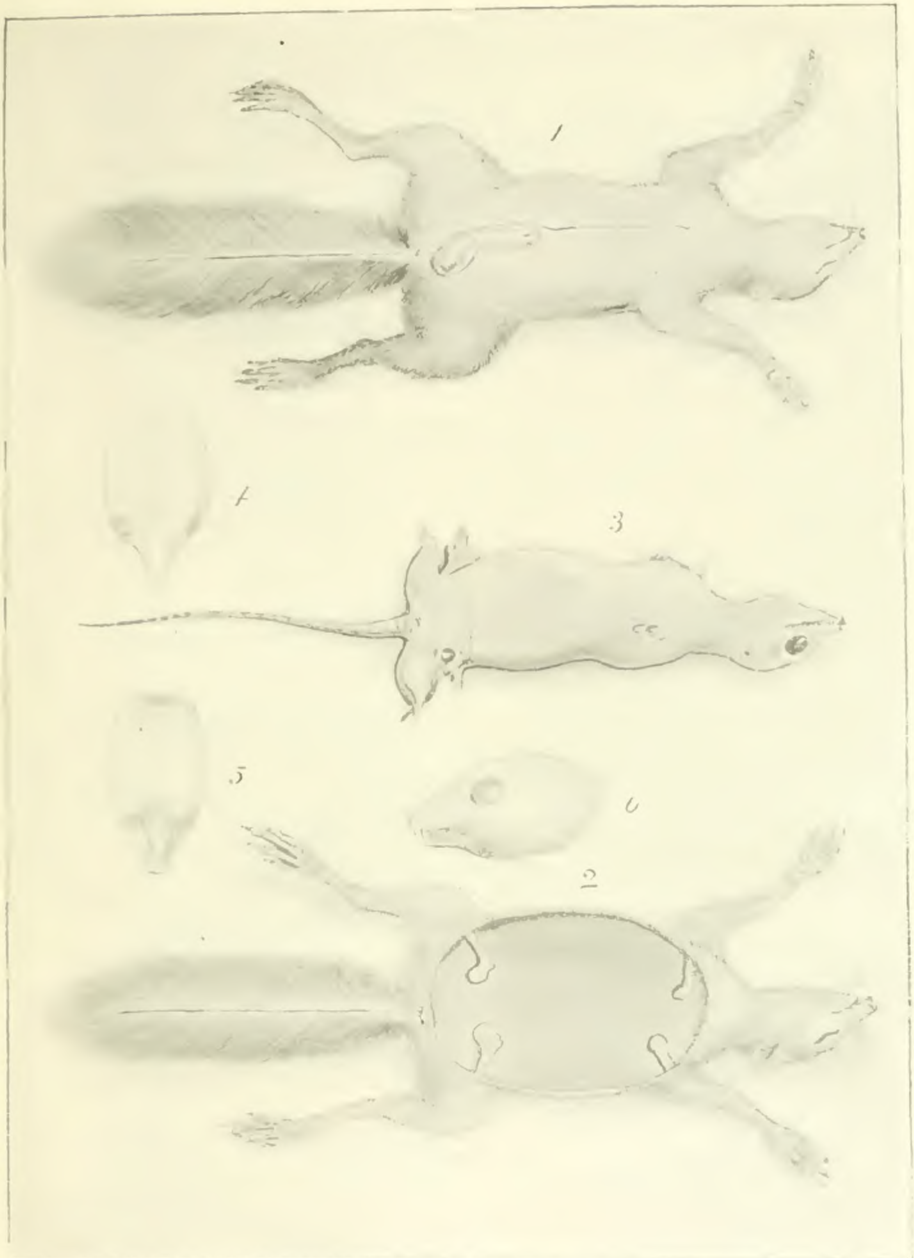
1. **Systems of Wiring Small Quadrupeds.**—The system of wiring small mammals as seen in Plate XLVI has advantages over that illustrated in Plate XLV not necessary to explain in detail. The center or body wire is anchored into two pieces of cork, or, if cork is not near at hand roll up two balls of tow, bind them with strong cord and make them hard. Into these the wires of the legs, tail and head can be anchored as seen in Plate XLVI, Fig. 3. In this method all of the wires require to be sharp-pointed and the head wire is held in place in the skull by filling the brain cavity with thin plaster of Paris, inserting the wire in the hole made in the back of the skull and the plaster allowed to harden, which will hold the wire in place (Fig. 5, Plate XLVI). It is a good idea to form a loop on the blunt end of the wire which goes into the skull. The tail is made on a separate wire as seen in Figs. 1 and 2, Plate XLVI, and anchored in the cork or ball of tow. In filling the skin of a quadruped to be mounted upon this method a thick cushion of fine tow should be placed under each cork; all around the base of the tail and around the thighs and humerus, the neck and, lastly, the lower or abdominal region should have your attehtion. In bending the legs together at a right angle the ends of the femur and humerus can rest on the lower side of the corks or tow balls which will insure that these bones are the proper distance apart, as they were when attached to the pelvis and the shoulder blade.

cross each other in their proper places. Take the center wire on which you have made the artificial tail and form two loops with your round-nosed pliers. These loops should be formed where the wires of the legs cross each other in the skin. Insert the end of the center wire into the opening you have made in the back of the skull and then through either the right or left nasal cavity. If the skin of the tail has been slit open simply lay the artificial tail in place in the tail skin; if not, draw the center wire out through the nose as far as necessary and carefully insert the artificial tail in its skin by forcing it entirely to the point. You may now insert the leg wires into the loops (see Plate XLV) and twist them on the center wire. Give the entire inside of the skin a coat of arsenical paste. Everything is in readiness for the body filling. Now adjust the eyelids so that they will come in their proper place over the eye orbit and then drive a tack over each eye through the skin and into the skull. This is of great importance as they will hold the skin of the head in place. The tacks are removed when the specimen is about finished or ready to put away to dry on its temporary stand. But before we fill the skin with finely chopped tow we must arrange the legs in their proper position and give them the pose we expect the animal to assume when mounted. We can bend the wires at the head of the humerus and femur at a right angle, and by referring to the outline and accurate measurements (which should always be taken beforehand) know that they are the same distance apart as they were when they were attached to the pelvis and the shoulder blade. Cover the center or body wire and others that are visible with tow. Now begin to fill the neck with fine tow, and also around the hips, shoulders and the base of the tail, and from these points the entire skin should be filled out in a general way, gradually and equally filling out the corresponding parts on all sides, being careful to make both sides alike. If the skin of the tail has been slit open adjust the artificial tail which you have made on the center or body wire and neatly sew it up. When you have filled the skin out evenly in every part begin to sew up the opening, using the understitch for this purpose, for the seam can easily be covered by lifting the hairs over the stitches when finished (see Plate XLVII, Fig. 1). While you are sewing up the opening is the time to detect any portion of the body which needs more or less filling in the different parts, and this should be done as you proceed.

There is no rule or rules for securing a correct attitude of an animal. It will all depend upon your knowledge of its anatomy, your conception of what the ideal should be, and your power to execute and imitate.

Comb out the fur with a fine steel comb and, by using pressure with your hands, squeeze the squirrel into better proportions if possible; if he is to sit on his haunches give his back the characteristic curve, and gracefully turn the tail over the back; push the thighs up close to the body; press the heels closer together than the feet. Now measure the distance between each of the hind feet and drill two holes in a board the same distance apart for the reception of the wires of the hind feet. Two other holes should be made in the board in order to run the wires back into the board from underneath to clinch them. If you desire to have the squirrel mounted on the limb of a tree eating a nut, as our little gray squirrel appears in Plate LXII, Fig. 3, fasten the limb on the board by means of screws and then drill holes in the limb the proper distance apart for the leg wires. If our squirrel is to be placed on all fours as the fox squirrel is seen in Plate XLVII, Fig. 2, the same method must be resorted to and four holes should be drilled to receive the wires of all the feet. One of the most pleasing attitudes in which to place a squirrel, with appropriate artificial or natural surroundings is illustrated in Fig. 2, Plate LXII. Mounted on its pedestal our squirrel needs shaping up in general. Look carefully all over the specimen; if you find any hollows where they should not be, thrust an awl through the skin, catch hold of some of the tow and raise the hollow into a hill if necessary. Make the proper elevation and smoothness at all hazards. If there is a hump where a hollow should be, work the elevation out by pressing and distributing the extra filling with your fingers and the awl. See that every outline is symmetrical; watch the proportions on every side and make them match one another. Now let us turn our attention to the head. If you have failed to cover the head with clay equally on both sides, or if there is a deficiency apparent on either side, fill it out with chopped tow; make both cheeks alike. Fill in the lips with clay and press them into shape with your fingers, moulding the skin of the cheeks and lips close to the clay where they will remain in place when dry. Insert the eyes next by filling the sockets with clay mixed with strong glue-water or imbed them in papier-maché. Put the eyes in edgewise and turn them over flat with the point of a darning needle or awl. Nicely adjust the eyelids over the glass eye, being careful not to have them bulge out too far. See that the eyes are set alike in their sockets — that they are both looking in the same direction. The ears should be pinned close to card-board cut the shape of the ear. The toes of each foot should be carefully arranged and pinned in position — a point which many taxidermists overlook, and which is



SKINNING SMALL MAMMALS.

Fig. 1, showing where to make the first incision, beginning at a point between the fore legs, or higher up if advisable, and continuing to the vent, thence to the tip of the tail; Fig. 2, skin completely taken off; Fig. 3, carcass as it appears when the skin has been removed; Fig. 4, view of the upper portion of the skull, the muscles replaced with clay; Fig. 5, view of the under portion of the head, the muscles replaced with clay; Fig. 6, side view of the head with muscles modeled in clay.

one of the *little* things that go to make up the general neatness and excellence of the specimen. Now give the specimen a critical looking over on all sides and see what fault you can find with it. And, after you have given it a combing and brushing, pinned the corners of the eyes down in their hollows, cut the wire off that protrudes from the nose, adjusted the tail, etc., set the specimen away in your dark closet to dry for two or three weeks. During all this time, however, it should be examined daily to see that the ears are drying smoothly, that the lips still remain in shape; that the toes still hold the position you gave them. If you desire to paint the color of the eyelids and the end of the nose, or to model an open mouth in colored wax, I shall refer you to Chapter X. Remember this is your first specimen of mammal mounting and you are very likely in the future to regret that you did not spend more time, and exercise more care and patience in its mounting. But keep it as a relic; you can always find some out-of-the-way corner, dark enough to hide its defects, and you may even venture to look at it once in a while and thereby have an opportunity to congratulate yourself on the improvement you are making in the art.

Mounting Mammals with the Center Board — The method of using a center wire for the backbone as we have done in the squirrel which we have just mounted will not answer in the larger specimens of long-haired quadrupeds, such as coyotes, large dogs, bears, large monkeys, anthropoid apes, etc., because the leg supports must, from the size of the animals be something more than a light wire that can be twisted at will. Iron rods or wires of a large size must be used (see sizes of wires and rods, page 11). Many old, dry skins cannot be mounted on the *dermoplastic* method, *i. e.*, on a manikin covered with clay, because the skins are shrunken to such a degree that nothing but plenty of tow or straw and physical force will stretch them to their proper proportions — hence in the cases of aged, dry skins a heroic method must be adopted; it is the old taxidermic style and is recommended and practiced by the best German taxidermists.

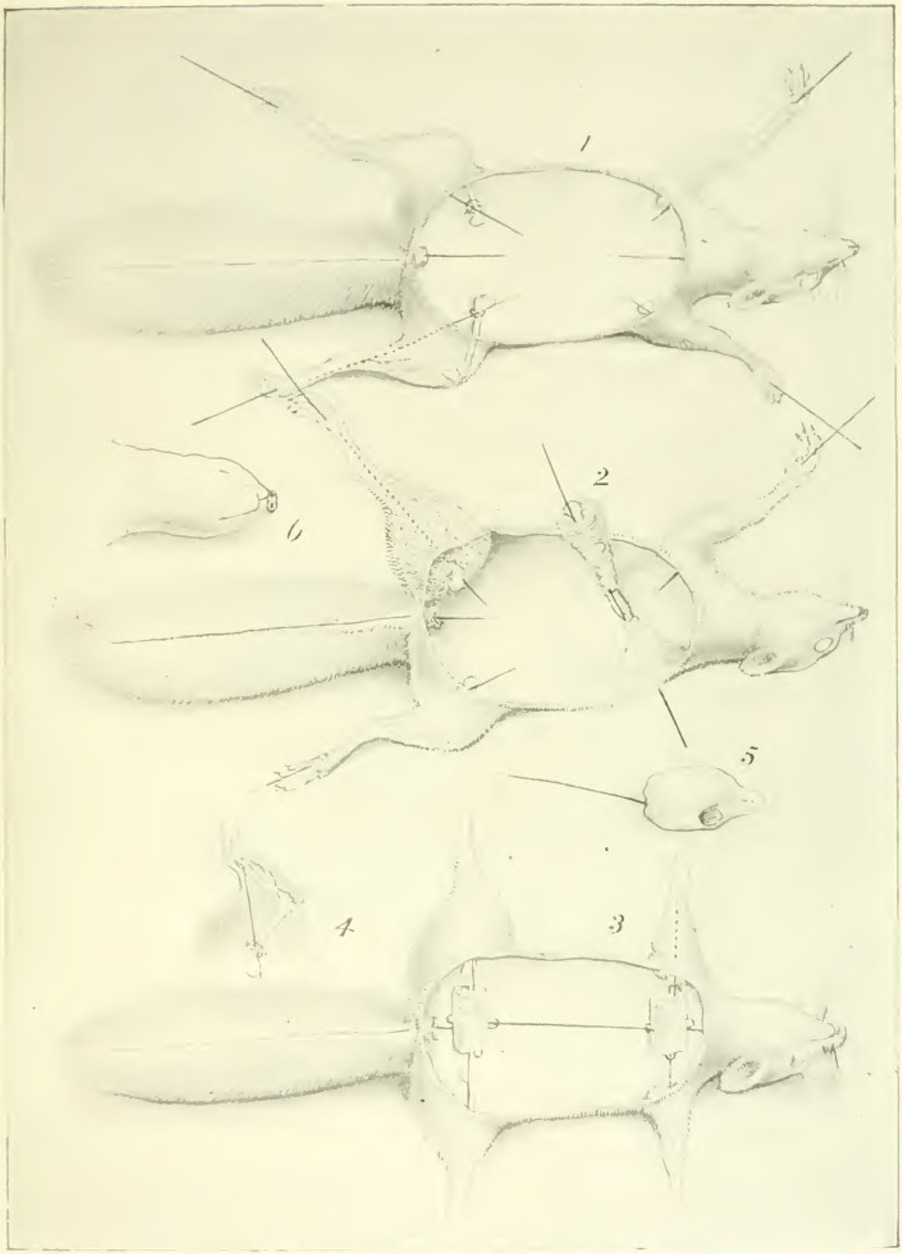
I shall here describe Dr. Jasper's method of handling these subjects, and we shall take for our example a coyote. It is skinned exactly as we have directed for the squirrel or small mammals. Lay the skin out on the work-bench, arrange the legs in a natural walking attitude. Place them in the position you desire to have the animal stand when mounted. Take a heavy annealed wire and make it conform to every bend along the back of the leg bones. In each leg allow the length of the wires to project far enough out of the soles of the feet so that a thread can be cut on the rods, to receive a nut, which depends entirely on the thickness of the pedestal on which the coyote is to be mounted. Also allow the wires in all of the legs to project far enough above the ends of the femur and humerus so that they can be anchored into the center board and firmly fastened by means of staples on the opposite side of the board. This is not all, the wires must be left long enough to be bent at a right angle down on the board and the same distance between the two femora and the two humeri as when they were attached to the pelvis and shoulder blade must be calculated upon. This can be done by taking accurate measurements beforehand from the carcass after skinning, or from a skeleton. The wires which have been bent along the back of each of the leg bones will serve as patterns by which to make their counterparts in iron rods. The iron rods should be one-fourth inch in thickness and should be bent and made the exact shape of the wire patterns. Now insert them in the leg skin, tie them fast to the bones and begin to replace the muscles of the legs with tow precisely as you have done in the legs of the squirrel, wrapping and binding the tow down with cord.

The tendon of Achilles forms over the heel; between it and the lower end of the tibia there is always a deep hollow where the skin of both sides touches. It is very pronounced in the large and the short-haired mammals. This may be nicely imitated by drilling a hole in the end of the calcaneum, and, by winding a copper wire with tow to the thickness of the tendon, fasten one end of this artificial tendon in the hole you have drilled, and the other end half way up to the knee on the tibia. This is clearly shown in C. C. Plate LII. Having imitated the muscles of the legs in tow, with the leg irons in their places, we shall now begin to make the center board. Lay the skin out full length on the work bench and allow the leg irons to cross each other where they naturally will inside the skin, as seen in the squirrel skin, Plate XLV. In order to form an idea of the center board we shall examine the one in the first steps in the structure on which we mount the greyhound, Plate LII. The center board we are about to make, however, is *very much different*, being in a single piece, much narrower, about four and one-half inches wide for our coyote, of tough wood and rounded or oval at both ends. It is simply a slender bar of wood, around which you can easily work while filling the body skin. Now give the skin of the head a heavy coating of arsenical paste. The ears having been skinned to their tips and the cartilage removed, it must be imitated with sheet copper or lead cut

WIRING SMALL QUADRUPEDS.

M. B. Stollas' method of wiring small quadrupeds. See page 184.

and hammered out the proper shape and inserted in the ear skin. When the cartilage of the ear has been made the exact size and shape with sheet copper or lead and carefully adjusted with clay it is impossible for the ears to lose their shape or shrivel. This is by far the best method of shaping the ears of all the large quadrupeds. Ere this time the muscles on the skull have been replaced with clay and chopped tow, and you may now insert the modeled head in its proper place in the skin. On the top of one end of the center board fasten with staples the neck rod, and pass it through the opening in the back of the skull and through the nasal cavity as seen in Plate XLV. For the tail wire cut off a piece of wire sufficiently long for its full length, and also long enough to fasten on the other end of the center board in the same manner you have fastened the neck rod. Before doing this the tail must be made on the wire by wrapping tow around the wire to its proper thickness its full length. We will now fasten the leg wires to the center board. If you have taken measurements of the distance between the lower end of the shoulder blade and the lower end of the pelvis bone, you will know exactly where to drill the holes in the center board. For various reasons the holes should be slanting on just about the same angle as the wires appear in Plate XLV. The ends should be bent close to and on opposite sides of the board and clinched fast with staples. The next bend we make in the leg wires is at a right angle in order to stand the animal on its feet. In doing this be sure that the width between the lower ends of the pelvis and shoulder blades (where the femur and humerus join them) are the same as they were in the carcass. These measurements are of great value and should be followed closely. When this has been done we are ready to fill the body skin and shape the animal for mounting on its pedestal. Before we begin this operation let us examine the center board to see if it is in the middle of the skin, so that we can work freely all around it; and also that every joint is firm. Give the entire skin a coat of arsenical paste and rub on a mixture of two-thirds powdered alum and one-third arsenic. Begin to fill the neck skin with tow or hackled straw; place a cushion of tow, along the back, on top of the center board; fill around the shoulders, around the thighs and at the base of the tail. Do not fill one side before you begin on the other, but fill both sides alternately and all other points as you proceed in a like manner; you can by so doing equalize the skin on all parts of the animal. In the larger specimens use the stuffing rods as figured in Plate IV. When you have filled the skin to its natural fullness from measurements previously taken, begin to sew up the opening as I have directed in the mounting of the squirrel, by the understitch, filling in any of the parts that seem to be deficient as you proceed. Continue to sew the opening all the way to the end of the tail. The coyote is now ready to be placed on its pedestal, but only for trial. If the holes you have made to receive the leg irons in the temporary stand are not exactly correct you will have to make others until the legs assume their proper attitude on the board. At this stage the animal may be unsightly in form and attitude, but do not get discouraged. It may need filling here and there where you have overlooked the proportions, or miscalculated; or, perhaps you have not followed your measurements close enough. Take it from its pedestal, and wherever there is a place in the body that needs filling which you can reach through the seam which you have sewed up, cut the threads in the opening, and fill with tow any part that is deficient in filling, or, distribute the tow in the portions that are too full to other parts that are lacking. In this way you must manipulate, mould and form your animal until it has reached its proper proportions in every part. Study your subject as carefully now as you did before it was skinned, and refer to your measurements, drawings, casts, etc., constantly. We shall once more place it on its pedestal and examine critically its form, attitude, and the position of the legs. Upon this trial we have succeeded in shaping the coyote nearly as we desire, and it begins to look more natural; the finishing touches, however, will work wonders in its appearance. We can now place washers on the threaded ends of the leg irons beneath the pedestal, put on the nuts and screw them up firmly. At this stage the important part of the operation lies in giving the correct form to every part of the animal, and for this you will depend largely upon your measurements, drawings, etc., and also upon your knowledge of the proportions of the living subject; the latter being, sometimes, all that we have to depend on in mounting specimens from dry skins. We will fill the cheeks out to their natural fullness with chopped tow and potter's clay, and if you have pocketed the lips (see Chapter X), fill the pockets with clay and press them into shape, and make them come close together as in life; in this shape and position they will dry and never shrink. Some taxidermists sew the lips closed with thread, as seen in Fig. 6, Plate XLVI. This is quite unnecessary, and you will never resort to it when you have learned by experience the value of clay for this purpose. Insert the eyes in clay mixed with strong glue-water, or imbed them in papier-maché. The color-



WIRING SMALL QUADRUPEDS.

The figures in this plate illustrate a system of wiring different from that exhibited in Plate XLV. The various procedures are so clearly shown that an explanation is unnecessary. See foot-note on page 186.

ing of the nose and the modeling of tongues, open mouths, etc., will be described in the next chapter.

It sometimes happens that certain parts of aged skins have been stretched too full, and it is necessary to cut out an oblong or thin triangular piece of the skin; the shape of the cut depends altogether on the quantity of skin necessary to be worked away and the position of the cut in the skin. The filling can be taken out and the seam sewn up; if the part needs stretching, a slit can be made and more tow can be introduced and the skin forced out to better proportions.

The Center Board Method with Iron Squares.—We have already discussed the center board, and we must now consider the iron square. This is a contrivance which looks like a door hinge open at right angle. It has three holes for the reception of the leg irons, and two or three may be made to fasten it to the center board. The iron square has been used in the mounting of the ostrich, Fig. D, Plate XXIII; in the greyhound, Figs. A, B, Plate LII; and in the horse, Figs. A, B, Plate LVI. There are several advantages in using the iron square on center boards of any description, and chief among them may be cited the fact that in case you have the quadruped coupled too long or too short it is an easy matter to change the leg irons from one hole to another in the square until the proper distance has been obtained. Therefore, the reason we make three holes in the square for the reception of the leg irons is obvious. Even after we have the animal very nearly completed, and discover that the legs are coupled too long or too short, it is a matter of only a few minutes' labor to make the change without the extra labor of taking the entire quadruped apart. This iron square is very useful when we are mounting a dry skin which has come to us without measurements, and where we have to make our measurements by analogy. The distance between the joint where the humerus connects with the shoulder blade and where the femur joins the pelvis can be adjusted with very little effort. The iron square is fastened to the center board with screws or bolts, the latter being the best in the larger specimens; these can be taken out and the square put forward, backward, raised or lowered, according to the deficiency in either case; but after a little experience in mounting mammals by this method it seldom occurs that the screws or both have to be removed to make a change; the holes made for the leg irons generally give us sufficient latitude to correct any error in the coupling. The thickness of the square should vary in strength according to the size of the animal—from one-eighth to three-eighths of an inch. Do not allow the half of the square which receives the leg irons to extend out too far. This should correspond exactly to the width of the pelvis and the distance between the heads of the humeri. Of course you will have to depend upon the measurements you have taken of these points in the carcass or skeleton. The iron square may be used on the narrow center board in *all the larger quadrupeds* mentioned in this chapter, and the specimens are all stuffed precisely as we have directed in the case of the coyote which we have just finished, and it would be unnecessary for me to repeat the details. It requires forethought, ingenuity and hard work from beginning to end to mount any of the larger mammals by the soft filling method. The broad center board and the iron square obtain their highest value in the *dermoplastic* method, as exhibited in the mounting of the ostrich, Plate XXIII; that of the greyhound, Plate LII, and of the horse, Plate LVI. The mounting of large mammals will be fully discussed in the next chapter.

Making up Skins.—The object of making up dry skins is either to form them into shapes best to handle in scientific study, that they take up as little space as possible in a cabinet, or for the purpose of transportation from the field, or for mounting at some future time. We shall first consider the making up of cabinet specimens. The most beautiful and artistic small mammal skins which I have ever seen are those prepared by Dr. Jasper. The fox squirrel skin in Plate XLVIII is an example of how some of them are shaped; in this specimen the tail is thrown over the back. Sometimes the tail is arranged over the belly, which is better in case the skin is made up for transportation. In all the smaller long-tailed specimens, and in every case, the tail should be wired and made as directed on page 83, to protect it from injury, and the legs and feet should be arranged with the same end in view. Many skins are made up with the tail parallel with the body. In large specimens the tail, which has been split open, may be left flat. The skull can be replaced in the skin of the head if desired, the cheeks filled out to their fullness, the muscles of the legs replaced with tow, and the body filled full and pressed into shape after the opening has been sewn up. If, after you have sewed up the opening, you discover that the skin is too full, or lacking filling in any part, cut the seam open and remedy the defect, whatever it may be. Be sure not to fill the skin too full; this is a common fault. One of the best methods to dispose of the skull is to place it in the abdominal region with the filling. When this is done, the skin of the head must be nicely filled with tow. The lips may be held together by taking a stitch in the middle of the upper and lower and tying them together. In all cases, in the field or in the workshop, before filling the skin give

SEWING UP THE OPENING IN SMALL QUADRUPEDS, WITH FORMS AND ATTITUDES.

Fig. 1, showing the manner of taking the understitch in sewing up the opening in quadrupeds; Fig. 2, Fox Squirrel mounted on a limb; Figs. 3 and 4, Striped Ground Squirrel, Chipping Squirrel or Chipmunk; Fig. 5, Common Shrew; Fig. 6, Common Mole.

the inside a coating of arsenical paste and then rub on a mixture of two-thirds powdered alum and one-third arsenic. If you are in the field and nothing but salt is obtainable, put on all the skin will hold. When large skins are to be hung up to dry, it is best to give them a coat of arsenical paste and equal parts of powdered alum and salt. Mammals that are skinned, like the deer in Plate LI, should be folded similar to our dog skin in Plate XLVIII, with the leg bones attached to the skin and folded. The legs may be arranged underneath. In this case the bones of the legs should be wrapped with tow, paper, cotton, cloth, straw or dry grass to keep the bones from touching the skin. In this shape the skin is a good one for study or for mounting, and in excellent condition for shipping. If the subject is larger than a deer, for example an elk or a moose, it is always best to disjoint the legs at the first joint above the foot, in the hind legs leaving the calcaneum attached to the canon bone, which will remain in the skin. By so doing the skin may be folded into smaller compass, and the leg bones and skull may be bundled together and properly labeled as belonging to a particular skin. The skin and the bones may be done up in separate bundles and more easily transported than with all the bones attached to the skin in animals of large size. Any collector who has had the least experience in mounting mammals, especially those prepared upon the dermoplastic method, will never be guilty of throwing away any of the leg bones. They are the guide by which we are to obtain the true length of the legs and the shape of the joints. If we do not have these or others, we must imitate them the best we can by carving them out of wood. If it is absolutely necessary for you to lighten your burden in traveling from the field, do at least, save all the bones of one hind and one fore leg; they are valuable, for accuracy is the chief object in mounting a mammal.

Never allow the flat skin of a mammal to dry in the sun, but *always in the shade*, using the preservatives as directed above and as noted on page 40.

No animal skin should leave your hands without a label attached to it, containing date, locality, measurements, etc., as noted in Chapter III, page 56. The measurements which should be taken of small mammals will be found on page 182 (foot-note), and those for the large specimens in foot-note on page 220.

After all that has been said on the preparation and making up of dry mammal skins, I shall emphasize what has already been said concerning the *preservation of skins in a wet state* with the salt and alum bath in the lead-lined tank, as devised by Professor Wiley, pages 61-62.

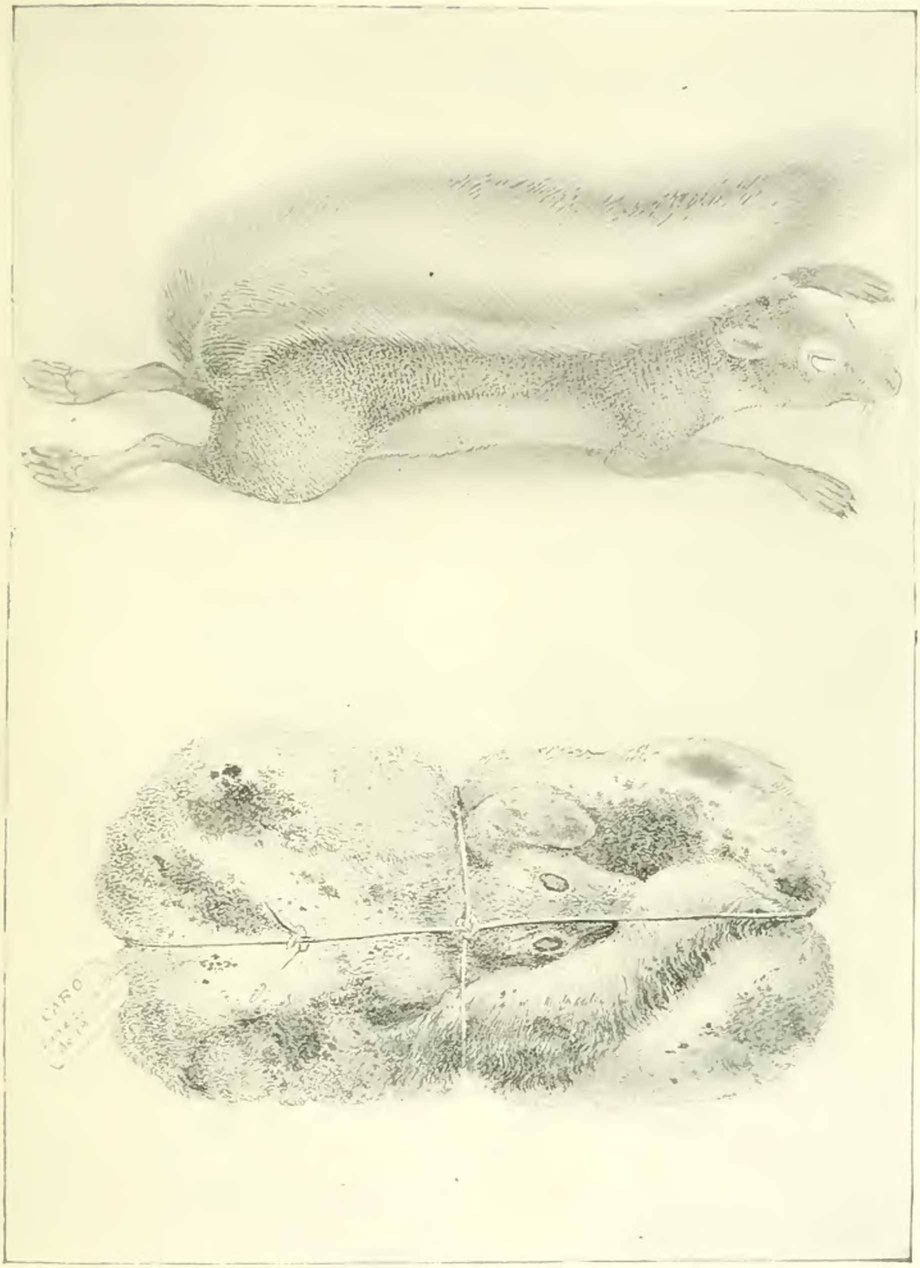
If you are so situated that the lead tank is out of the question, then resort to kegs and barrels, while salt and alum may be procured anywhere you may travel in the world. If the design be to mount the specimens collected in the field, this is positively the best manner for their preservation, under all circumstances.

Relaxing Dry Skins of Mammals.— I shall here describe the method I have always employed in relaxing the dry skins of mammals, whether they be the size of a mouse, or from that upward to the size of an elephant. To relax an old, dry skin of a deer, elk, moose, horse, or anything larger, the best plan is to place it in clear, lukewarm water, or, in case that cannot be had, cold water will do. In this condition, the skin must not be allowed to remain in the water too long, and must be examined frequently to see that it does not macerate, which will cause the hair to come out. It will soon become pliable, however, especially if worked vigorously with the hands. The next step is to take it out of the water bath, throw it over a beam, as the tanners do, and either scrape it with a skin-scraper or toothed currier's knife (Figs. 7, 8, Plate II), or thin the skin down with a sharp, common carpenter's draw-shave, or a keen-edged currier's knife (Fig. 9, Plate II). Do not be afraid of cutting the skin too thin; do not trim down below the roots of the hair, for the hair will come out. Where you cannot use the currier's knife or draw-shave, apply the scraper and plenty of physical force. Work at the skin with the determination to make it as soft and elastic as possible, and this can be done only by *hard work*. It is sometimes necessary while at work to place the skin on a smooth surface in order to work to the best advantage with the scraper.

To lessen the power of shrinkage in a skin, the fibres must be separated, and this may be done by cross-cutting the skin with a sharp knife. This is particularly essential about the head, where frequently a peculiar expression is to be obtained, and if the animal has whiskers by this mode of cutting you are not liable to pare the skin down so thin that the whiskers will come out.

I once spent three days' labor on a horse's skin which was two years and a half old, and at the end of the third day the skin was almost as soft as a kid glove. If there were any faults in the shapes which I afterward gave to the various parts of the skin on the clay model, they could not be attributed to the condition of the skin, for its pliability was all that could be desired. You cannot give the proper form to a skin that is hard and thick.

In order to have complete control over the shaping of a skin to



SKINS OF QUADRUPEDS.

Upper figure, Fox Squirrel skin, showing one method of shaping skins of small quadrupeds for cabinet specimens.

Lower figure, Dog skin made up as a specimen for study or for transportation (see page 200).

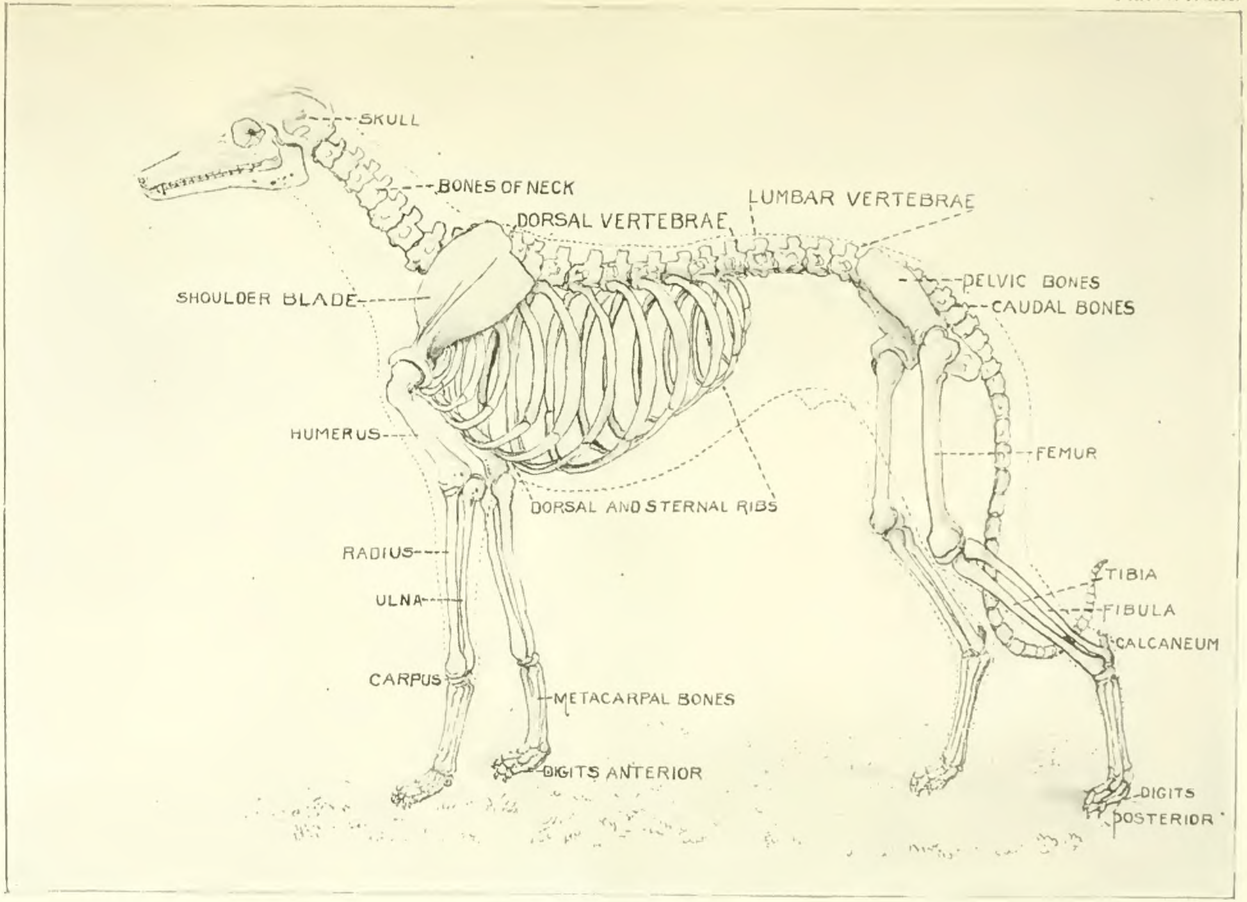
the clay, it must be thinned down so as to be perfectly elastic and soft. Then you can model it down to the clay and give it characteristic shapes — this is particularly the case in forming the face, where there are often peculiar hollows and elevations impossible to produce with a thick, hard skin.

Skins can usually be relaxed in the salt and alum bath of 12° strength. If they do not yield in that, the clear water must be resorted to. In relaxing all skins smaller than that of a deer, I use the salt and alum solution at 12° strength with perfect success. A chimpanzee skin which was made in 1890 I relaxed this year (1893) in this manner within eighteen hours.

Dr. Jasper has a method of thinning down the skin so thin that it becomes translucent, and colors can be painted on the inner side so that they will show through. In the faces of the great baboons that are striped with brilliant colors the skin is pared down in this manner and the colors applied both to the skin and skull. If, for example, the color of the face be a red, the skull and the skin should be painted an *intense* red; sometimes, in order to produce the proper red tint on the outside, it is necessary to use Chinese vermilion.

Open Mouths, Tongues, etc —If a mammal is to be mounted with open mouth, exposing the teeth and tongue, expressing a state of rage or anger, the entire head must first be modeled in clay, as when the mouth is to be closed. The nose and cheeks must be filled to their natural fullness. The lips must be brought in position and held there with the clay and arranged according to the facial expression desired to be obtained. Sometimes it will be necessary to hold the lips in place by driving double-pointed tacks into the jaws, or by taking stitches across from one side to the other over the jaws. Now allow the clay to dry before you begin to model the mouth with papier-maché. Do not be alarmed if the lips have shrunken a little. If you have pared them down thin enough the shrinkage will be very little, if any. When the skin and clay are thoroughly dry, clean the whole mouth out generally by digging out the surplus clay from between the lips and the jaws and in the interior of the mouth. When this has been done, mix up some fine, sticky papier-maché (see directions, page 22), and get out your steel modeling tools, as figured in Plate IV. Model the gums with the maché up to the jaws, keeping the modeling tools wet so that they will slip over the maché smoothly. Model the entire inside of the mouth in the same manner, imitating as closely as possible all the characteristics which you saw in the mouth of the animal before it was skinned. When you have done this according to your taste, set the animal away until the papier-maché is perfectly dry. A tongue must now be made from the skin of the natural one or constructed artificially. The best are made by using the skin of the natural tongue, for it is impossible to imitate accurately the papillæ, which are so characteristic in the tongues of many species. To do this the entire tongue must be taken out while the animal is being skinned, and preserved in alcohol diluted with one-third its bulk of water. This is the best means of preservation until we are ready to prepare it. The tongue should be slit open on the under side almost to the tip and nicely skinned. Now cut out a piece of sheet copper or lead the shape of the tongue and imbed it in the skin of the tongue with clay and sew the opening up. Be sure, however, to leave the copper or lead project long enough from the rear of the tongue so that it can be anchored in the back part of the mouth in papier-maché. Now give it the proper shape, and when dry it may be painted with tube colors and turpentine and inserted in the mouth. The tongue and mouth of the Bengal tiger rug, in my private museum, seen in the frontispiece of this work, were made in the manner above described, also that of the cougar in the same plate. Another method of making a tongue is simply to cut out a piece of sheet copper the proper shape, cover it with papier-maché and paint it. Be sure to study the color of the tongue before applying the paint, and mix the tube colors with nothing but turpentine. Before you proceed any further, clean the teeth with a weak solution of muriatic acid; make them as white as ivory, if possible. In coloring and finishing the inside of the mouth, the lips and the gums, use white wax and tube colors. It must be borne in mind that this final touch is to be done over the papier-maché. Place the wax in a small tin vessel and heat it until the wax has melted; then mix in the desired color from the tube paints and apply it on the modeled gums and lips with a small flat bristle brush. This should be done by strokes, and great care should be exercised not to allow the colored wax to pile up. Should this be the case, however, heat a steel modeling tool and smooth the colored wax out over the surface. The most useful vessel in which to mix the colors with wax is one made of tin like a glue-pot, but of very small size. The wax, by this means, can be melted without any danger of its "burning" or changing color, as is sometimes the case over fire heat. The open mouths of all mammals and reptiles should be modeled in the same manner as described in this section.

Restoring Colors to Dried Specimens.—Many museum specimens lose during the drying process certain characteristic colors which



SKELETON OF A GREYHOUND.

The bones of quadrupeds referred to in Chapters IX and X are named in this plate.

must be restored by artificial processes. The patches of bare skin in some birds and quadrupeds, as well as the lips, tongue, nostrils, etc., of the latter must be restored to proper coloration by the use of paints. To accomplish this skillfully is not always an easy task. The taxidermist who would execute his work in the most efficient manner must put into use a considerable amount of skill, patience and ingenuity.

Careful notes should be made when the specimen is fresh of the colors that are known to be evanescent, or it will serve better if a live or freshly killed specimen can be used for observation at the time the dried one is to be colored. The surface to be painted should be dry and clean. All shot-holes, if any exist, must be filled with papier-maché, over which two coats of shellac varnish should be applied. The papier maché being porous, rapidly absorbs the oil of paint applied directly over it, leaving the paint to dry with a dead color. The shellac prevents the absorption of the oil, and the whole painted surface will dry uniformly.

Materials.—The best materials for restoring colors are such as are used by artists in oil painting. The Windsor and Newton tube colors, as recommended on page 22, are fully sufficient for all fine work. The pigments and other supplies to be employed in coarse taxidermic work have already been discussed in Chapter II, pages 51 and 52. Of the many colors that may be obtained in tubes, a few only will answer the purpose of the taxidermist, since from these, carefully selected, all the ordinary tints that will be found serviceable in taxidermy may be produced. They may be mentioned as follows: Vandyke brown, Prussian blue, ivory black, chrome yellow, Naples yellow, zinc white, raw and burned umber, raw and burned sienna, yellow ochre and vermilion. Possibly a few others may be added with advantage. Use the middle of the palette for blending colors and the margin for depositing such primary colors as you desire to use in mixing.

Tone of Colors.—It will be noticed that the colors in specimens to be painted are usually of a subdued nature, seldom gaudy or glossy. Care should, therefore, be exercised that the proper tone may be acquired before applying. The lips of quadrupeds must be mentioned as exceptions to this rule, as they are always more or less glossy. When it is necessary to produce a gloss, boiled linseed oil may be used in thinning the colors on the palette; but if no gloss is desired, turpentine should be used exclusively. The less gloss required the less oil should be used and the more turpentine.

PLATE L.

SUPERFICIAL MUSCLES OF THE HORSE AND DOG. FACIAL EXPRESSIONS OF THE HORSE, TOGETHER WITH THE FORMATION OF ITS NOSTRILS, LIPS AND MOUTH.

Fig. 1, illustrating many of the prominent muscles of the horse, as follows:

Muscles of the Head.—*a*, dilator naris lateralis; *b*, orbicularis oris; *c*, levator labii spurioris; *d*, zigomaticus; *e*, buccinator; *f*, masseter; *g*, abducens aurem.

Muscles of the Neck and Shoulder.—*a*, *a*, levator humeri; *b*, trapezius; *c*, *c*, scalenus; *d*, Rhomboideus longus; *e*, sterno maxillaris; *e′* sterno scapulari; *f*, antea spinatus; *g*, scapulo-ulnaris; *h*, *i*, triceps extensor brachii; *k*, postea spinatus; *c*,* latissimus dorsi.

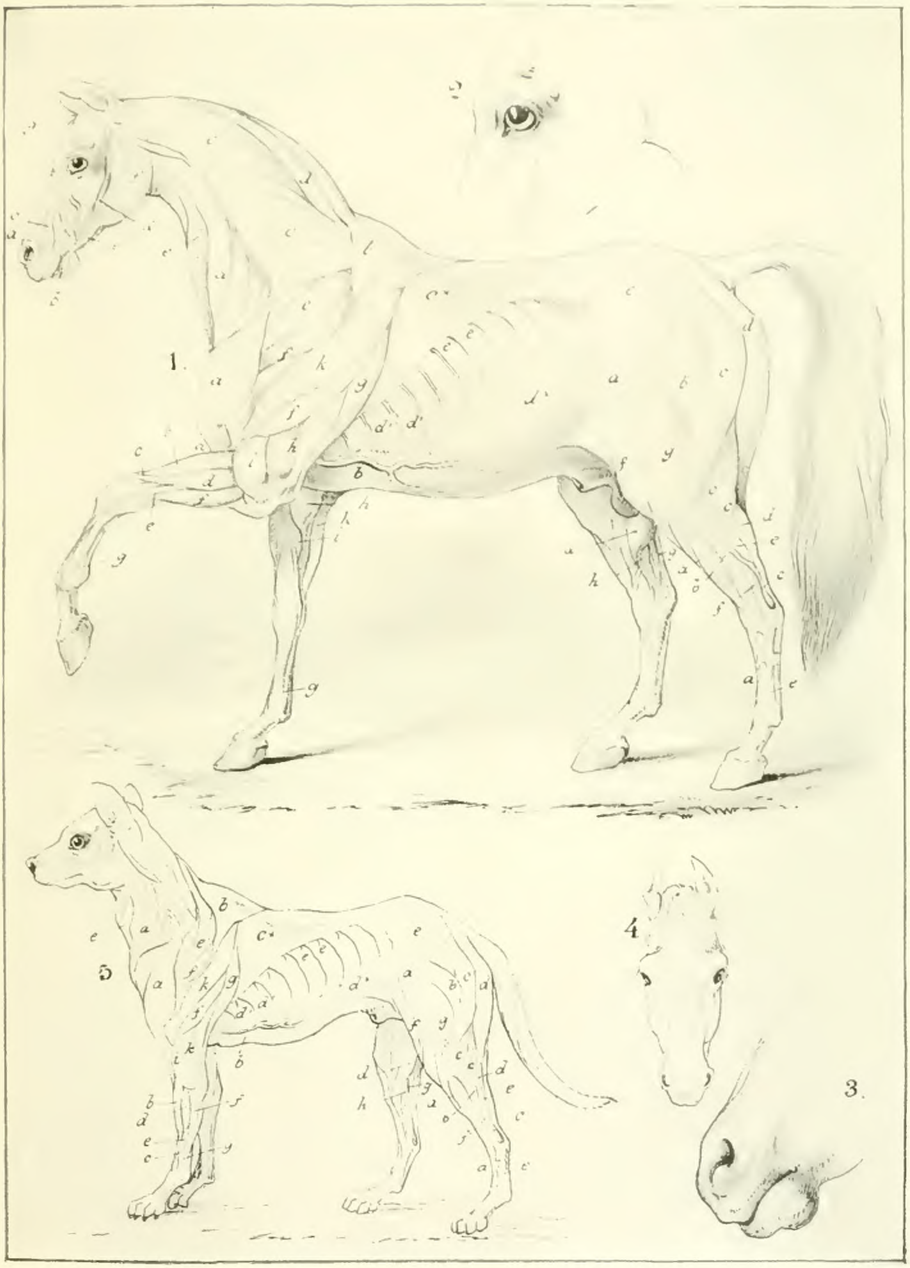
Muscles of the Fore Leg.—*b*, extensor metacarpi magnus; *c*, extensor, metacarpi obliquus; *d*, extensor pedis; *e*, extensor suffraginis; *f*, flexor metacarpi externus; *g*, tendon sperforans; *h*, flexor metacarpi externus; *i*, flexor carpi radialis; *k*, flexor metacarpi medius.

Muscles of the Breast and Belly.—*b*, pectoralis magnus; *d*, *d*, seratus magnus; *e*, *e*, serratus lumborum; *d*″, obliquus internus abdominus.

Muscles of the Pelvis.—*a*, tensor vaginæ; *b*, *c*, gluteii muscles; *e*, triceps abductor; *d*, *d*, biceps abductor tibialis; *f*, rectus; *g*, vastus externus.

Muscles of the Hind Leg.—*a*, extensor pedis; *b*, extensor; *c*, tendon Achilles; *d*, gastrocnemi; *e*, flexor pedis; *f*, flexor digiti longus; *g*, gastrocnemius internus; *h*, flexor pedis accessorius; *a*, *e*, tendons.

Fig. 2, side view expression of the face; Fig. 3, formation of the nostrils, lips and mouth; Fig. 4, front view of face; Fig. 5, superficial muscles of the dog, letters corresponding to those in the horse.


1.
4
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3.

Applying Colors.—Apply your colors smoothly and, as a rule, very thin. If it is desirous that paint should dry rapidly, mix with it on the palette a little sugar of lead, which may be obtained in tubes similar to the paints. There are cases in which a brush cannot be used with advantage. In the case of some quadrupeds sparsely covered with hair, the skin will assume a disfigured appearance and be plainly visible. To restore the natural color, mix paint of the desired tint very thinly with turpentine. Take a small funnel, place the opening close to the skin and pour very slowly the thin paint into the funnel, allowing the skin to become saturated. The paint will spread quickly and evenly over the adjacent portions of the skin. Move the funnel to other parts of the skin and repeat the operation till all the skin has been colored.

CHAPTER X.

THE DERMOPLASTIC METHOD OF MOUNTING MAMMALS.

Here is a branch of taxidermy which partakes more or less of the elements of the sculptor's art. The principles embodied in this plan of mounting mammals are of the most practical kind, lacking in no detail which will aid in attaining any form or attitude the artist may design.

The dermoplastic[1] method involves the building of a manikin of iron, wood and tow, the muscles being modeled in clay and the skin perfectly fitted over the clay-covered structure.

If the beginner is a *born* sculptor he will have ample opportunity of displaying his powers in the construction of mammal models upon these principles. Dr. Jasper has employed this method of mounting large mammals since 1850. Phillipp Leopold Martin, the German taxidermist, was the first to advocate by publication the clay-covered manikin in 1870, and again in 1876; it has since been very generally adopted by taxidermists the world over. While the procedures require longer time for their execution, and are more complicated in their manipulation than others heretofore employed, the results possible to be attained are far superior to any method ever adopted. The dermoplastic method is, in a word, employed in the mounting of all large mammals, all short-haired and hairless quadrupeds, as for example the hairless Mexican dog, pointer, bull-dog, greyhound, tapir, bears of great size, deer, antelope, elk, giraffe, rhinoceros, hippopotamus, elephant, etc.

Before skinning an animal which is to be mounted by this method we should take full and accurate measurements of the subject as it lies before us. To the beginner these are of the utmost importance, for by them he must reproduce the sizes and proportions which are natural to the animal in life. If you would be accurate, by all means possess a sketch-book and make an outline drawing in pencil of the spec-

1. This word, which best describes the particular method, is from the Greek *derma*, skin, and the verb *plasso*, to form, to give form or fashion to a mass of matter capable of being modeled or moulded as plastic clay.

PLATE LI.

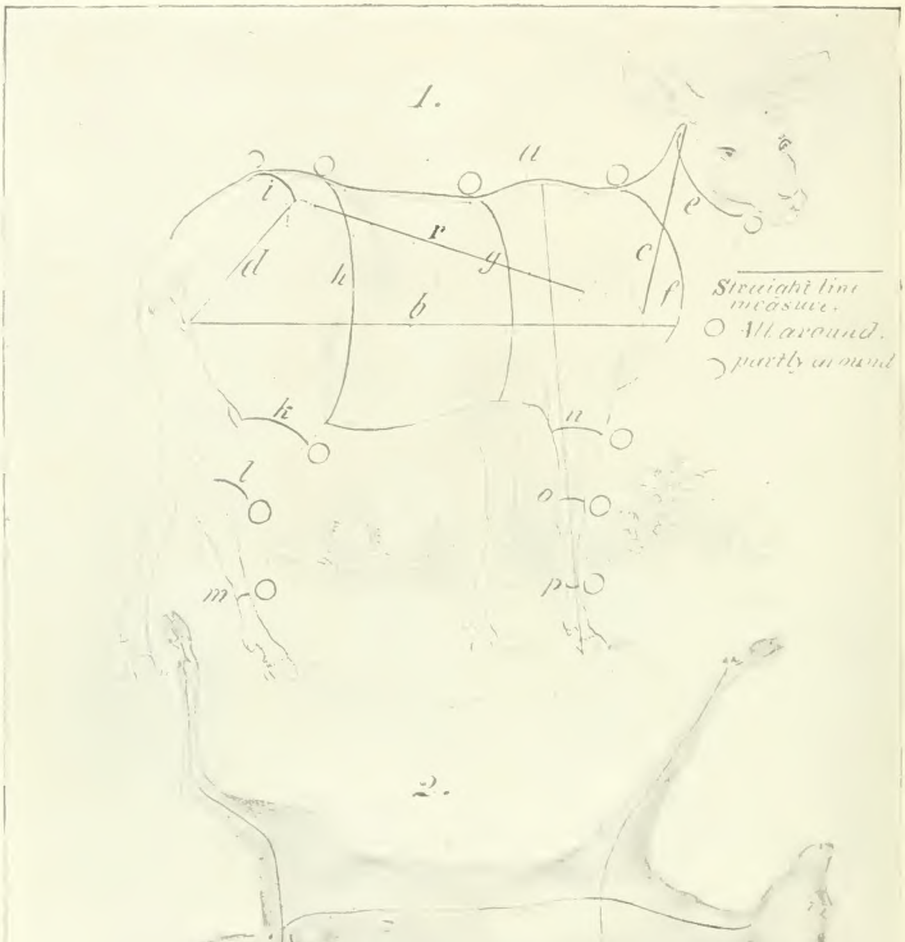

PLATE LI.

MEASUREMENTS OF LARGE MAMMALS.

Height of shoulder, which means from the sole of the foot to the top of the shoulder. This is best taken by placing a rod perpendicularly at the top of the shoulder, *a*, and holding the leg up on a level with the body in an easy position; now measure from the sole to the perpendicular at the shoulder.

Length along the back is made by beginning at the base of the skull and running the tape-line along the line of the back to the base of the tail.

Length of body is on a straight line from the chest to the end of the hip muscles, or muscles of the rump, as in *b*. This measurement may be made by holding a rod in a straight line and placing a stick perpendicularly at the chest and another in the same position below the tail. The measurement is taken between these.

Length of neck, from the chest to the base of skull back of the ear, *c*.

Thigh measurement, from the knob of the thigh-bone down to largest part of thigh under the tail, *d*.

Circumference of neck just below the head, *e*.

Circumference of neck just in front of the chest, *f*.

Circumference of body behind the fore legs, *g*.

Circumference of body just before hind legs, *h*.

Top of back, from humerus to middle of back, *i*. To obtain this measurement you will have to feel for the knob of the femur and then strike the center line of the back.

Hind and fore leg measurements, *k*, *l*, and *m*; *n*, *o*, and *p*, circumference at three points as indicated.

Humerus and femur measurement. This is one of the most important measurements which can be recorded, and it should be again taken after the animal has been skinned, *r*. Feel for the knobs of the humerus and femur and measure the distance between them. With this measurement you can place the iron squares in their proper places for the reception of the leg irons.

Length of tail is always a necessary measurement when a mammal is to be mounted on the dermoplastic method.

Circumference of muzzle and head. The circumference of the muzzle in at least two places should always be recorded, also one of the head in front of the ears.

imen, on a similar plan as we have it in Fig. 1, Plate LI, and on the opposite leaf enter carefully each measurement, together with other notes and remarks which you may think would be of value to you in the construction of the manikin or clay model. This sketch-book should be kept for future reference. In the smaller specimens, which should be mounted upon the dermoplastic method, the best plan after taking full measurements, sketches, etc., is to make plaster casts of the prominent muscles of the hind and fore legs and of the head after skinning. Making casts will be fully treated in the last chapter. For my purpose of describing the measurements of mammals to be mounted by the directions given in this chapter, I shall take for my outline the deer, Fig. 1, Plate LI.[1] These same directions will be found facing this plate, which will facilitate ready reference. The measurements given below are recommended for all mammals which are to be mounted upon the dermoplastic method.

Skinning Large Mammals.—The manner of skinning mammals of great size and the short-haired ones for mounting by this method differs from the skinning of small quadrupeds, chiefly in one particular, which is as follows: A cut is made from the bottom of the foot up the back of the leg nearly to the first joint, and from thence up the inside of the leg until it meets the center incision which has been made along the belly. This is very distinctly shown in Fig. 2, Plate LI.

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1. **Measurements of Large Mammals.**—Before taking these measurements make notes of the color of any external fleshy parts which the animal may possess. If it is to be mounted with the mouth open study its tints and peculiarities.

HEIGHT AT SHOULDER, which means from the sole of the foot to the top of the shoulder. This is best taken by placing a rod perpendicularly at the top of the shoulder, *a*, and holding the leg up on a level with the body in an easy position; now measure from the sole to the perpendicular at the shoulder.

LENGTH ALONG THE BACK is made by beginning at the base of the skull and running the tape-line along the line of the back to the base of the tail.

LENGTH OF BODY is on a straight line from the chest to the end of the hip muscles, or muscles of the rump, as in *b*. This measurement may be made by holding a rod in a straight line and placing a stick perpendicularly at the chest and another in the same position below the tail. The measurement is taken between these.

LENGTH OF NECK, from the chest to the base of skull back of the ear, *c*.

THIGH MEASUREMENT from the knob of the thigh-bone down to largest part of the thigh under the tail, *d*

CIRCUMFERENCE OF NECK just below the head, *e*.

CIRCUMFERENCE OF NECK just in front of the chest, *f*.

CIRCUMFERENCE OF BODY behind the fore legs, *g*.

CIRCUMFERENCE OF BODY just before hind legs, *h*.

TOP OF BACK, from humerus to middle of back, *i*. To obtain this measurement you will have to feel for the knob of the femur and then strike the center line of the back.

HIND AND FORE LEG MEASUREMENTS, *k*, *l*, and *m*: *n*, *o*, and *p*, circumference at three points as indicated.

HUMERUS AND FEMUR MEASUREMENT. This is one of the most important measurements which can be recorded, and it should be again taken after the animal has been skinned, *r*. Feel for the knobs of the humerus and femur and measure the distance between them. With this measurement you can place the iron squares in their proper places for the reception of the leg irons.

LENGTH OF TAIL is always a necessary measurement when a mammal is to be mounted on the dermoplastic method.

CIRCUMFERENCE OF MUZZLE AND HEAD. The circumference of the muzzle in at least two places should always be recorded, also one of the head in front of the ears.

A few years ago, before skinning two African Elephants of small size I obtained the exact curves of their backs by pressing bars of lead close along the middle line of the back, thus obtaining very accurately their shapes. The shapes of the curves between the legs were secured in the same way.

The center incision begins at the throat and extends to the vent, and the tail is slit open and skinned quite to the tip. In large mammals, such as elephants, the skin is removed in three pieces, so that it may be handled with facility.

The skin of the elephant Jumbo, for example, which was mounted at Ward's Natural Science Establishment, Rochester, New York, was taken off in three pieces, the head and neck in one, the body in two, by cutting along the middle of the back and belly until the cuts met that severed the head and neck and divided the body skin.

The legs should be disjointed from the body where the fore leg joins the shoulder blade and where the hind leg joins the pelvis bone. Skin the legs by turning the skin wrong side out over the foot, and cut all the flesh away from the bones and clean them thoroughly. In mammals above the size of a deer, the bones of the legs may be detached at the first joint above foot, as the skin can then be more easily handled; the bones, however, should remain attached to their ligaments.

The skin should be cut neatly from the body and every particle of flesh adhering to it removed.

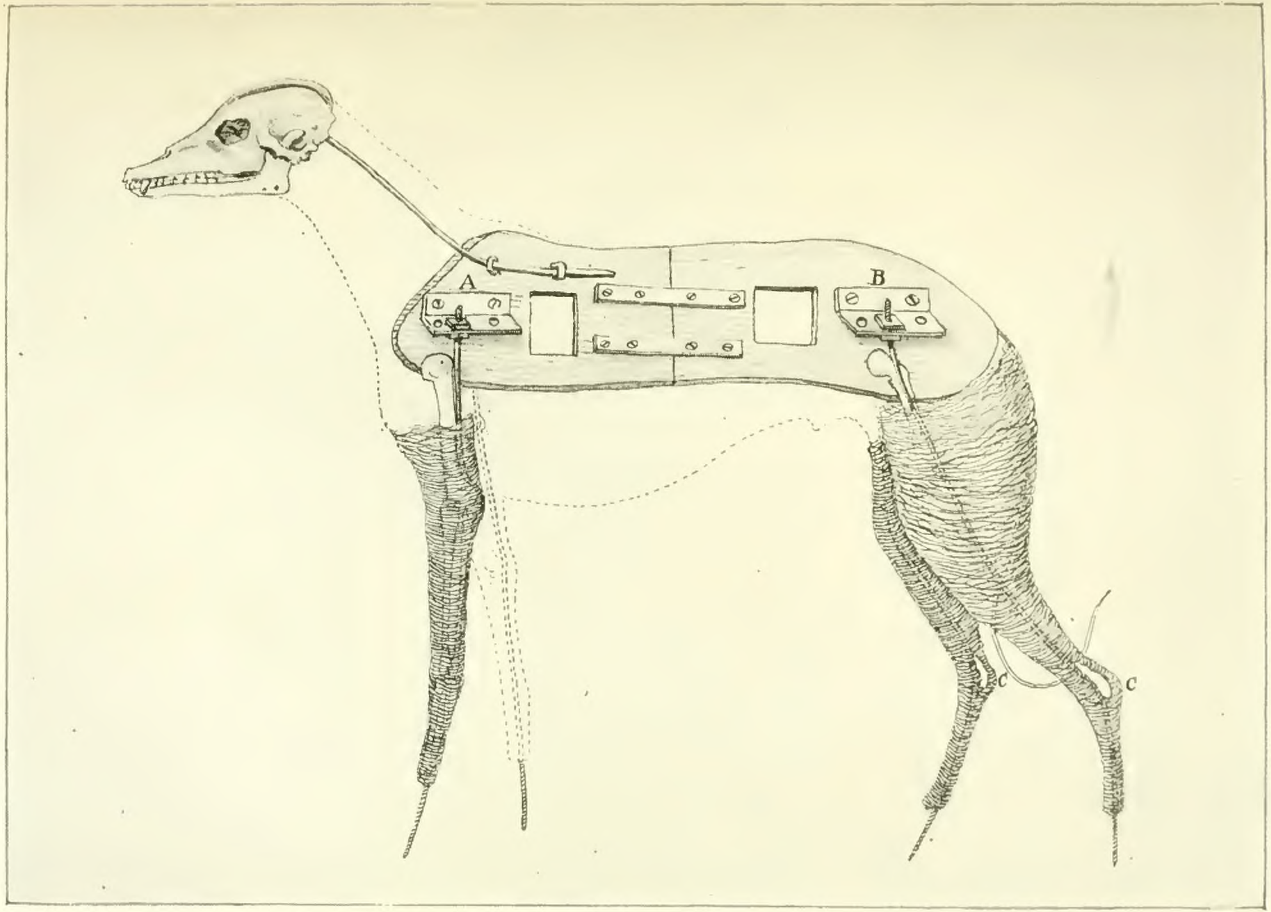
When you have skinned down far enough to reach the ears, cut them off close to the head and continue to turn the skin wrong side out over the head, being careful while skinning over the eyes, mouth and nose, as I have previously directed. The thick, fleshy upper lip must be split open from the inside and the flesh pared off. When split in this manner it can be thinned down, and a pocket formed in which we can place clay and give the lip its natural fullness. The head of an animal having horns must be skinned through an opening made in the back of the neck and across from one horn to another, as is seen in Fig. 1, Plate LXIX. Some make this opening in the shape of a **Y**, the incisions reaching to and around each horn. The skin is cut away completely around the base of each horn, while the skin of the head worked down over the skull and cheeks.

Skinning the ears to their tips and removing their cartilage is a tedious operation, requiring patience, care and perseverance. There is more than one decided advantage in skinning the ears all the way to their tips and removing the cartilage. In the first place, you can thoroughly poison them; secondly, when the cartilage has been nicely replaced with sheet copper or lead cut and hammered the proper shape, and the lower portion filled with clay, it is impossible for the ear to curl up or shrivel; it will always retain the shape you give to it. Now wash off every blood stain before you go any farther.

The first thing to do after you have removed the skin from an animal and carefully washed all blood stains out is, to set about and prepare it, so that you can successfully mount it. To do this you must spare no labor. In order to give any form you may desire to the skin while molding it down to the clay on your model, you *must cut it as thin as it is possible to make it.* Fasten the skin with hair side down on your workbench and pare it down thin. This is half the battle in handling the skin on the manikin. Moreover, the thinning down of a skin lessens its shrinking powers, for you cut the fibres, which of itself is worth all the time and labor you may bestow upon it. Go at it with the scraper, and if you cannot make an impression on it in that position, place it over a beam and work at it with your draw-knife or the keen-edged currier's knife. You will have to do most of the cutting on the skin of the head with sharp scissors and sharp knives; and as this is the most difficult part of the animal to prepare, you must not slight one inch of it. Make it so thin that you can pinch any portion of it on the wet clay and it will retain that particular shape; make it so pliable that you can have perfect control over its shape. But I have already warned the beginner under the head of "Relaxing Dry Skins of Mammals," page 204, of the necessity of having the skins of quadrupeds well thinned, and any further remarks on the subject would be superfluous. We shall place in the 15° strength salt and alum pickle the skin of the greyhound, which we have prepared exactly as we have described above, and begin to build the model on which we shall mount the skin.

Building of the Manikin.—The illustrations in Plates LII and LIII, which figure the building of the manikin for the greyhound, are so clearly laid off that a description of them seems unnecessary. The framework of the horse in Plate LVI is of similar construction. There are many procedures, however, which cannot be illustrated, and must be described in order to successfully carry out our plan. There are variations in the methods of constructing manikins in certain cases—as in the figures of the greyhound in Plate LIV; also that of the horse in Plates LVII, LVIII and LIX, and that of the elephant in Plate LV. All of these variations will be given in foot-notes, as has been previously done with the birds and the small quadrupeds.

The first thing to be done after you have placed the skin in pickle is to make a center board, which is accomplished by making an outline of the contour of the animal's body from the measurements and sketches you have taken. This can be made on the floor or on a large piece of paper. Now, on an inch thick pine board mark off a portion



DERMOPLASTIC METHOD.

First stage of building the manikin for the Greyhound.

from this outline which will conform to the shape of the back and up into the neck a little, extending almost to the outline of the chest and to a point which will take in the upper muscles of the thigh, about as we have it in Plate LII. Saw this board out and make two square holes in it, which are for the purpose of sewing the tow on with long needle and cord through the holes. If you desire to give the body of the animal a curve, saw the center board in two in the middle, and have your blacksmith make four narrow strips of iron of the desired curve, and fasten two of these on each side with screws, as seen in Plate LII. In making a center board, do not make it too wide; leave enough space on the line of the back for the binding down of tow with cord, and for a layer of clay. The center board in the smaller mammals should be so narrow that you can work all around it while placing the tow on the sides, chest and under parts.

If the leg bones still remain attached to the skin which is in pickle, take the skin out and detach the bones at the first joint above the foot. Now place these bones on the center board and arrange them in the position you desire to have the animal assume. Have your blacksmith make four iron squares, as we have directed on page 90, and as seen *a*, *b*, Plate LII, for the reception of the leg irons, as will presently be described. Place the knob of the humerus and femur on the center board against the iron squares at the distance apart which your measurements indicate, and be sure you are right, because upon this alone you must depend for the proper coupling of your animal. Mark the places on the board, and fasten the iron squares there with screws. Now place the bones again in position and take four pieces of heavy annealed wire and bend them close to the back of the leg bones in the position you have arranged them, following accurately the bend of every joint. Allow enough for the missing bones of the foot, and also to go through the pedestal, and to project through the iron squares to receive nuts. Now have made out of ¼ inch round iron rod their counterparts in shape and length, and have both ends of each rod threaded to receive nuts. When this has been done, you will soon have the center-board standing on four leg irons. The next thing to be done is to fit the leg irons into the back of the bones. Low down on the tibia the iron must be sunken into the bone so that it will not project out too far and give to that part of the leg an ill shape; by cutting a groove in the tibia behind the calcaneum and all the way down to where the bones of the foot have been detached, the iron can be sunken almost out of sight. The hollow formed where the tendon Achilles passes over the calcaneum may in this manner be nicely preserved (see *c*, *c*, Plate LII, and *c*, Plate LVI). For cutting these grooves use saws and chisels. The leg irons must be tied fast to the bones by winding them with copper or annealed wire. Now place a nut on the upper end of each leg iron and turn it down so that it will come below the iron square when it has been inserted in one of the holes; when the leg irons have been adjusted, place another on top of each leg iron and screw them up firmly, as in Figs. *a*, *b*, Plate LII. The leg irons must be secured in the same manner in the pedestal.[1]

Fasten the neck iron in the skull with plaster of Paris, and on the center-board with staples, which should be clinched on the opposite side, as seen in Plate LII. The rod for the taii support should be fastened with staples on the top edge of the center-board. Tie the lower jaw to the upper with wire until you can replace the muscles in clay. Should you desire to turn the head to one side, this can be done by bending the neck iron. Before we proceed, let us test every joint to see that it is firm and secure. Let strength be one of the main objects in building every structure; do not allow it to wabble in any of its parts. In all mammals the size of a greyhound, the strength should be such that it will bear the weight of an ordinary sized man; the same strength prevailed in a cougar which I recently mounted, and my last horse held the weight of three men on its back at once. Now is the time to try the skin on the skeleton manikin to see if there are any changes necessary. In the smaller mammals mounted upon this plan it is easier to build the greater bulk of the muscles out with tow, as seen in Plate LIII, before we develop the super-

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1. **Mounting Mammals without Bones.**—In Plates LVII, LVIII, LIX and likewise in Plate LIV are figures illustrating a method of mounting mammals by the dermoplastic method without the use of the iron square or tow in building out the underlying muscles. No bones are used, the entire structure being built from measurements and the skull carved in wood. One of the best mounted horses I ever saw was mounted upon this plan. But the method requires vast experience. It will be observed that instead of using an iron rod for the neck support, a neck board has been cut out of lumber in the same manner in which the center-board for the body has been made; when it is desired to turn the head to one side, the neck board is sawed crosswise on one side, commonly termed kerfing in carpentry, in order to make the bend, and then the neck board is fastened to the main center-board with iron braces, as seen in Plate LVII, Figs. 3 and 4. In employing this method we must depend entirely upon the skeleton for accuracy. Many of the French and German taxidermists adopt this method solely, preferring not to make use of any of the bones whatever, bending the leg irons with absolute accuracy according to the measurement and position of the bones, making the necessary extension in the irons, where the thigh bone joins the pelvis and the femur joins the shoulder blade. They claim that it gives them *"the freedom of touch which the actual bones in contact with the iron supports will not admit."* As for myself I have frequently been compelled to cut off and throw away bones of the common mammals when I was endeavoring to produce the *ideal*. The effect desired must be carefully considered before this is done.

In constructing a manikin on these principles the entire frame is covered with thin strips of wood, and as far as possible down on the legs. The strips are firmly nailed to the quarter round sections which form the shape of the body. They are placed so close together that when the clay is put upon them it is forced through to the under side, where it forms a "key" by which it holds. Clay mixed with strong glue water is the material employed. By exact measurements from the skeleton the leg irons are inserted in the center-board and held fast by nuts on both sides, as is seen in Fig. 4, Plate LVII.

The same method has been employed in the mounting of the greyhound in Plate LIV, the figures being from a specimen in course of preparation.

DERMOPLASTIC METHOD

Second stage of building the Manikin for the Greyhound.

ficial muscles in clay. Begin by laying on the tow and binding it with cord and sewing it down with a long needle through and through and winding it around and around until it has become hard and firm all over. In the center-board two square holes should always be cut so as to sew through with the needle, and thus bind the tow firmly down. Sometimes I cut the center-board in the middle and leave an opening of three or four inches, which gives additional advantage in sewing through the body, the iron bands holding both ends of the center-board out perfectly secure and separated in the middle. To imitate the hollow in the hind legs so visible in most short-haired and large mammals, take a piece of copper wire, neatly wind it with tow the proper size, cut a groove in the calcaneum and bind it nicely over the back of this bone and extend it to about three-quarters of the way up on the tibia and bind it there. This is seen in *c*, *c*, Plates LII, LIII and LVI. When the tow has been placed on all parts of the animal, and its form has been made as nearly the natural shape and proportions as it is in your power to develop it, the next thing to do is again to take the skin from the salt and alum bath and try it on the manikin and carefully fit it to every part of the model. Here use your critical powers and discover, if possible, where you can make any improvements. See that the edges of the skin meet everywhere. Take several stitches at different places and examine closely the form at every point. Wherever it is too full, cut the tow away, or build it out where needful. Try the skin on once more before putting on the clay. Notice in particular the coupling of your manikin ; if it is coupled too long or too short, cut into the tow, take the nuts off, remove the leg irons, and place them in any hole in the iron square which will correct the error. This is the chief beauty of the iron square — any error in the coupling can be corrected in a few moments' time, even when the manikin has been completed.[1] We will assume that the manikin is ready for the clay, which can be

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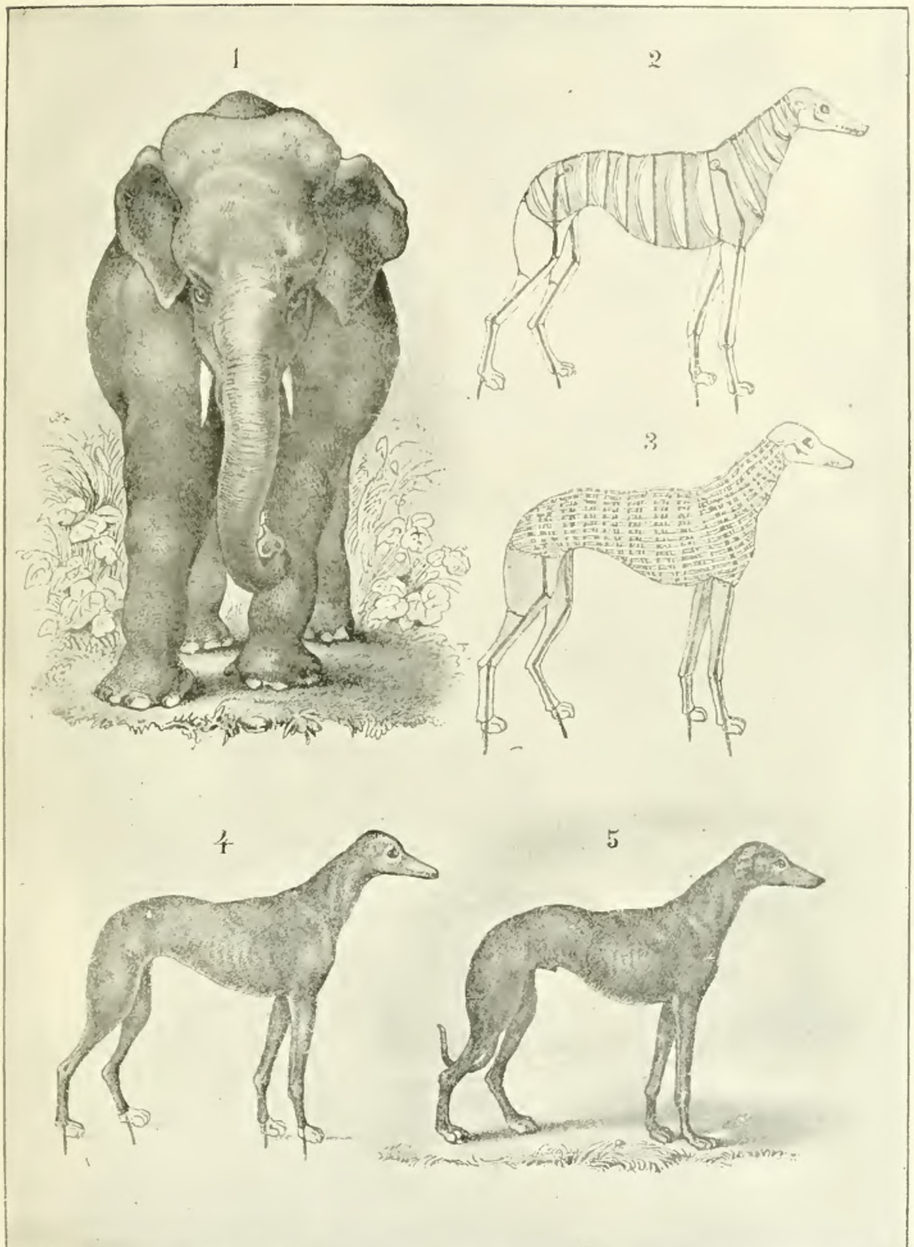
1. Just in the nick of time, as these pages are going into the metal, I have constructed a device which will do away with three holes made in the iron square for the reception of the leg irons. With this contrivance *one* hole for the leg supports can be made to answer the purpose in all cases. I regret that it is now too late to have this device illustrated, for it is a difficult construction to describe. When the center-board has been cut in two in the middle, one inch is sawed off from each end where it has been severed, thus leaving two inches of play in order to be able to *lengthen* or *shorten* the center-board. A square bar of iron is made the proper length, which should not be so long as to interfere with the leg bones. In this iron bar holes are drilled for screws, and it is in this way fastened to the rear half of the center-board. A *shoulder* of iron is made through which this iron bar will pass. A screw hole should be made in the top and middle of this shoulder and four others (two on each side) in the flanges of the shoulder, which rests on the center-board. This shoulder is fastened to the forward half of the center-board by means of screws in the same manner as the iron square. Along through the end of the iron bar which is to pass through the shoulder, holes are drilled about half an inch apart. They should be of the same size as the one drilled on top and middle of the shoulder. If, after you have your manikin standing, you discover that it has been coupled too long or too short, instead of making any change in the iron squares, simply take out the long screw which passes through the middle of the shoulder and through one of the holes in the iron bar into the center-board, and make the necessary change to another hole to suit the case

mixed and put on with a small trowel, but the hands should be used in rubbing it into the tow and in forming the various muscles. For the uses of clay, see page 45. Replace the muscles of the head with clay, and your model is ready for the skin. Insert sheet copper or lead, cut and hammered into shape, into the ear skin, as advised on page 192. In sewing up the opening in a mammal mounted by this method, much can be done in developing and bringing out the beauties of the various muscles as you proceed with the sewing. The thin skin which extends from the thigh to the side of the body should be filled with clay and nicely pressed into shape. When sewing has been begun on an animal, and it is desirous to leave it for a time, the skin should be covered with wet blankets in order to keep it in a soft condition until the sewing is completed. The head is now ready to be finished with clay and chopped tow, through the mouth, and the most careful work must be done here. See Chapter XII. In this position the mouth, if the skin has been properly thinned, will retain its shape forever. The eyes come last and may be imbedded in clay mixed with glue water or in papier-maché. Now comb the hair with a steel comb, and clean the specimen up generally by brushing it with a moderately stiff brush. The animal is now ready to set away until it is thoroughly dry, during which time it should be examined daily to see that all parts are properly drying.

There are no rules by which a person can acquire skill and sound judgment in the finishing up of mammals mounted by this method. His skill, which may be excellent, will improve by practice and experience. Whatever you do, let neatness of finish be one of the characteristics of your completed specimens, and let the merit of your work speak for itself.

I should advise the beginner not to take a dry skin for his first effort in the dermoplastic method. By all means skin the animal yourself, and have it as fresh as you can secure it. It should be remembered that in skinning hoofed animals to be mounted on this plan the leg bones should be detached at the hoof; in all others the bones of the foot only should remain attached to the skin.

In large mammals, such as the deer, elk, horse, etc., we must make a center-board out of inch and a half pine lumber; this should be exactly the shape of the contour of the body as seen in Fig. 1, Plate LVI. The iron squares for the reception of the leg irons for a horse should be three-eighths in thickness, and the leg irons should be made of five-eighths Norway iron. The skull is fastened to the center-board by means of an iron rod on which it is bolted. This rod



DERMOPLASTIC METHOD.

The three stages of building the manikin for the Greyhound without the use bones. See foot-note, page 226, Fig. 1, Asiatic Elephant.

may be turned or bent in any direction to give any desirable curve to the neck. The next thing is to make side pieces to conform to the shape of the sides of the animal, which, on the whole, are about quarter-round. These are fastened about nine inches apart on each side of the center-board, between the legs, as in Fig. 2, Plate LVI. Across these are nailed thin strips of wood, and the whole are bound with tow. The legs and neck are built out with tow, as in the greyhound. Over all these the muscles are imitated with clay. The skin should be fitted on the manikin at various stages in the progress of its making, in order to see that all the dimensions are correct. All other procedures in the mounting of large mammals are similar to those described for the mounting of the greyhound, except in the case of some of the large elephants, which are mounted on a manikin of wood similar to the one in our Plate LV. As my experience with these animals is limited to two small African elephants, I shall place in a foot-note a description of the mounting of the African elephant Jumbo, at Ward's Natural Science Establishment, Rochester, N. Y.[1]

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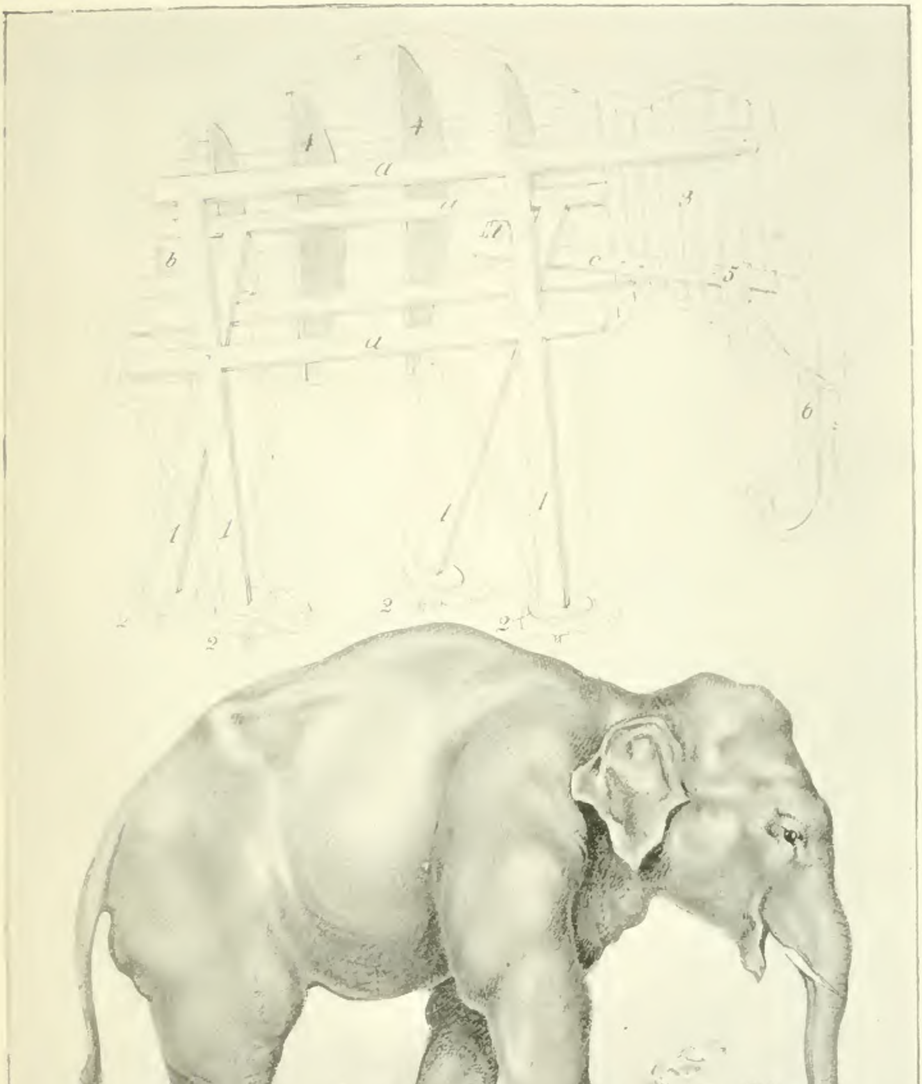
1. **The Mounting of the Elephant Jumbo.**—In the mounting of this particular elephant one of the important elements which had to enter into its structure was *strength* — the building of the manikin so that it would withstand the constant rack and strain of travel in transporting it from place to place with a menagerie. The following is compiled from Ward's Natural Science Bulletin :

A heavy oak pedestal was built with 8 x 10-inch cross pieces of oak to hold the leg irons, which were of 2-inch round iron. These were secured in place, two to each leg, by heavy nuts and iron plates. Connecting the tops were heavy oak cross pieces, upon which were fitted joists serving as a back bone for the manikin. Two-inch planks fitted between these were cut to the contour of the back, others gave the shape of the sides at distances of a foot apart, while still others were put around the leg irons and the heavy beam in the trunk. All of this work was accurately done and firmly fastened and braced and bolted so that there should be no shaking of the parts. Over this outline frame two series of strips of inch square steamed basswood were firmly nailed, bent and hewn so as to give the exact shape of the animal *without any stuffing between the wood and skin.* This we deemed necessary that the specimen might withstand the exceptional usage which it was to undergo. The tusks were sawed off a little above the part protruding from the skin, bored and threaded, and into each a heavy iron was screwed which ran back into the framework of the neck where it was securely bolted. After this manikin was completed and the skin had been dressed down to its proper thickness, less than half an inch, and thoroughly poisoned with arsenic, the work of applying it to the manikin was commenced. To hold the skin firmly in place it was nailed to the wooden manikin. For this purpose several thousand steel wire nails of various sizes were used, weighing in all about fifteen pounds. Perhaps no other animal was ever stuffed in this manner, and in fact for any other purpose than railroad travel, or, even then, in mounting any smaller animal such a method would be unnecessary. When these thousands of nails had been countersunk so as to be entirely invisible, and all the seams firmly sewn up, the finishing touches were put on, and Jumbo stood complete and as lifelike as his photograph. All the hundreds of creases, wrinkles and folds that characterize the elephant and were so prominent in this one were brought out. This was no easy matter to accomplish — a thing hardly even attempted in any other stuffed elephant — and it was only by very painstaking and tedious work, together with a rigid adherence to the exact size of the animal, that the result was so successfully attained. We give a few measurements of the stuffed specimen that may be of interest. Greatest width of ear, 5 feet 5 inches. Length of trunk from base of tusk, 5 feet 11 inches. Circumference of tusk, 1 foot 6 inches. Circumference of front foot, 5 feet 3 inches. Greatest circumference of fore leg, 5 feet 7 inches. Smallest circumference of fore leg (14 inches above ground), 3 feet 4 inches. Circumference of head back of eyes, 10 feet 4 inches. Circumference of neck back of ears, 11 feet 6 inches. Greatest circumference of body, 18 feet. Measure from sole of fore foot to top of back between shoulders, 12 feet.

PLATE LV.

DERMOPLASTIC METHOD.

Frame-work for the manikin of an Elephant. Asiatic Elephant.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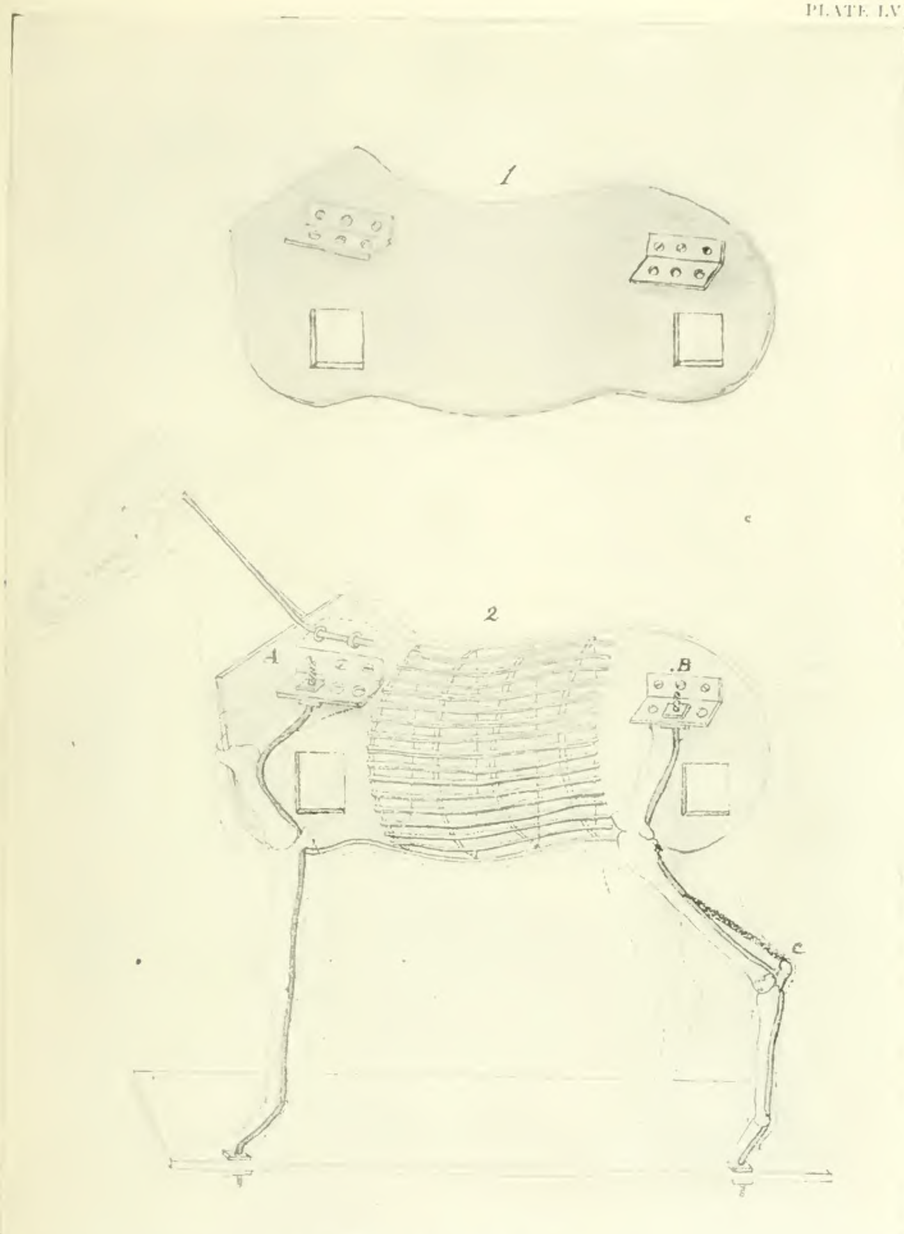
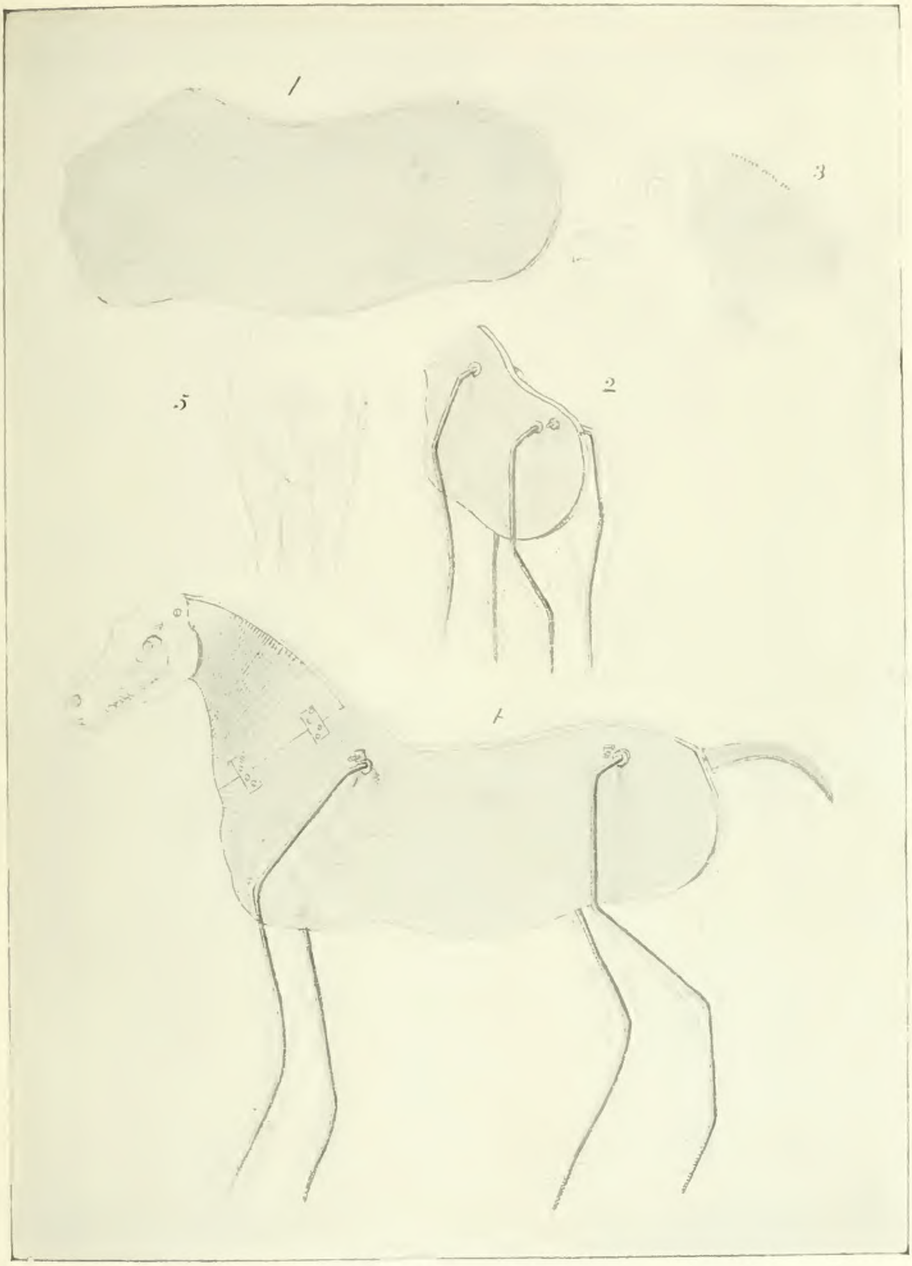


DERMOPLASTIC METHOD.

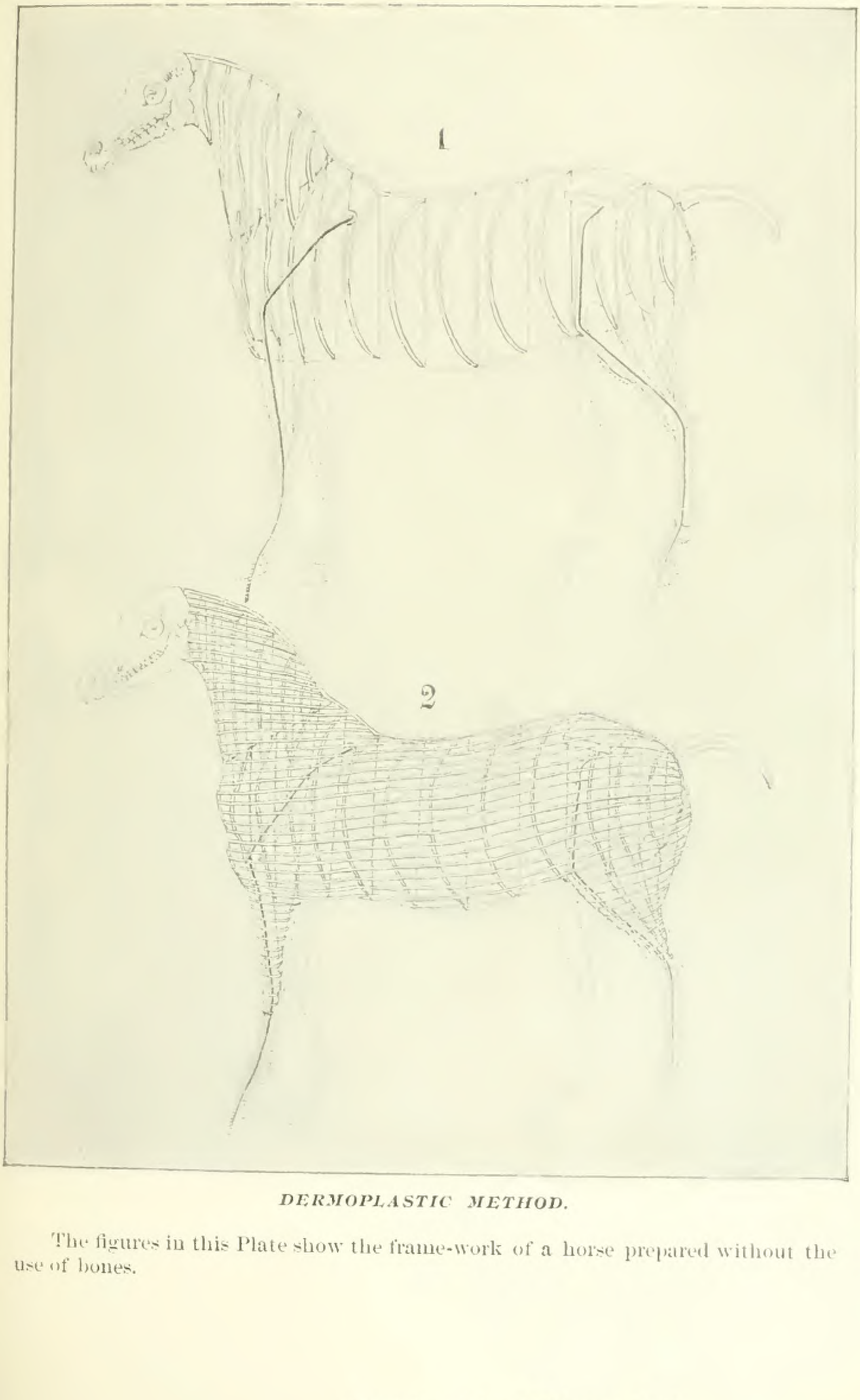
Fig. 1, center-board, with iron squares, for horse manikin; Fig. 2, leg bones and leg irons in position in iron squares, A, B. The letter *c* is the calcaneum, where the tendon Achilles forms over it, and makes the hollow.

In Fig. 2 are seen the quarter-round sections which form the shape of the body; these are fastened to the center-board and covered with thin strips of wood.



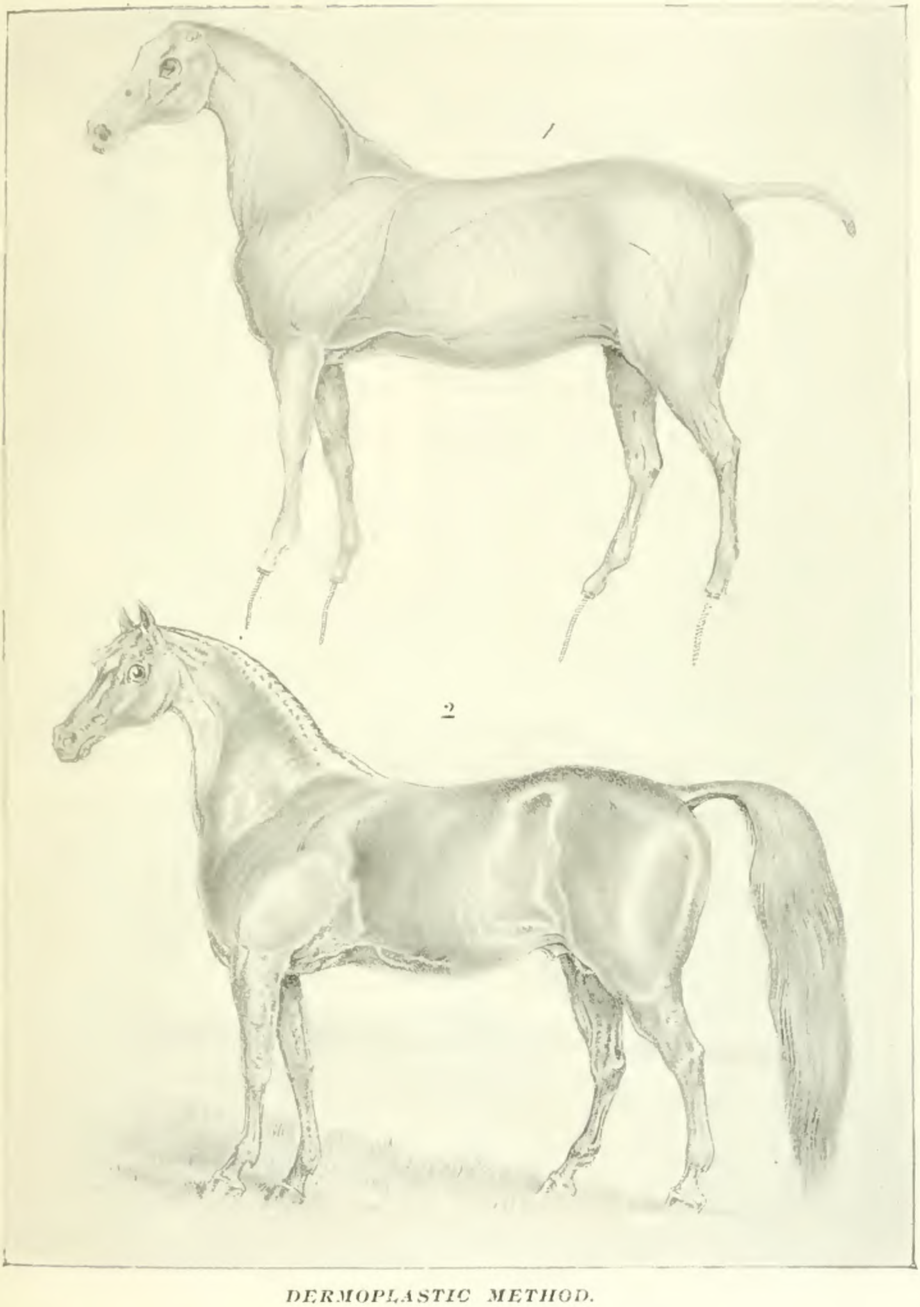
DERMOPLASTIC METHOD.

First stages in mounting mammals without the use of bones. Fig. 1, center-board; Fig. 2, side and rear view of center-board with leg irons in place. Fig. 3, head with neck-board bent by kerfing. Fig. 4, head, neck-board and leg irons in place; Fig. 5, front view of horse's chest.



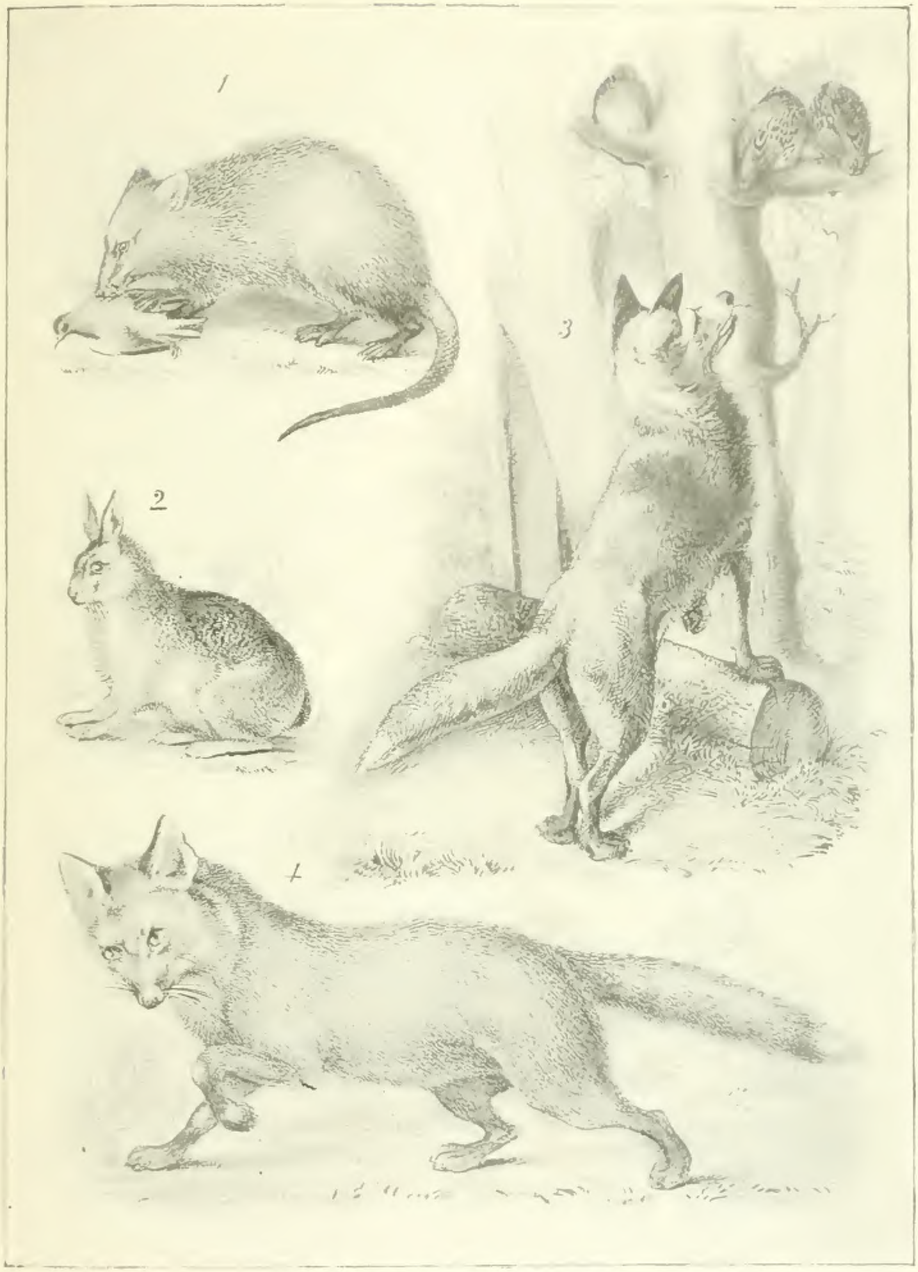
DERMOPLASTIC METHOD.

The figures in this Plate show the frame-work of a horse prepared without the use of bones.



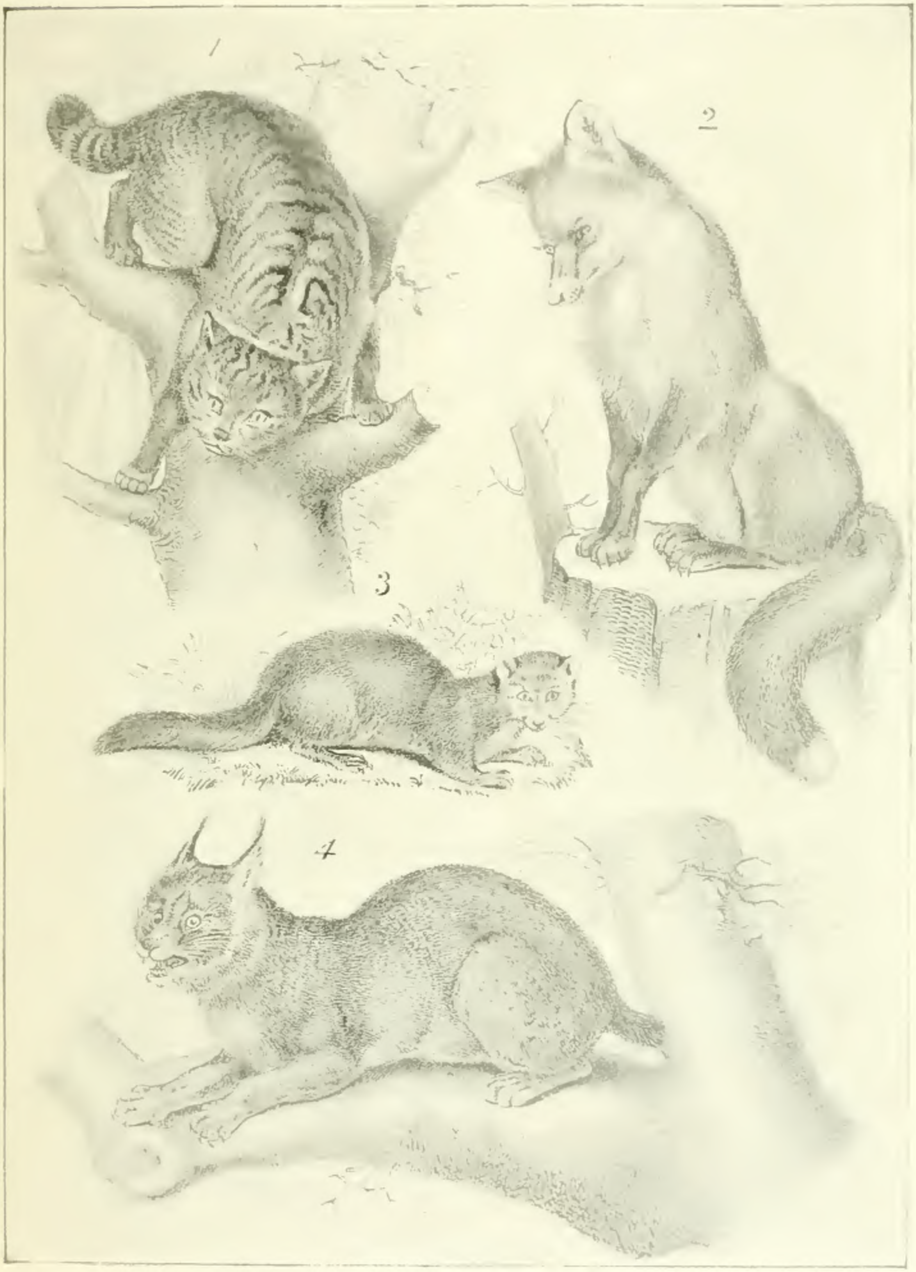
DERMOPLASTIC METHOD.

Fig. 1, completed clay-covered manikin of a horse; Fig. 2, finished specimen.



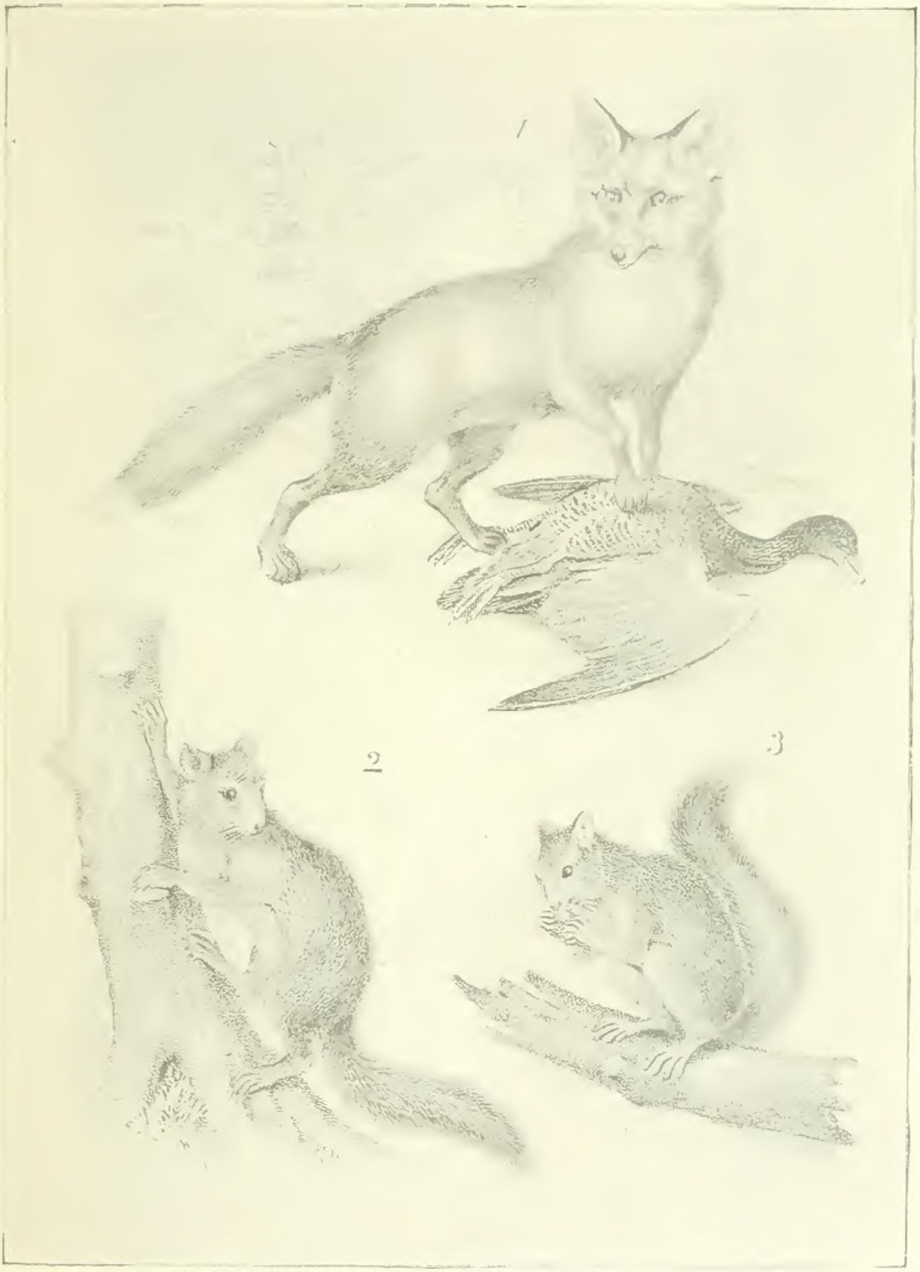
FORMS AND ATTITUDES.

Fig. 1, Opossum; Fig. 2, Rabbit; Figs. 3, 4, Foxes.



FORMS AND ATTITUDES.

Fig. 1, American Wild Cat; Fig. 2, Fox; Fig. 3, Marten; Fig. 4, Canada Lynx.

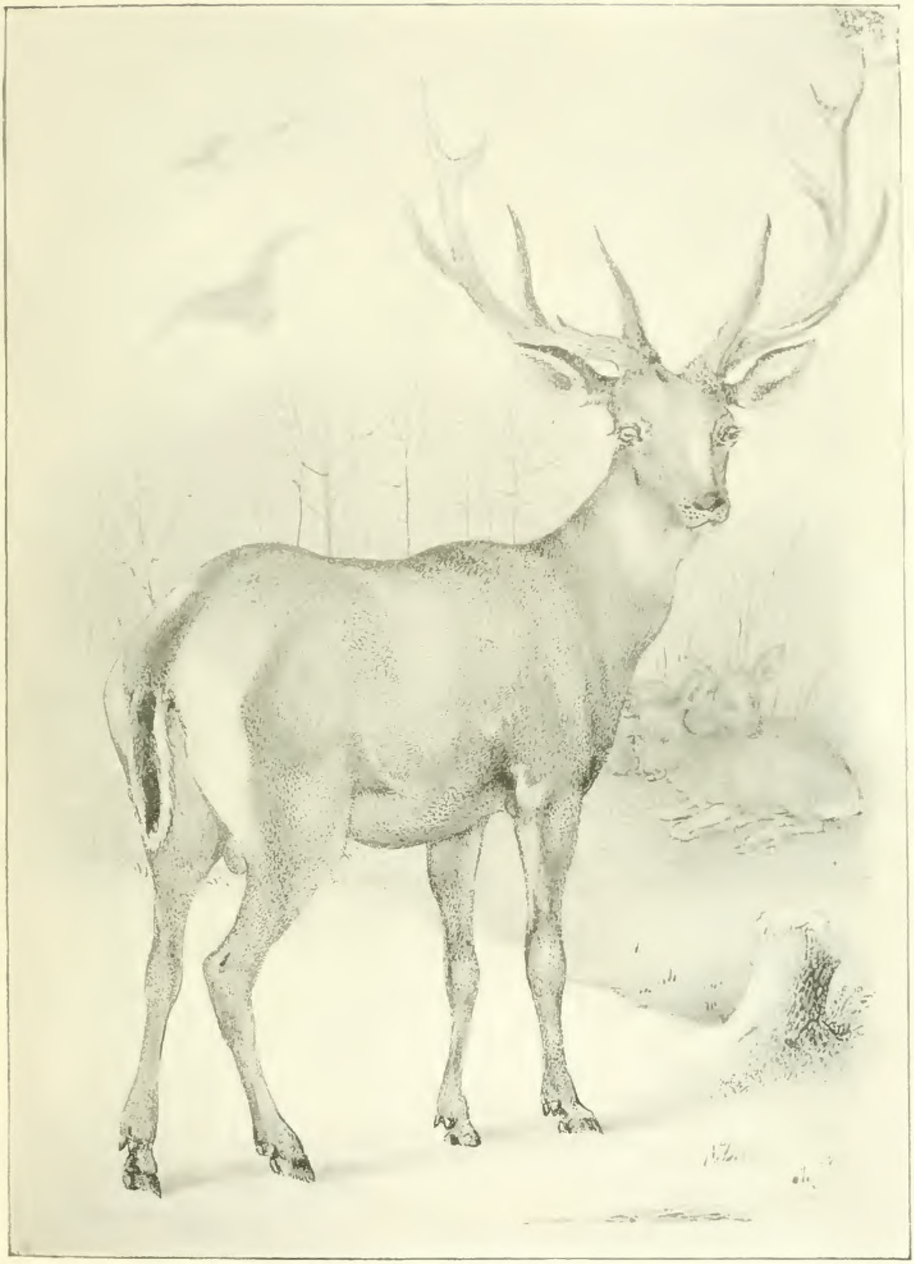


FORMS AND ATTITUDES.

Fig. 1, Fox; Figs. 2, 3, Gray Squirrels.

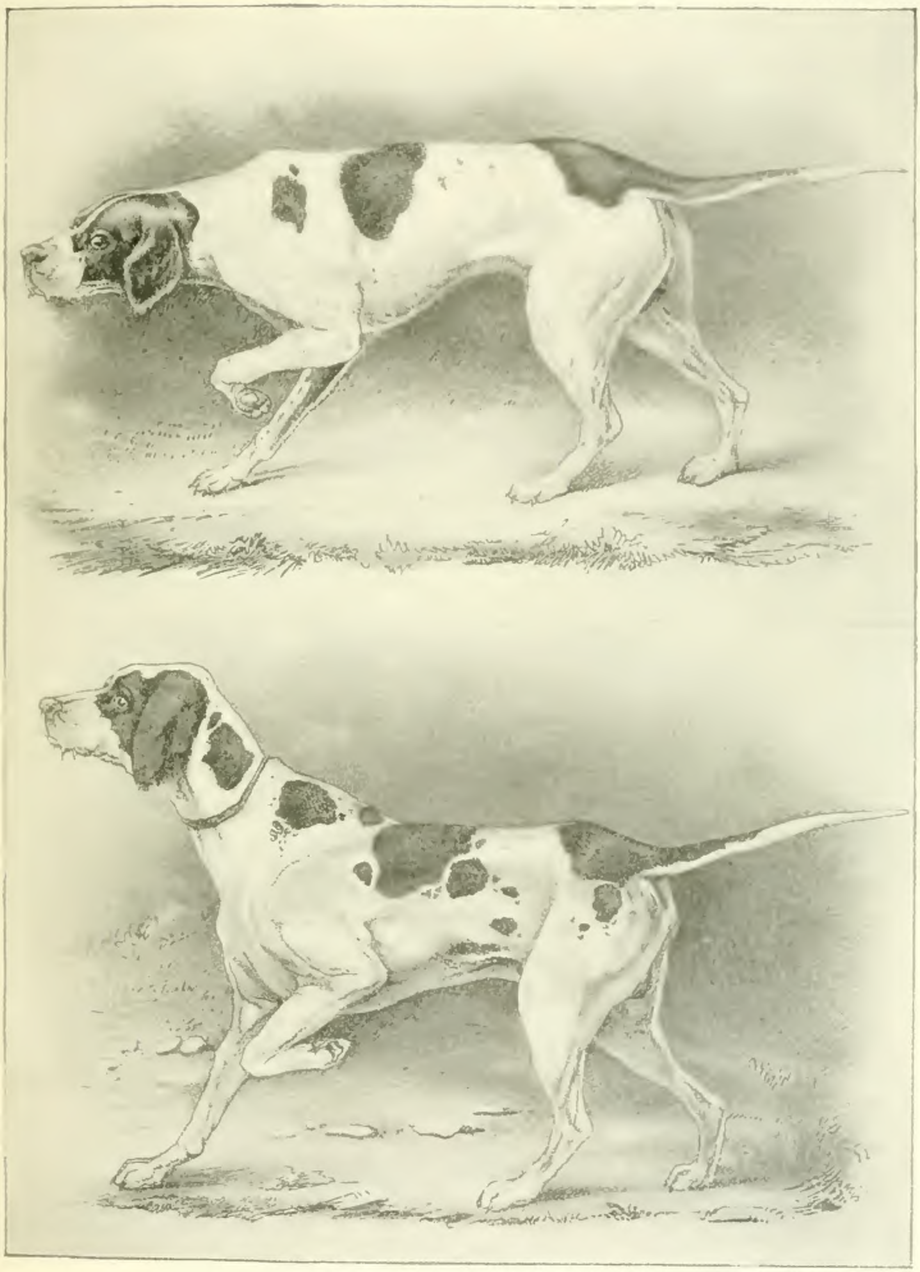
FORMS AND ATTITUDES.

Fig. 1, Otter; Fig. 2, Muskrat; Fig. 3, Mink; Fig. 4, Beaver.



FORMS AND ATTITUDES.

This figure was made expressly to illustrate how closely the heels come together in Elk, Moose, Deer, etc.

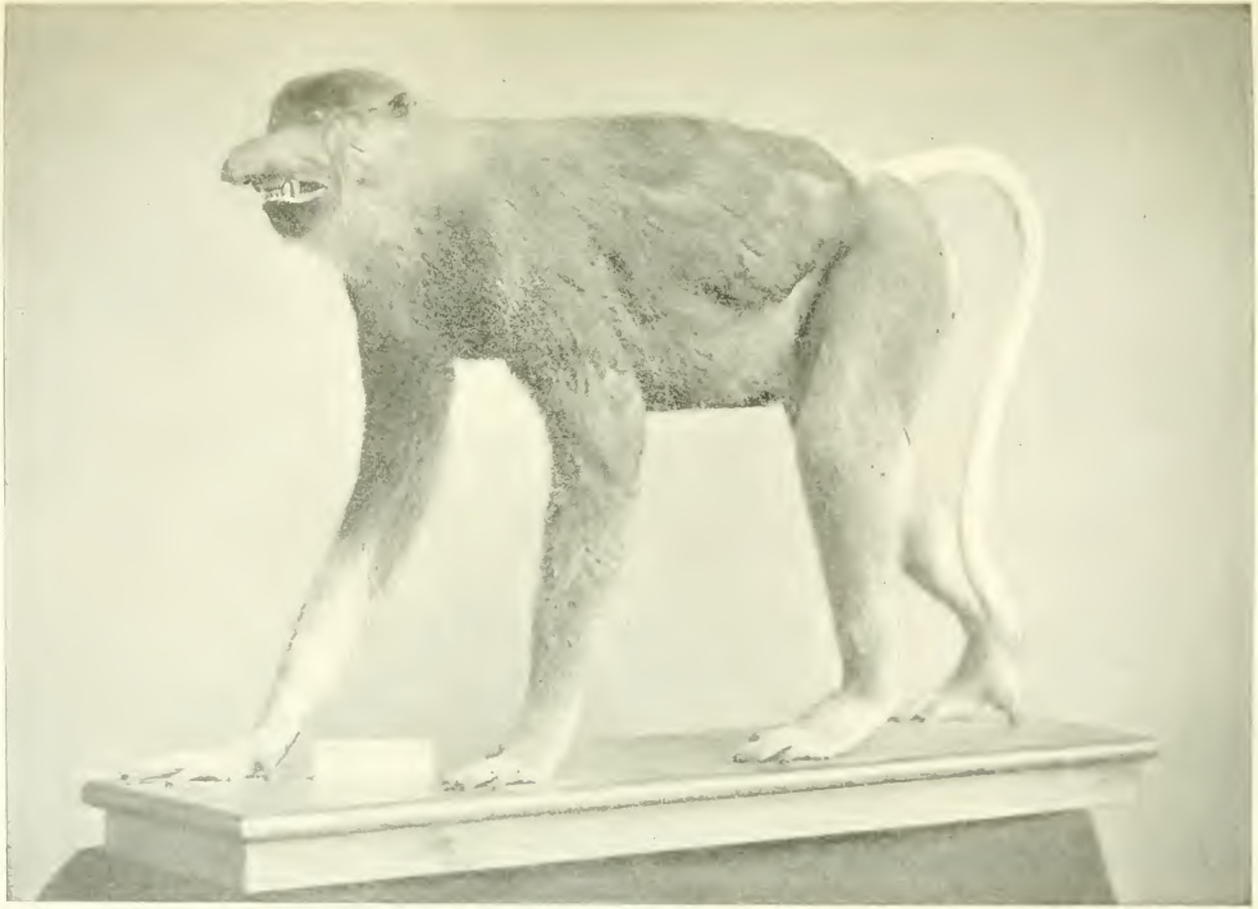


FORMS AND ATTITUDES.

Pointer Dogs.

FORMS AND ATTITUDES.

Setter Dogs.



FORMS AND ATTITUDES. Proboscis Monkey, mounted at Ward's Natural Science Establishment, Rochester, N. Y.

CHAPTER XI.

HINTS ON THE FORMS AND ATTITUDES OF MAMMALS; ACCESSORIES, GROUPING, ETC., WITH REMARKS ON THE ARRANGEMENT OF REPTILES.

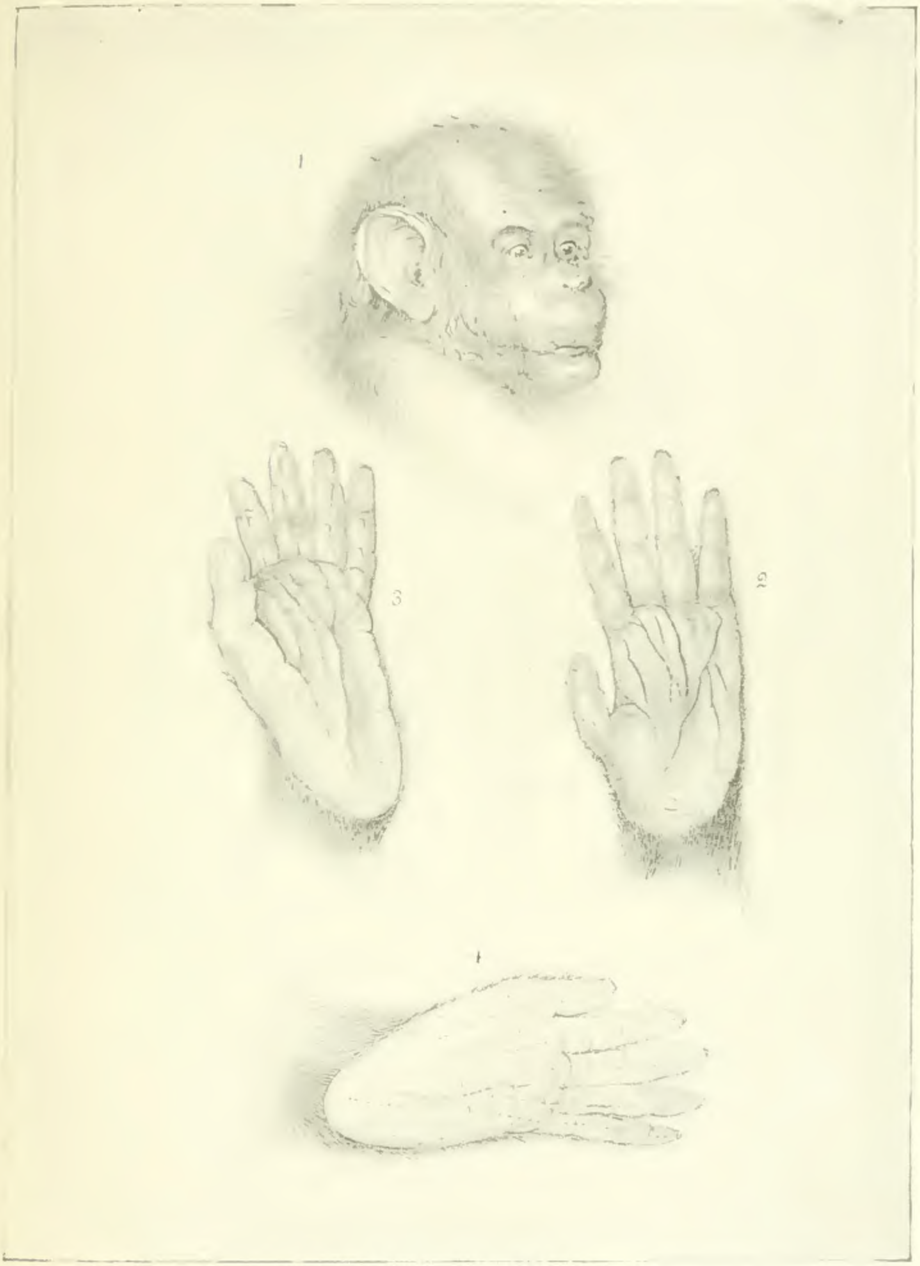
The chief object of the taxidermist's art is to faithfully reproduce the forms, attitudes and expressions of living animals with the actual skin. From the moment you take up the pencil to make a sketch and to take the measurements of an animal for the purpose of mounting its skin, your strife to imitate nature has begun. The perfection of everything depends upon the relation it has to the end which it is to serve. A mounted mammal is intended to please the eye just as much as its figure does in stone or on canvas, and in order to do this the inanimate form must compare closely with the animate. The size and shape of the various muscles, the general form and attitude and expression must be life-like. This is not an easy task to accomplish with a shapeless skin; it involves the highest principles of art. You need not attempt to make black white or white black or purposely mistake, for with all your pains you may fall far short of the mark. The specimen that is worth preparing demands all the skill you are able to bestow upon it. Go at your task then with the determination to copy nature to the best of your ability. At every opportunity study the living animal, and, of the dead ones, make sketches and casts, take measurements, study colors, and whenever possible study their skeletons. These are the principles which, with the proper application and skill, will bring forth fruits of labor approaching closely to the ideal.

The taxidermist should, by all means, study the fundamental principles of osteology in order to *know* the attitudes which are *possible* and those that are *impossible* for an animal to assume. No sculptor would deem his education complete without a thorough knowledge of the skeleton. We must, therefore, adopt the same system of study in order to secure the best results.

Never allow your quadruped to be better developed on one side than it is on the other; make it so accurate and so well-balanced on all sides that it will bear the closest scrutiny from every view. Fill the body out to its natural size, but never *too full;* the latter is the most common fault to be found in the work of the beginner. Remember that the legs of your mammal are never perfectly round and thick; on the contrary, the thigh is broad and flat and the muscles of the upper arm are of a similar shape, but not so broad as those of the thigh. The examination of a single mammal when skinned will reveal all this and many other points which are unnecessary to describe. In mounting quadrupeds, as in birds, be sure that the heels are brought close together; do not spread them far apart. A quadruped in life cannot walk or stand with the heels very far apart unless it is deformed. This point is well illustrated in a number of figures in Plates LX to LXVI inclusive. One of the most important parts of a mounted animal is the *head.* Every detail of the body may be most perfectly wrought, but if the head and face be poorly finished, the chief beauty of the specimen is lacking: *the life expression is gone.* The ears, lips and nose must then have your special attention in their preparation, and the eyes must be set with the greatest care. The time necessary to model and develop this particular part of the animal depends, of course, altogether upon the character of the head and the shape the mouth is to assume. The beginner should be very careful when mounting an animal with its mouth open.

In using the clay, papier-maché, the wax and tube colors, the best judgment must be exercised. These have all been discussed in former chapters. You may approach more nearly to perfection if you will often be your own critic. Allow no mounted mammal to pass out of your hands that has not undergone your inspection. You should be able to assert the excellence of your work, or "damn it with faint praise," or somebody will do it for you. It is better to shoulder the responsibility and let your specimens speak for themselves.

I will say with Mr. Lucas, that nine-tenths or more of the carnivores mounted by taxidermists have their mouths wide open, and are trying to look fierce without having any adequate cause for so doing, and without, in the least, showing their emotion by their attitude. Animals rarely open their mouths without accompanying the action with an equally expressive movement of the limbs. A knowledge of methods in taxidermy by which we can overcome difficulties in the construction of the frame-work, is absolutely necessary, but a mere knowledge of methods will not give the artistic eye and skilled hand necessary for attaining the best results. While practical methods



CHIMPANZEE.

Fig. 1, head; Fig. 2, hand; Fig. 3, foot; Fig. 4, hand, showing where to make the opening cuts in the fingers and palm in order to take out the flesh, which must be replaced with clay and neatly sewn up.

will assist one in attaining the desired results, he must be possessed with "a spark o' nature's fire" in order to catch the spirit of his subject.

The preparation of some one of the most common animals which we have an opportunity of observing and studying in life almost daily, is the proper subject for the beginner to first undertake in mammal mounting. Nearly every one is familiar with the forms of squirrels, rabbits, raccoons, foxes and others, and it is easy to decide whether they look natural when one of them has been mounted. Almost any of your friends will be kind enough to act as your critic on this point. In mounting squirrels on the flat surface of a stump do not make them appear as though they were taking a toboggan slide or backing up. Watch their equilibrium. Some very bad work is indeed done by taxidermists on the common animals, the fox being one of those whose form and attitude most of them fail to interpret. The failure is usually in the expression not conforming to the apparent agility of its movements. In Plates LX, LXI and LXII are four attitudes of the fox, all of which are capable of being reproduced, together with the accessories. The forms and attitudes of the wild-cat and the lynx in Plate LXI are characteristic of these animals, and, when well executed with similar surroundings, make striking studies. The same may be said of the single pieces of the otter, muskrat, mink and beaver in Plate LXIII, which, to give effect, are arranged with simple accessories, easy to imitate.

One of the finest mounted pointer dogs I ever saw is one prepared by Dr. Jasper, similar in attitude to the one represented in the upper figure of Plate LXV. In this specimen our artist has reproduced all the prominent muscles which are visible in the animal while in the characteristic attitude it assumes when coming to a point. The anxious expression in its face is most faithfully preserved, while the hard work and excitement it has undergone has brought the slobbers to its mouth.

This dog was mounted on the dermoplastic method described and recommended in the previous chapter, which is the only proper method to employ in the mounting of all short-haired mammals and those of large size.

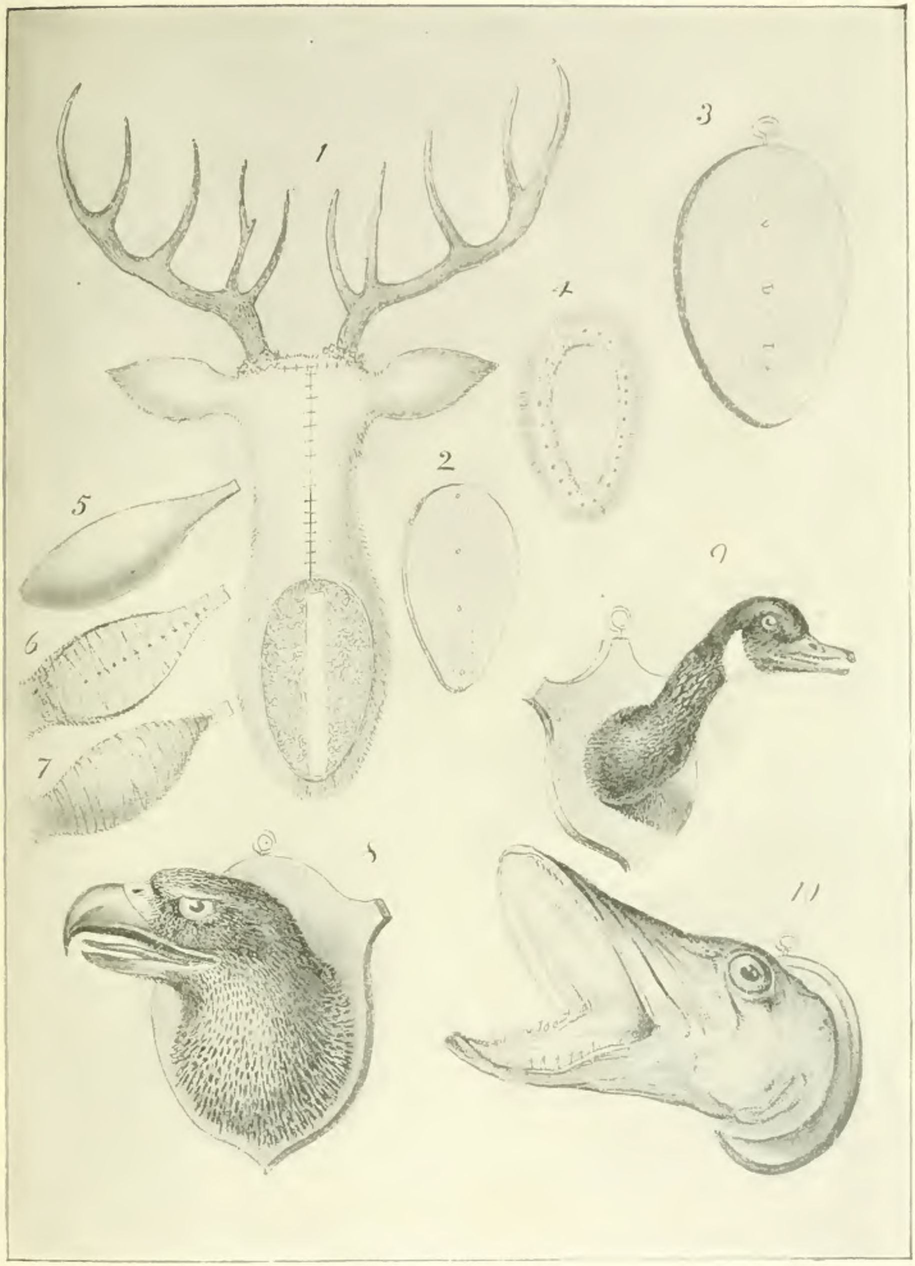
Some of the best specimens of mounted mammals to be seen in this country have been prepared by Mr. William T. Hornaday, formerly of Ward's Natural Science Establishment, and late chief taxidermist of the National Museum. His work is stamped with the imprint of extraordinary genius, and through his efforts the new school of American taxidermists owes much to the high order of art which is now being infused into the taxidermic specimens all over the land. Besides the very accurate form, attitude and expression of his mammals, there is one feature which is also characteristic of his work: it is the apparent natural, flexible texture of the skin, if I may be allowed the expression. That taxidermy is a true art, this man has surely proven it. Among some of the single pieces which I have seen that have been prepared by this artist is the little African elephant, "Mungo," an exquisite piece of work which was awarded the first prize at the third annual exhibition of the Society of American Taxidermists, a hairless Mexican terrier, a most difficult subject, a cinnamon bear and a baby ourang-outang. Numbers of pieces illustrating his skill may be seen in the various museums of this country, including many charming mammal groups.

A new era has come in with the arrangement of museum specimens in groups, with their natural surroundings. Often the old and the young of a species are represented in families placed in characteristic attitudes, the whole illustrating some phase in the life-history of the species. The natural surroundings of the animals are reproduced as accurately as possible by artificial accessories, or they are made from the actual materials brought from the woods and fields. The leading museums of America and Europe have entered upon this new era of improvement, and already there are to be seen within their halls scenes from the fields of nature such as were never wrought in stone or painted on canvas.

There are a number of American taxidermists whose skill has contributed to the success which has been attained in the various museums. Some of the finest groups of mammals that have been prepared are to be seen in the American Museum of Natural History in Central Park, N. Y. With one exception they were prepared under the direction of the late Mr. Jeness Richardson,[1] the leaves and flowers being modeled by Mrs. E. S. Mogridge.

A red squirrel group is among those of the small mammals. In a yellow locust in full bloom, intertwined with the Virginia creeper, is a nest with young and old, male and female. For elegance of finish and general beauty, this is considered the finest of the small mammal groups. The flying squirrel group is represented by a male and female and young, with the summer nest in a hemlock tree-top; and close by and under the same cover are the winter quarters in a hollow chestnut stub. The curious opossum scene contains an old butternut stub, with

1. This highly accomplished naturalist and taxidermist died June 21, 1893, his place in the American Museum now being filled by Mr. J. Rowley.



MOUNTING HEADS.

Fig. 1, opening cut in deer head sewn up, showing the incision that is necessary to be made in the heads of mammals having horns in order to skin over the head; in this figure the end of the center-board is shown; Figs. 2, 3, neck board which is fastened to the end of the center-board, around which the skin of the neck is tacked as seen in Fig. 4; Fig. 5, ear block; Figs. 6, 7, ear block in position in ears; Fig. 8, eagle head mounted on shield; Fig. 9, goose head mounted on shield; Fig. 10, mounted fish head.

the nest in the hollow. The male hangs from a branch overhead by his prehensile tail, and the female squats below with her tail thrown up over her back. A number of young are hanging to the mother, with their tails wrapped around hers, in the manner peculiar to this species. More of the young are shown in various places in the foliage at the base of the butternut stub. A very striking and interesting group is that of the woodchuck, which shows the construction of the burrow and situation of the nest. The old and young are in various attitudes on the sward above, which is covered with daisies and red and white clover. A beautiful and costly group is that of the musk-rats, which represents the construction of the burrow in the bank, with nest and young, and the house or winter quarters built out in a pond filled with water lilies and rushes. A portion of the house at one corner has been cut away, revealing the interior of their dwelling. The ourang-outang group in this museum was prepared by Mr. Hornaday while employed at Ward's Natural Science Establishment, and is one of the finest of its kind represented in the museums of this country. It contains five specimens, all admirably mounted. The group represents a quiet scene in a Borneon forest. Another superb group of ourang-outangs prepared by Mr. Hornaday, entitled, "A Fight in the Tree-Tops," is to be seen in the National Museum. The largest and perhaps the best piece of work ever done by Mr. Richardson is the bison group. It contains an old bull, represented as "shying" at a rattlesnake partially concealed under a soap-weed bush; three cows standing, one three-year-old cow feeding, one two-year-old cow lying down, and a two-weeks'-old calf standing beside its mother on the edge of a buffalo "wallow." The ground-work is very carefully represented from studies made in northern Texas, and the actual prairie sod and other accessories were brought from the field and introduced into the scene. Such vegetation as could not be satisfactorily preserved was made up artificially in wax; as, for instance, the beds of cactus. The vegetation was prepared entirely by Mr. Richardson, and too much cannot be said in praise of the superior workmanship and artistic skill shown in every detail of this group. It is a masterpiece. In the National Museum is a group of bison prepared by Mr. Hornaday, similar to that by Mr. Richardson. It is likewise most skillfully executed. The skins of the animals, the ground and accessories, were obtained in Montana. This group is matched, only in size, however, by the monarch moose group; and this, with a number of other mammal groups in the same institution, attest the profound genius of their author.

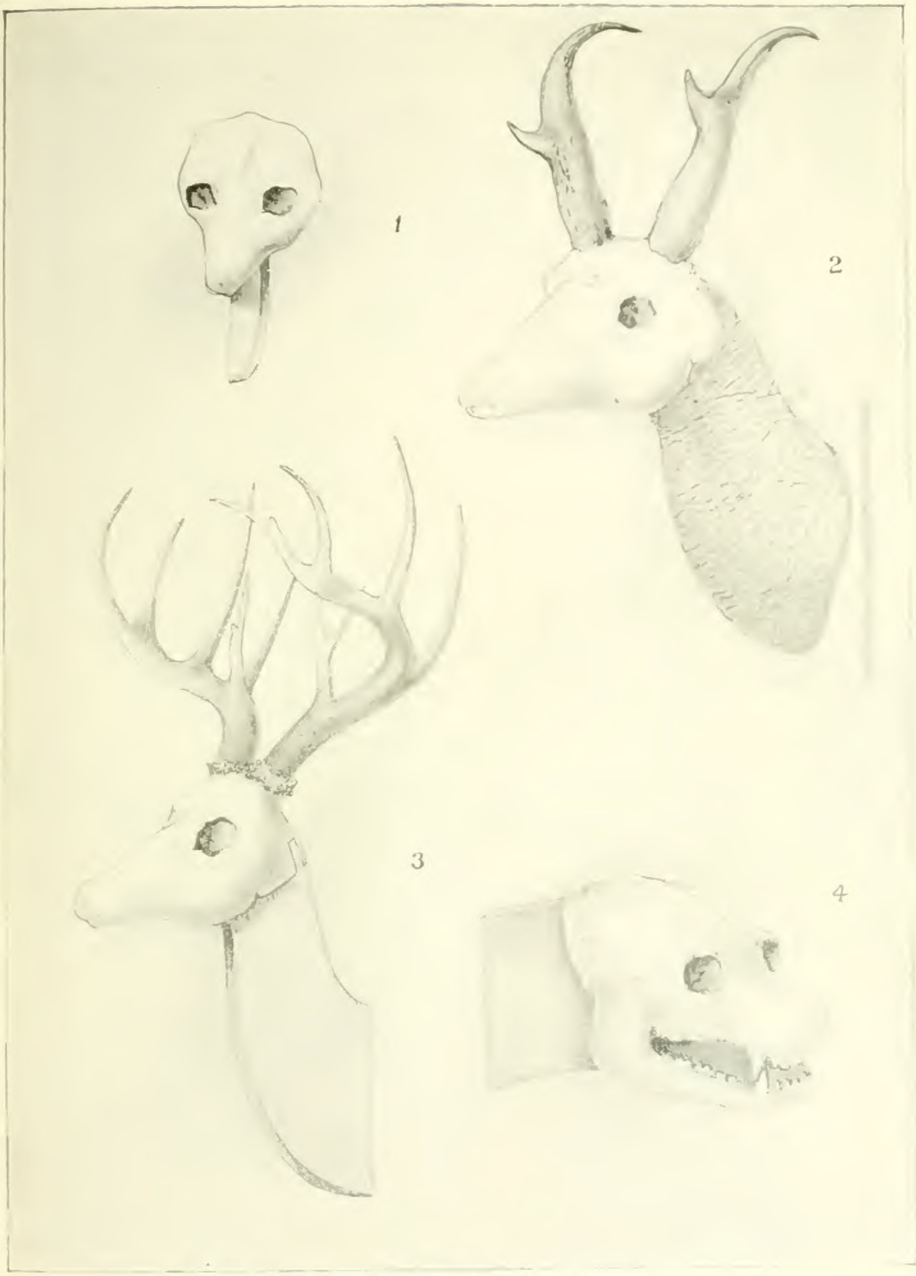
Some of the best examples of mammal mounting that have been done in this country, are the work of Prof. L. L. Dyche, of the Kansas University. A proof of his skill and genius in this branch of taxidermy, in the arrangement, grouping and effect of the whole was exhibited in the Kansas building at the World's Columbian Exposition. This was a mammoth exhibit of mammals, consisting of those species belonging to prairies, woods and mountains, and consequently the scene was as varied as the localities and their fauna demanded.

The groups consisted of the moose, elk, deer, antelope, Rocky Mountain sheep, American bison, cougars, wolves, coyotes, etc. These were all arranged in a manner illustrative of some peculiar habits and characteristics of the animals.

Mr. Frederic S. Webster has prepared a most interesting group of Duck-billed Platypus *Ornithorhynchus paradoxus*. This is one of the most singular little creatures belonging to the animal kingdom — combining, as it does, the external characteristics of a duck and a mole, with fur and tail like a beaver, spurs like a cock, and in every way aquatic in its habits. The group is composed of nine specimens — four adult males, four females and one young — arranged in positions representing their life habits: swimming in the water, coming from and entering their burrow, rolled up in sleeping attitude, climbing limbs, and playing. The vegetation of the locality in which they live is also reproduced as closely as possible, and in every respect teaches the life history of the animal. A caving of the bank of earth discloses the interior of burrow and its narrow passage. In this burrow are two of the animals (a mother and young): the mother just waking up, disturbed by the catastrophe, while the little one is yet fast asleep.

Mammals and birds can be much more easily combined in artistic and instructive groups than reptiles. So far as postures are concerned it is not possible to give to the latter the variety of striking attitudes and peculiarities of which mammals and birds are capable. To make up a group of reptiles, illustrating their life habits and their haunts, we must depend largely upon the truthful reproduction or imitation of the natural surroundings which they inhabit. An illustration of this may be seen in Plate LXXXIV.

There have been prepared some very interesting and striking groups of the snakes, lizards and turtles, and also of the batrachians. Among the groups in the National Museum is one of edible terrapins, prepared by Mr. Frederic A. Lucas. It well illustrates what may be done with animals which, like turtles, do not readily lend themselves to the making of groups.



MANIKINS FOR MAMMAL HEADS.

Fig. 1, Fox head, modeled in clay with center-board in place. Fig. 2, Prong-horn Antelope head modeled in clay and neck wrapped with tow, ready for the clay. Fig. 3, Deer head modeled in clay with center-board in position; Fig. 4, head modeled in clay for an animal snarling.

CHAPTER XII.

MOUNTING MAMMAL HEADS.

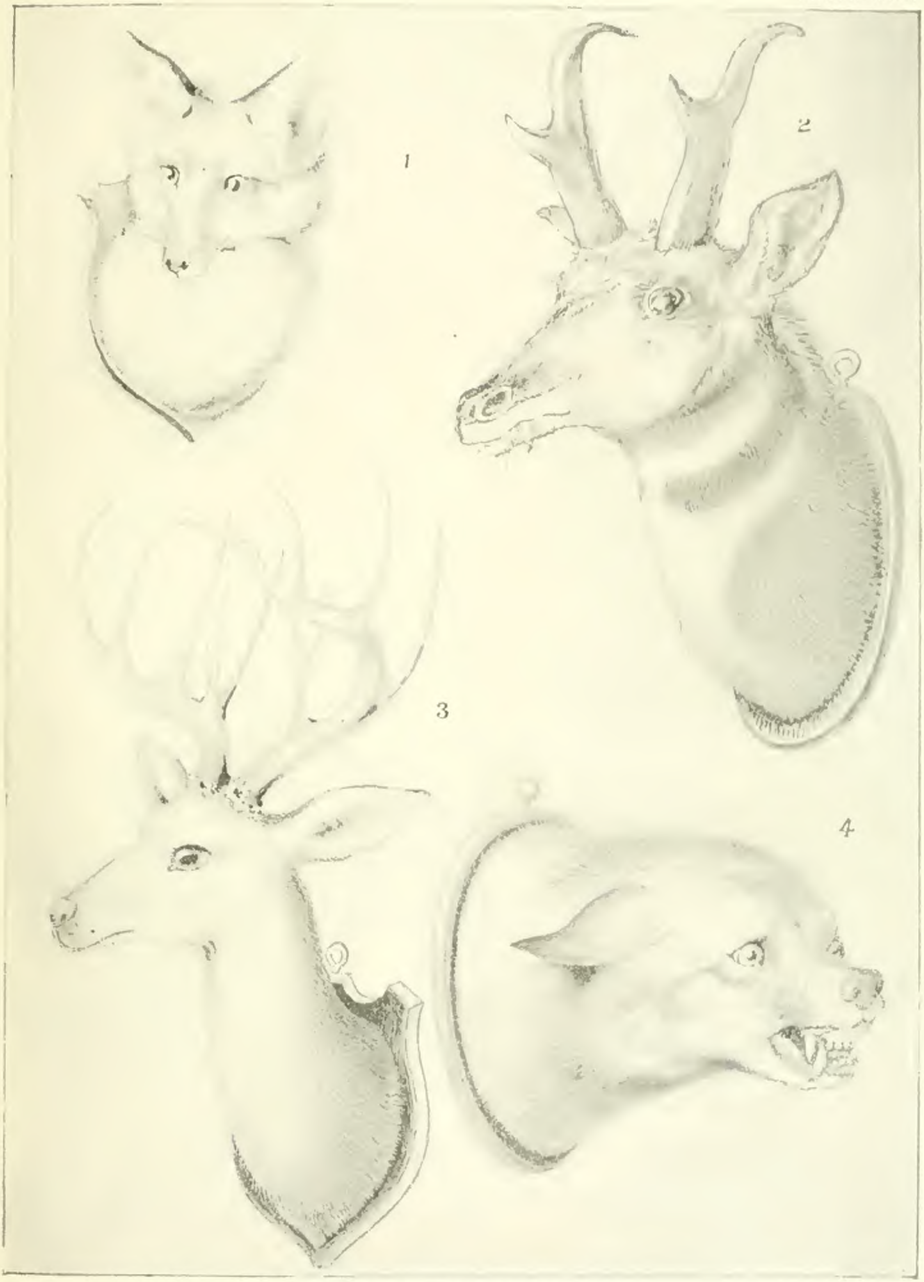
The chief procedures, in the mounting of mammal heads, are shown in Plates LXIX and LXX. If the head has horns it must be skinned through an opening incision made in the back of the neck (Fig. 1, Plate LXIX), and this cut must extend all the way around the base of the horns. This incision can also be made in the shape of a **Y**, the stems extending around the horns. If the head has no horns, the skin should be cut off the desired length on the neck, and it can be skinned wrong side out over the skull. Heads having horns are often shipped to taxidermists by sportsmen and others with the neck cut off *entirely too short*. You may have a head mounted whose skin has been cut off just back of the ears if you choose, but you cannot in this case blame the taxidermist for not producing the *ideal*.

In the heads of all mammals with large horns the skin should be cut off just in front of the shoulders, and it should be left longest on the under side of the neck. The reason this should be done is that the head can then be given the *proper elevation*, and when mounted on a shield the horns will *clear* the *wall*. Moreover, the neck, which adds to the beauty of the animal, can be given the curve and shape which are characteristic of it in life. Therefore, if elegance and beauty are the objects in mounted heads, the length of the neck is, before skinning the subject, one of the important calculations to be made. Sportsmen, when you are in the field, and by your prowess, lay low an elk, a moose or a deer, and desire to have the heads mounted to decorate your halls, be sure that the length of the neck-skin is sufficient for your purpose before the knife has severed it from the body-skin.

In heads with short horns or without horns the length of the neck is arbitrary, and must be governed by one's judgment and taste.

With these preliminary remarks I shall proceed to describe the best method of mounting a mammal head of any kind. We shall take for our trial a deer head, one similar to the fine specimen represented in Fig. 3, Plate LXXI, which was mounted and drawn by Dr. Jasper. When the opening cut has been made up the back of the neck and around the base of the horns, proceed to separate the skin from the flesh until you come to the base of the skull. At this point you will discover the butt of the ears; here you may cut them off close to the skull and continue skinning forward over the face to the tip of the nose. Perhaps the most difficult point for the beginner to work over is the eyes. When you come to these the best plan, adopted by nearly all taxidermists, is to place the index finger on the outside of the eye, pull the skin away from the skull gently and cut through the membrane, being very careful when you come down into the corner of the eye where the skin closely joins the bone. Separate the skin neatly along the jaws all the way to the end of the nose, where the cartilage must be cut through in order to detach the skin entirely from the skull. After taking the skin off roughly, begin to pare off all particles of flesh that remain adhering to it. Clean it thoroughly. If you do or do not intend to mount the head immediately, *skin the ears all the way to the tips* and *pocket the upper lip.* In skinning the ears of the larger mammals it is a good plan to use a pair of flat-nosed pliers for pulling the skin of the ears apart. Toward the tips the skin joins closely together, and it requires force to separate it. The cartilage after this must be carefully cut away. The upper lip may be pocketed by cutting into the fleshy part and the skin proper, leaving a pocket between the fleshy part and the skin. In previous chapters I have given sufficient directions for *thinning* the skin. This is of such great importance to the person who is to mount the head that it will well repay him to study carefully what I have said in the last chapter concerning the *thinning* of skins, when expression and shape are desired in the head of an animal. On page 204 there are special directions for thinning skins under the head of *Relaxing Dry Skins of Mammals.* After washing all blood stains from the hair we shall place the skin in the salt and alum pickle, as directed on page 18. The flesh ere this time has been thoroughly cleaned from the skull, and the brain has been taken out through a long hole, cut forward from the back of the occipital opening. In this hole the center-board for the neck is fitted into the skull cavity. Now mix up some plaster of Paris in water, place the center-board in the cavity, pour in the plaster until it is full; pile the plaster up and around where the lower jaw joins the upper, so that it will also be held in place. This is a good method of fixing the center-board for the neck in the heads of deer, antelope, etc., but in the skulls of elk, moose, etc., on account of the great weight, we must employ a different means of fastening, which I shall describe in this chapter.

For a deer head you may make the center-board the shape it appears in Fig. 3, Plate LXX, or you may make it perfectly straight, for



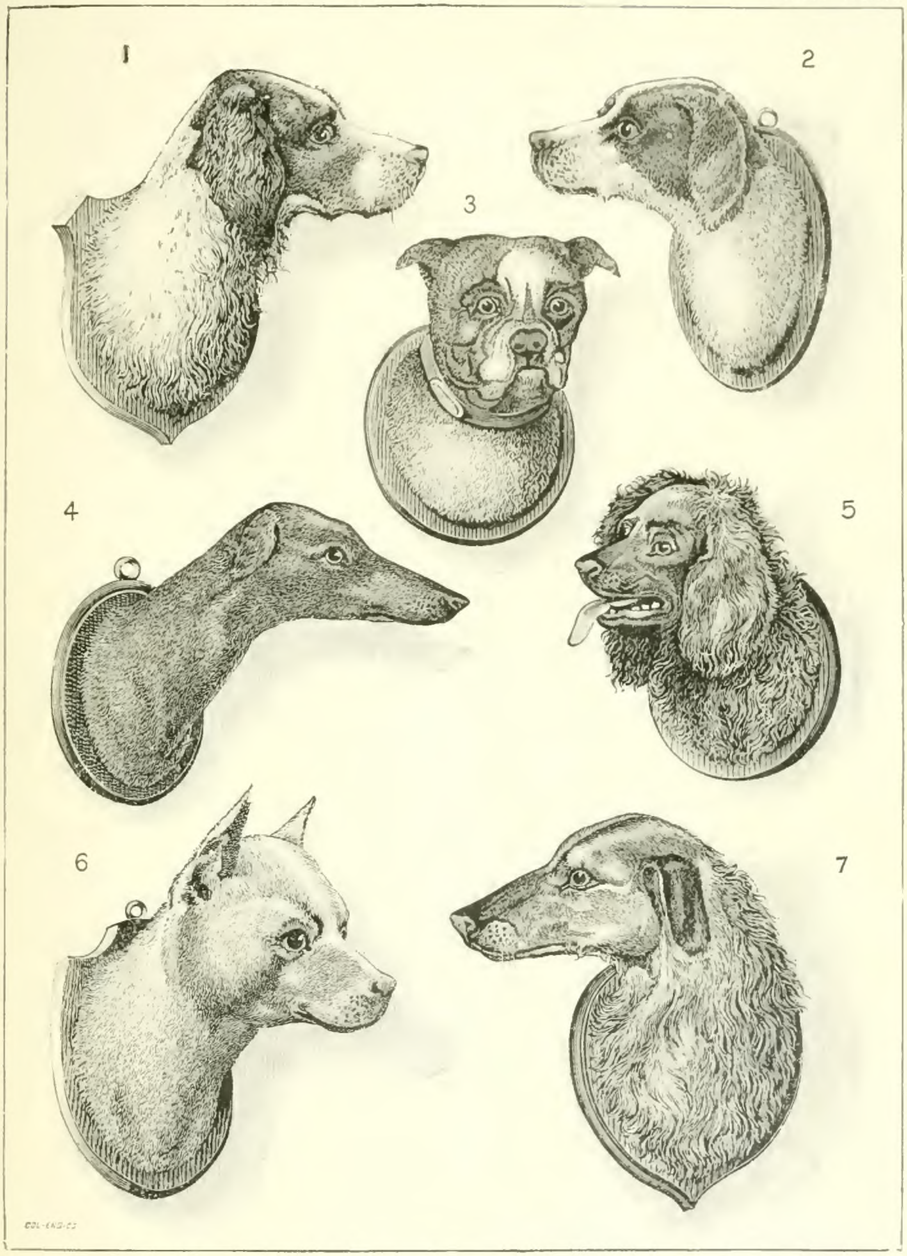
FINISHED MAMMAL HEADS.

Fig. 1, Fox; Fig. 2, Prong-horn Antelope; Fig. 3, Deer; Fig. 4, head mounted representing an animal snarling, as in a wolf, hyena, etc.

the neck must be formed around it, whatever shape you adopt. I prefer for the neck of a deer a gracefully curved center-board; the natural shape of a deer's neck is more easily obtained by it (see Fig. 3, Plate LXXI). At the end of this center-board there must be fixed a neck-board around which to tack the skin. It should be the shape of the neck at its base. This is seen in Fig. 2, Plate LXIX. The neck-board is fastened to the center-board by means of screws. In order to make the neck-board the proper shape and size, measure the neck-skin and make the proper shape out of a one-inch pine board, from these measurements, which, for a deer, is about as we have it in Fig. 2, Plate LXIX. Fasten it to the center-board, the end of which can be seen in Fig. 1 of the Plate just referred to. Now put an eye-screw in the top as seen in Fig. 3, Plate LXIX, by which to hang the head on the wall in a convenient place where you can work at it. If you prefer to do so you can fasten it temporarily to a square board with an eye-screw, and, in this shape, hang it on the wall (Fig. 2, Plate LXX). Now begin to form the neck by wrapping tow around the center-board all the way up to the skull, giving it the proper shape and size by binding it firmly down with cord. Having gone this far take the skin out of the salt and alum pickle and try it on the manikin. Pull the skin together at the opening along the back of the neck and around the base of the horns and see how it fits. You can easily judge where more tow is needed, or where it should be taken away. When this has been done take the skin off and model the head with clay and chopped tow as is represented in the figures of Plate LXX. Now is the time to give the inside of the skin a heavy coating of arsenical paste or soap (see page 34), and leave it lie until just before you place it on the model for the last time when it should have another heavy coat. Paint it also thoroughly around the base of the horns where the skin is to form around them. Give the ears all they will hold all the way to their tips. Continue to model the neck proper all over with clay mixed with chopped tow, until your model is complete. The next thing in order are the ears; these must have sheet lead or copper cut and hammered the shape of the ear, to replace the cartilage you have taken out and to fill them all the way to the tips. These metal ears should be trumpet shape at their base that they may rest snugly on the skull. They may be inserted in the skin of the ear, and when the skin is placed in position on the head the base of the metal ears may be imbedded in the clay. When you have placed the skin on the manikin take several stitches along the back of the neck to hold it in place while you proceed with the sewing. Begin at the base of the horns and draw the skin closely around them and sew it firmly together. At this point you can lift the skin of the head and fill in around the base of the ears and any parts along the neck. In sewing up the opening, use a surgeon's curved needle, and when you sew through thick skins an awl must be used to make the holes for the needle to pass through. When the seam has been completely sewn up tack the base of the neck-skin around the neck-board as shown in Fig. 4, Plate LXIX.

After you have the skin on and the neck opening sewed up and the skin tacked around the neck-board, you must frequently comb the hair and rub it smooth. Keep this up until the head is finished. A tack should be driven into the deep corners of each eye, which will hold the eye-lids in place over the orbits. You are now ready to put the finishing touches on the head.

The mouth, cheeks and nose demand attention first. Turn the upper lip back and fill in clay, mixed with chopped tow, around the nose where the cartilage has been cut away, then fill in the same manner the pocket you have made in the upper lip. The cheeks may be reached through the mouth. By pressing the clay carefully from the outside you can form the lips and face to their natural shape and fullness. The under lip must have a coating of clay and chopped tow and then brought up and pressed into shape close to the upper. If you desire to add strength to the clay and chopped tow, put in some strong glue water. The best modeling clay which I have ever used is furnished at one cent and a half per pound, by C. Hennecke Co., 162 and 164 West Water street, Milwaukee, Wis. A stitch may be taken in the middle of the upper and lower lips, which will hold them in place. The clay when dry, however, will hold the lips forever in place, and if the skin has been thinned down properly there will be little or no shrinking apart. Now carve out of soft pine a block that will fit the ears, which is, for a deer, exactly as we have it illustrated in Fig. 5, Plate LXIX. Drive tacks in a row on the flat side of this block, in the middle; place the block in the ear and wind soft, light cord around it (Figs. 6 and 7, Plate LXIX), using the tacks as anchors by which the thread can be wound around. This is called "blocking the ears." While the lead or copper inside will hold them in shape, the blocks and thread will help to give additional smoothness and beauty. Now place some clay, mixed with glue water, in the orbits and "set" the eyes. See that they are set even in the head, and are looking at the same object. Do not allow them to bulge out too far — staring — but give to them the expression of mildness or gentleness. The head now is ready to



MOUNTED DOG HEADS.

Fig. 1, Setter; Fig. 2, Pointer; Fig. 3, Bulldog; Fig. 4, Greyhound; Fig. 5, Spaniel; Fig. 6, Bull-terrier; Fig. 7, Stag-hound.

be let alone until it is dry, when the final touches around the lips, nose and eyes must be done with papier-maché, and then colored. For this portion of the work, and for modeling of open mouths, I refer the reader to page 207.

The very best way to preserve the skin of a head while collecting in the field is in the salt and alum bath, which keeps the skin as soft and pliable as when it was taken from the animal. The next is by rubbing on equal parts of salt and alum and hanging the skin up to dry in the shade. If the head be that of a moose or an elk, space may be saved in shipping by sawing the skull through in the middle — through the middle line of the cranium — separating the skull in halves. Each half of the skull, with the horns and the lower jaw, can be bundled together in one package for shipment. In mounting a head whose skull has been cut in half, the center-board for the neck can be placed between the two halves and securely fastened with bolts. Enough of the skull should be taken from both halves of the skull to allow for the thickness of the board. On each side of this center-board there should be fastened with screws a piece of 2x8 pine, all the way to the base. This is necessary to give strength, and to provide sufficient anchorage for the heavy screws which must pass through the neck-board to support the weight of the head. The neck-board for a moose is somewhat more oval than that for a deer (Fig. 2, Plate LXIX), and should be made of inch and a half pine.

Never mount your mammal heads on anything but elegant, massive shields, and have them highly polished. Oak, red-wood, walnut, mahogany and cherry are among the best woods for this purpose. Various shapes of panels and shields may be made on which to mount heads, and a number of designs are shown in Plates LXXI to LXXVII, inclusive. Bird and fish heads may be mounted in the same manner with fine effect, as shown in Figs. 8, 9 and 10, Plate LXIX.

CHAPTER XIII.

THE MOUNTING OF CRUSTACEANS, FISHES, REPTILES, ETC.

I am indebted to Mr. Frederic A. Lucas, of the National Museum, for the use of his valuable paper "*On the Mounting of Crustaceans.*" The figures in brackets refer to Plate LXXXII, which is intended to illustrate this article:

"The mounting of crabs, lobsters and other crustaceans is somewhat of a thankless task, requiring an outlay of considerable time and trouble to arrive at results at all satisfactory. At first sight it would seem an easy matter to mount an animal whose form is determined beforehand, but a little trial develops the fact that, like bringing up children, it is much easier in theory than in practice. As crustaceans dry they become very brittle, and the small legs and delicate feelers break only too readily. Worse than all, the beautiful colors with which these creatures are adorned while living fade rapidly, and the only way in which they can be renewed is by a dextrous use of paint. Therefore, the great requisites for mounting crustaceans are a careful touch, a good eye for colors, and some knowledge of the proper methods of applying them. The preparation of crustaceans is a little peculiar, inasmuch as, instead of the skin being removed from the body, the body is removed piecemeal from the skin. The first step in this process is to detach the carapace (Fig. 1) or covering of the back, and this, in many crabs, is a work of considerable time and patience. Commence by inserting a knife-blade — an ordinary table-knife is good — at the junction of the body with the tail and work it carefully around the hinder portion of the shell until it is detached. Now pry up the back portion of the shell, cutting away the attachments as fast as they can be reached, and the carapace will soon come away from the body (Fig. 2), leaving the modified legs that surround the mouth attached to the body. To scrape the flesh from the carapace and exposed portions of the body, is an easy matter, and it is only needful to exercise a little care not to scrape through the upper joints of the legs. To clean the legs it will be necessary to make some small hooked scrapers by flattening, sharpening and bending one end of a piece of annealed wire (Fig. 3) sufficiently long to run the entire length of the leg. These scrapers are inserted in openings made between the joints

BISON HEAD.

Remounted from an old specimen by the author.

of each leg and the meat drawn out, an operation much more quickly described than performed. Usually it is most convenient to make the openings on the upper side of the leg, as it is a very simple matter to close them with a little glue and cotton in the manner hereafter described. After carefully scraping the interior of each leg, wash thoroughly with a syringe to finish the work of cleansing. As crustaceans are particularly liable to the attacks of dermestes, they should be carefully poisoned, either by a liberal application of thin arsenical soap, or better still, by soaking for two or three hours in a bath made by dissolving arsenic in hot water. If the soap is used, see that it is worked well into the legs, as well as every nook and cranny of the body, by means of a small brush. The method of wiring varies a little according to the desired position of the finished piece, but, owing to the nature of the subject, but little variety of attitude is possible. The best wire to use is zinc, as it never stains by rusting, but, unfortunately it is, so far as I know, impossible to procure zinc wire in this country except by special importation, and iron wire must ordinarily be made to answer. It is well to wrap iron wire thinly with tow. If the animal is to be walking with the body clear from the ground the wire must be passed through the tips of the claws, and in many species which, like the common blue crab, have sharply-pointed claws, it will be necessary to remove a little of the tip in order to render this operation possible. Ordinarily it will be quite sufficient to support the animal on four legs, thus leaving the others intact. The wires for the large claws must be carefully worked to the very tip, and not infrequently these claws are so heavy that they must be allowed to rest on the pedestal. The leg-wires should be so long that the free inner end can reach from the opening of the leg to the opposite side of the body, so that the leg-wires cross one another. (Upper *a a*, Fig. 2.)[1] Bend the ends into hooks, place a little tow between the wires and the shell, and fill the opening of the leg-joints with cotton. Place the animal in a walking attitude on the temporary pedestal, supporting the body by a block of wood just as thick as the height that you wish to have it from the ground. Bear in mind that the third pair of legs keeps step with the first, and the fourth with the second, and that they do not sprawl away from the body, but keep pretty close to it. Therefore, what may by courtesy be called the knee-joint, should be bent at a pretty sharp angle. All this being done, pour in a little thin plaster of Paris, and

1. The lower *a, a* and *b, b* in Fig. 2 are intended to illustrate another method by which the wires of four legs in pairs, on each side are twisted together; these should reach to the opposite sides and they should be hooked together before the plaster is poured over them.

thus unite the wires in a solid mass. Do not meddle with the specimen until the plaster has thoroughly set. When it has, put the carapace in place, adjusting it carefully over the legs, and tie it firmly on, lest it should warp in drying; also, pin out the eyes and arrange the feelers. In case the specimen is to be resting on its pedestal it will be unnecessary to run the wire *through* the legs, and quite slender wires may then be used, since their only purpose will be to keep the legs in place and render it impossible for them to fall off should they become disjointed. The animal is held in place by means of a wire bent into the shape of a wide U, one end of which is run through the front portion of the body and the other through the hinder part, the middle of the U passing over all the leg-wires and holding them securely in place (D, Fig. 2). Lobsters are usually placed flat on their pedestals, and the fastening wire is run through the entire length of the tail and brought out at the tip of it. For museum or other purposes it is often desirable to study all sides of a specimen, and in such cases the mode of procedure is as follows: Shape a piece of wood so that it will fit loosely in the body cavity (Fig. 4) and attach it securely to a rod of sufficient size to firmly support the finished piece. This rod is variously placed according to the position in which it is wished to have the finished specimen.[1]

In the case of crabs it is desirable to have them "stand on end," and the rod may be brought out at the rear of the body, while in lobsters it may be brought out through the center of the thorax. The legs having been wired, this piece of wood is introduced, the legs fast to it (Fig. 4, 1. 2. 3. 4), and plaster poured around it to form a firm attachment. First, however, place fibers of tow or pieces of twine over the wood and poke them down into the space between it and the sides of the body. Of course, in a lobster thus mounted the tail-wire would need to be of some considerable size, and it is well in such a case to use a tow wire for additional security. When the specimen is quite dry glue on the carapace (Fig. 1) and fill the holes between the joints of the legs with finely cut cotton and thin glue. First, put a little cotton into the hole, smear it over with glue, and apply cut cotton and glue until the gap is completely filled. Le Page's fish-glue used thin, or his mucilage, is excellent for this work. In painting crustaceans, first give them a thin coat of sugar of lead, which fills the pores and prevents the color from striking in and thus looking dead in spots. When dry, paint with turpentine color, the main point being to stipple

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1. The rod is threaded at the lower end, and it is fastened on a wooden base by means of a nut below and ornamented by a rosette above (Figs. 4 and 5).

BIG-HORN SHEEP.

Mounted at Ward's Natural Science Establishment, Rochester, N. Y. From photograph.

over with a soft brush. This should be done very carefully, as otherwise it is almost impossible to avoid giving a streaked appearance to the animal. Crustaceans may be mounted either on plain pedestals or on artificial rock-work, according to the purpose they are to serve, and in any case they should be kept out of the dust so far as possible, since, owing to their fragile nature, they are very difficult to clean."

Fishes.—We shall take for our first attempt in the skinning and mounting of fishes a bass or a common red-horse. The principles upon which these are skinned and mounted will apply, with slight modification, to all others.[1]

The first thing to be done in order to keep the scales intact and to keep them from curling is to cover the entire fish (excepting the fins) with tough linen writing paper or thin muslin. The mucus on the fish, like glue, is usually sufficient to hold this firmly. The fins, tail (or caudal fin) should be kept damp with wet cloths until the specimen is finished. This will keep them from splitting. With a pair of dissecting scissors begin at the vent and make a straight cut along the middle line of the belly, prolonging the incision to where the V-shaped point forms between the gills. Start the cut again at the vent and continue it to one side of the anal fin, all the way to the caudal fin, or tail. This opening incision is shown in Plate LXXX, Fig. 4. You may now carefully cut with the scissors the spines which support the anal fin. The flesh that adheres to it may be cut away afterwards. Now divide the pelvic arch where the ventral fins are joined, and sever these fins from the pubic bones. Skin down to the tail and cut through the processes of the caudal region. You may then begin to lift the fleshy portion of the fish until you come to the back, where arises the median fins, supported by the interspinous bones. These may be separated with the scissors. Skin up to the base of the skull, where the vertebral column should be detached. Take the brain out, remove all flesh, and scrape clean the entire inside of the skin. The silver lining on the inside, which gives the fish its silvery color, should not be touched. After cleaning all around the head carefully, taking out the eyes, etc., give the skin a heavy coating of arsenical paste or soap. If you are collecting in the field, then place the skin in alcohol, as directed on pages 45 and 63. Upon catching a fish, an outline of it should be made and its colors painted in water colors. This was Prof. J. S. Wiley's method in the field.

1. For those who are unacquainted with the anatomy of fishes I should recommend Packard's First Lessons in Zoology, published by Henry Holt & Company, New York. See pages 130 and 131, treating on this subject.

But, for the present, we have skinned our fish for the purpose of mounting it at once. The best method for mounting the skin of a fish, when there is no decided curve to be given to the body, is by carving a block of soft wood to about the size and shape of the carcass. This should be surrounded with potter's clay, mixed with chopped tow. In this wooden center-board two holes should be bored at a proper distance apart, along the abdominal line, to receive the threaded ends of the brass rods which are to support the fish when mounted on a pedestal, similar to Fig. 5, Plate LXXX. These brass rods must be threaded at the ends which are to go into the pedestal, that they may be secured by nuts beneath. Above the pedestal an ornamental rosette should finish off the brass standards, just above the pedestal. This may be seen in Fig. 4, Plate LXXXII, the brass standard on which the crab is mounted. The best material in which to imbed the artificial eyes of fish is papier-maché or potter's clay, mixed with strong glue water.

If you desire to mount a fish, giving the body a curve, as when it comes struggling from the water, the best mode of procedure is to make a core of tow around a piece of wire, to which you can give the proper bend. This core should very nearly fit the skin, and the end of the wire should be anchored in the skull cavity. Now apply clay all over this core and insert it in the skin. When this is in position, and while you are sewing up the seam, you can add or take away whenever it is necessary to give the proper form to the fish. Some prefer to fill the skin entirely with finely chopped tow, around a center-board.

The advantages of clay, as a filling, over fibrous material, in special cases, has been fully discussed in this work. The rays may be taken as significant examples of failures when fibrous materials are exclusively introduced, and will demonstrate the value of clay as a filling material when it is necessary to secure thinness and smoothness. Even with the use of clay the most experienced taxidermists fail to make "a thing of beauty a joy forever" out of a ray.

Large fishes such as sharks may be mounted by using a center-board, and the filling should be hackled hay or straw.

Mr. Walker's method of mounting a fish is to cut a section out of one side — using about one-half of the fish. The skin is filled with cotton or tow. When thus filled the edges of the skin are fastened with small tacks to a board previously cut to the proper shape. This makes a very nice fish medallion, and, with the use of clay, can be very much improved. The fins of fishes should be spread out and

CARIBOU.

Mounted at Ward's Natural Science Establishment, Rochester, N. Y. From photograph.

held in position with cardboard, pinned in the same manner you do a bird's tail to hold the feathers in position while drying. Fig. 3, Plate XV. Small and medium-sized fishes are best preserved in jars of alcohol.

Stuffed fishes are not always a triumphant success. In many cases it is better to cast them in plaster and paint them. See Chapter XV, *Making Plaster Casts.* Of the species found in Ohio which give the best results in mounting are the Black Bass, Perch, Goggle-eye, Straw Bass, Sunfishes, Pickerel, Muscallonge and Gars. Mr. Charles Dury's method of preparing the fishes for the Ohio exhibit at the World's Columbian Exposition is as follows: Choose and keep intact the most perfect side of the subject, i. e., the side having the most perfect set of scales and fins. Split the other side from the gill opening down the middle to the tail. Skin out the body, cut away as much bone of the head as possible, clean and scrape away every vestige of flesh and fat. Anoint every part with arsenical solution. Sew up the seam and fill the skin with saw dust, pouring the saw dust through a funnel placed in the mouth or gill opening. Lay the filled skin (seam down) on a board and mould it into shape with the hands. Spread the fins and tail as desired and hold them in position with pins until dry. The fish when dry may be painted and mounted on a medallion of wood of suitable color and shape.

Painting Mounted Fishes.—We have already in this work given directions for the mixing of tints and the manner of applying them. To paint the skin of a fish successfully, with its silver or golden metallic lustre—to produce those glorious colors as seen in a fish just taken from the water, and as viewed by a Waltonian eye, is truly a work of art. It requires the most delicate touch and dextrous use of the brush and colors. Tube colors alone will not impart the silver or golden lustre. Where the metallic tint is required nickel leaf must first be laid on with sizing; where a golden tint is necessary use gold paint. When these metallic tints are laid on, the tube colors may be worked in above them, after which the entire skin should be given a thin coat of clear white varnish.

Collecting in the Field.—Prof. Wiley's method of preserving a fish during long voyages was as follows: If the fish had a coat of mucous on it this was washed off with a solution of spirits of turpentine and alum. This was done after a finished water-color sketch of the subject was made. The skin having been taken off, was neatlv wrapped in a piece of linen and placed in a copper field-tank containing alcohol. This tank is made precisely as directed for the the lead field-tank on page 61. For the strength of spirits necessary see page sit. Small casks will answer the purpose when the tanks are not available. Before putting the entire fish into spirits, Prof. Wiley plunged it into spirits of turpentine, sometimes making the fish die in the turpentine. This was done to preserve their metallic lustre. A fish to be preserved entire in spirits should have an opening made along the belly, beginning from the vent and prolonging the cut to between the ventral fins; the spirits may then have quick and free action.

Prof. Wiley's method of placing an entire fish in alcohol is the same as he employed when the fish is skinned, the fish after being washed is wrapped in linen. A bed of clean flax, tow or cotton is placed in the tank or barrel to prevent the rubbing and tossing about in the conveyance. The tank should not contain more than two-thirds of fish, the rest ought to be flax or cotton and spirits. Each fish should have attached to it a pure tin or a copper label on which is embossed a number which should correspond to the same number in your record-book, containing the full data of each fish. Skins of the larger fishes, sharks, etc., may be preserved equally well in the salt and alum pickle. It is a notable fact that the great naturalist, Cuvier, received from North America a small cask of fishes placed in strong brine. The colors were better preserved than any which had before been seen.

Frogs.—Plate LXXXVI shows the system of wiring in a frog designed to stand upright in a human-like attitude. It will be seen that the wire of one of the hind legs is used as the center wire which runs up through the nasal cavity. The other hind leg wire is twisted around the one used as the center wire. A loop is turned in the center wire to receive the wires of the front legs which are also twisted together. The legs are made by wrapping the bones with cotton in the same manner the legs of the small quadrupeds are formed of tow. The body filling is of the same material, stuffed in by way of the mouth piecemeal until the desired shape and fullness is attained.

Frogs for mounting should be skinned through the mouth; the front legs should be detached and drawn through the mouth and skinned; continuing all the way down the body every particle of flesh should be removed and the hind legs skinned in the same manner as the fore legs. But you *must not detach any of the vertebral column* from the skin of the back; leave it attached to the skin the entire length as seen in the Plate, because it gives shape and character to the back which you cannot possibly produce in any other way. If these are removed you would be able to fill the skin out perfectly round, but you cannot reproduce the characteristic shape of the back. Of course you must scrape and clean around the bones very carefully, and then

ELK.

Mounted at Ward's Natural Science Establishment, Rochester, N. Y. From photograph.

give the skin and bones a thorough poisoning before returning it right side out. This is one case in taxidermy where there are no seams to sew up. With this system of skinning and wiring a frog it is possible to give it a life-like attitude, besides many human postures, representing men boxing, fencing, playing billiards, etc., and all manner of human caricatures may be produced. There is an opportunity, however, in these animals, to display artistic skill in the coloring and varnishing of their skins. If the mouth is to be opened, it must be modeled in colored wax.

Lizards (*Lacertilia*).—Specimens of this order, with few exceptions, mounted by the usual processes in taxidermy are, generally speaking, unsatisfactory. Most lizards have cylindrical bodies and thin tails, adorned with bright metallic colors, making their reproduction a very difficult task. The best method for the preservation of the smaller reptiles is that employed at the National Museum. They are preserved in spirits in jars, and are arranged on *slabs of glass*, in life-like attitudes. Crustaceans and fishes are preserved in the same manner. It is done simply by passing threads through the feet or body and carrying them through holes bored in the glass with a piano drill, and then wedging the thread fast with a little plug of wood. Sometimes the plug is made long enough to penetrate the specimen part way and help sustain its weight. In boring the holes in the slabs of glass a chilled steel drill with a triangular point is used, moistened with a preparation known to dealers as "bore glass." Turpentine will do if that is not obtainable. Jars for the preservation of alcoholic specimens may be had from any dealer in natural history materials.

The larger lizards, as well as some of the larger salamanders, may be successfully mounted on wires, and, with the proper application of clay and chopped tow in the skins, their peculiar forms may be beautifully imitated. It remains then for the artist to deftly reproduce their wonderful colors and the natural effect will be complete.

Mounting Snakes.—I have tried almost every method of mounting snakes that has been devised, and have tested the merits of the various procedures on serpents ranging in size from the smallest to some of the largest in existence. I have come to the conclusion that there is only one practical method of mounting snakes. Make an opening incision, beginning at the throat, and continue it to the end of the tail, as we have it illustrated in Figs. 4 and 5, Plate LXXIX. When this has been done take the skin off clean, preserving the full length carcass for measurements, etc. The eyes may be removed by an opening into the orbit from the inside. Now give the skin and skull a heavy coating of arsenical paste and leave it in that state while you make a manikin of tow and wire. Select a piece of annealed wire sufficiently strong to bear the weight of your subject and several inches longer than the carcass before you. Now wrap this wire with tow and bind it with thread or strong cord, according to the size of the specimen. Make this manikin as nearly like the serpent's carcass as possible, both in size and shape. Coat the skin and skull once more with arsenical paste. Give the manikin you have made a heavy coating of clay mixed with chopped tow, insert the center wire (which should always be left long enough) into the skull cavity, at the same time arranging the clay-covered manikin in the skin and, after all has been carefully adjusted, begin to sew up the opening. If you desire to give the snake a curled up attitude, it will be necessary to provide an extra wire, which should be wrapped with the body wire in the tow and come out at any point necessary to enter the pedestal in order to give the snake the desired attitude. An additional wire should extend from the tail if two bends or curls are to be made. This is clearly shown in Fig. 3, A, B, Plate LXXIX, and also in Fig. 5. By this method you can place a snake in any desired attitude. For modeling the open mouth, etc., I shall refer the reader to page 207. The eyes are, of course, set in the same manner as those of birds or quadrupeds. All the smaller snakes are best preserved entire in spirits, as directed on page 45.

In collecting the skins of the large serpents they should be preserved in spirits or in the salt and alum solution, to make them of any value for mounting.

The Mounting of Turtles.—The methods which I have employed in the mounting of turtles within the last ten years have chiefly been those laid down by Mr. Frederic A. Lucas, whose skill in this branch of taxidermy is unexcelled. The most humane manner of killing a turtle is with chloroform or by quickly piercing its heart and severing its spinal column after the plastron has been lifted. We have taken for our illustration in the mounting of turtles the hawkbill, that beautiful marine turtle whose shell is so valued in commerce. It has an elegant shape, hooked bill, large scales and long, fin-like flippers. The figures we give in Plates LXXIX and LXXX will be sufficient to demonstrate methods in other groups. With a small dissecting saw (Fig. 4, Plate II) you can cut through under the edge of the plastron on both sides and all the way around the rear portion of it (*b*, *b* to *a*, *a*, Fig. 1, Plate LXXIX), but not any farther than the points *a*, *a* in front. The plastron should remain attached to the front skin. With a long

MOOSE.

Mounted by the author. From photograph by Baker.

knife blade you can detach the plastron or under shield from the flesh clear around to the points *a*, *a*, and lift the plastron up just as you would the lid of a chest.[1] This will expose the interior of the turtle. Enough skin should remain attached to the sides of the plastron so that you can sew the edges together just before finishing. Now make an incision along the under side of the tail, and on the under side of each flipper to facilitate skinning and, as an opening through which you can work in the clay. Sever the front legs at the shoulder bones and the hind legs at the pelvis. Skin them and clean them of flesh just as you do in a quadruped, skinning as far toward the end of the flippers as possible, and leaving the leg-bones attached to the flippers. With the aid of a chisel and bone forceps (Fig. 5, Plate III) separate the pelvis from the upper shell and skin out the tail. Sever the cervical vertebræ, skin to the base of the skull where the neck vertebræ should be disjointed, take out the brain and remove all flesh from the skull. The eyes of turtles are removed from the outside.

The interior must be thoroughly scraped and cleaned of flesh, and, after skinning, all large turtles should be placed in the salt and alum pickle for a few days. In mounting the larger species a narrow center-board is used in which to anchor the wires, as described for quadrupeds on page 191. The body filling should be of tow, and the legs like those of quadrupeds should be wrapped and made of the same material and surrounded with clay mixed with finely chopped tow. The peculiarities of the broad flat flippers can only be wrought out of the plastic clay, and the seams should be neatly sewn up. In the very small box and snapping turtles the system of wiring I have usually followed is similar to that in Fig. 3, Plate LXXX. When the body filling has been securely placed between the upper shell, and the wires that have all been twisted on the center wire which extends from the brain cavity to the end of the tail, (and sometimes through it), I pour on a thin mixture of plaster of Paris and water which, when dry, unites the wires which have been twisted together in one solid mass. Sometimes in the small specimens I anchor the leg and center wires in solid balls of tow. After the filling has been completed in turtles the plastron is brought down and fastened with brass wires and the edges of the skin sewed firmly together with strong thread. The final touches involve the forming of the wrinkles and folds of the skin in their proper places, the natural finish of the specimen, proper attitude and general neatness.

1. Some taxidermists hold to the old method of removing the plastron *entire* (Plate LXXX, Fig. 2). This is quite unnecessary and involves additional labor when the plastron is to be put back in place again. More than all, it is impossible to sew up the seam in front so that it will be invisible. By the dextrous use of papier-mache and colors, however, any unsightly seam may be covered up. Another method of skinning a turtle is hrough a square section cut out of the plastron as seen by the dotted lines in Plate LXXIX, Fig. 1.

But who should attempt to write on the mounting of turtles since Lucas has written!

"For skinning purposes turtles may, like Gaul, be divided into three groups. First, the sea-turtles, having a moderate sized lower shell or plastron, feet in the form of paddles, and legs which, like the short neck, are practically non-retractile; second, those which, like the snapping-turtle, have a small plastron and neck and legs largely retractile; and, lastly, turtles with a large under shield, and the power to draw the neck and legs quite under cover. This third group comprises the large majority of turtles, and, unfortunately, those most difficult to skin. A word as to the killing of turtles: 'I am told'—but have never tried it—that a short immersion in warm water is fatal, and sincerely hope it may be so, as these reptiles are ordinarily very tenacious of life. Cyanide of potassium, so deadly to animals more highly organized, acts very slowly, and although the spinal column becomes paralyzed in a few hours, the limbs move at the expiration of a day and a half. Chloroform, however, appears to kill rapidly and easily, and it is only necessary to saturate a wad of cotton with the liquid, tie it over the animal's nose when he draws in his head, and leave for half an hour or so. In the absence of chloroform and warm water, there remains only the barbarous but rapid plan of sewing through the shell into the heart.

"To skin a turtle with any degree of comfort it is absolutely necessary to have a small saw. If wealthy and addicted to the collection of good tools, buy a small dissecting saw, which costs twice as much as it should. A very good substitute can be made by breaking three or four inches off a hack saw and fitting it to a wooden handle, drawing the temper at one end to punch holes for the rivets. A pair of bone forceps may be a luxury, but they will be found a great convenience in detaching the neck and legs, and are wonderfully handy in skinning large birds and small mammals. In skinning a sea-turtle, saw through the under shell on either side, and with a knife continue the cut clear around the hinder portion of it. Leave sufficient skin attached to the border of the plastron to enable you to readily sew the edges of the cut together when the specimen is mounted. Continue the cuts toward the shoulder far enough to allow the plastron to be turned forward, thus exposing the interior of the body. Make a cut under each flipper and the last half of the tail. Disjoint and skin the legs, removing by the cut on the underside what flesh cannot be readily reached from within, and working as far toward the end of the flipper as is possible. Leave all the leg-bones attached to the flippers. With

STEER HEADS. Mounted and photographed by Gustave Stainsky, Chicago.

bone forceps or an old chisel separate the pelvis or hip bone from the upper shell and skin out the tail. Sever the neck from the body, skin to base of skull, disjoint the neck bones and remove the brain. Scrape away as much flesh as possible from the back of the skull. Unlike most other animals, the eyes of turtles must always be removed from the outside, care being taken not to cut the eyelids. Be sure to remove the small muscle from the outer hind portion of the jaw; otherwise it shrinks in drying, and creates an unsightly depression. Snapping turtles, and others with small under shells, are skinned in the same manner as sea-turtles. It is not *positively* necessary to make a cut under the foot of these, but it will be found to greatly facilitate turning the legs and the manipulation of the clay during the process of mounting.

"Tortoises and other turtles, whose legs can be withdrawn under the plastron, cannot be properly skinned by the method just described, owing to the impossibility of sewing up a cut along the hinder edge of the under shell. True, they often *are* thus skinned and mounted with the edges of the skin simply tucked in, but the result is unsightly, and the only gain is in time of preparation. Turtles of the last class should be skinned through an opening made by removing as large a section of the under shell as is practicable, drawing out the legs to their full extent to lessen the danger of cutting through the skin. The process of skinning is a somewhat difficult one, but the absence of unsightly seams after the animal is mounted amply repays the trouble.

"The smaller turtles may be mounted immediately after skinning, but all preferably, and the larger ones invariably, should be soaked for a few days in the usual bath of salt and alum. Always poison thoroughly, especially around the feet and back of head.

"As the skinning of a sea-turtle has been first described, it is consequently in order to proceed with the mounting. It must be borne in mind that the skin of turtles shrinks considerably in drying, and the sewing should, therefore, be done very solidly; also all wrinkles should be somewhat exaggerated, as they disappear in drying. Therefore, a turtle *must not* be filled out, but the skin should be left loose and the apparent excess will vanish.

"The main principles in mounting large turtles are similar to those in mounting mammals, except that as sea-turtles lie flat on the ground much lighter wires may be used. First, make the tail, by winding coarse tow on an iron rod until it has the same shape but not quite the size of the original. Now cover this with clay, prepared according to Mr. Hornaday's directions, by mixing with soft clay a quantity of finely chopped tow. Lay it in the skin and sew up, beginning at the tip of the tail and working toward the body, adding or subtracting clay here and there as occasion may require. Form in a general way the larger folds or wrinkles of the skin, leaving the finer markings until the animal is on its pedestal. Always decide the position of the finished piece before commencing work, and bend all your irons and shape the legs, neck and tail with that predetermined form in view. Remember that turtles swim and walk with the same movements as do most animals — the right fore and left hind leg moving together.

"The tail being finished, proceed with the hind legs, making so far as possible the same bends in the wires that are to be in the joints of the leg when finished, and tying the wire securely to the bones. Wrap the legs with coarse tow, taking care not to get the lower part too round. But little pains need be taken with the upper part of the leg, as it is concealed within the body, and most of the lower portion, as well as the "paddle," will need to be made with clay in order to insure a proper degree of flatness. If the animal is sufficiently small, the three hinder wires may be fastened together as follows: Place the knees and tail in their proper position — the animal lying, of course, on its back — and form a ring in the tail-wire just where the leg-wires cross. Through this pass the leg-wires and twist all firmly together, so that there shall be no 'wobbling.' If the specimen is large, the wires must be fastened to a piece of wood running lengthwise of the body, as in a large mammal. Secure the tail-wire with staples, and bore holes for the leg-wires through which they are passed, adjusted to the proper length, bent down against the board and secured with staples. It will next be necessary to fill in from the base of the tail to the legs. This can be done with chopped tow, after having first placed a good coat of clay on the skin in which to model the wrinkles. Now proceed with the neck and front paddles. Run the neck rod into the brain cavity and fasten it there securely, either by tying or by bending it down through the roof of the mouth, and turning it backward. It can be run out through the mouth, but this plan is not so solid as the above. The neck and front flippers are made and fastened in a similar manner to the tail and hind flippers.

"Secure the cut edges of the plastron together with wires, and in sewing the skin use strong thread, and pull the edges tightly together, in order that the shrinkage in drying may not cause an unsightly gap. In *very* large turtles it is sometimes necessary, in addition to the legwires, to run a bolt through the plastron into the wood, to which the leg-rods are fastened. After the specimen has been placed on its tem-

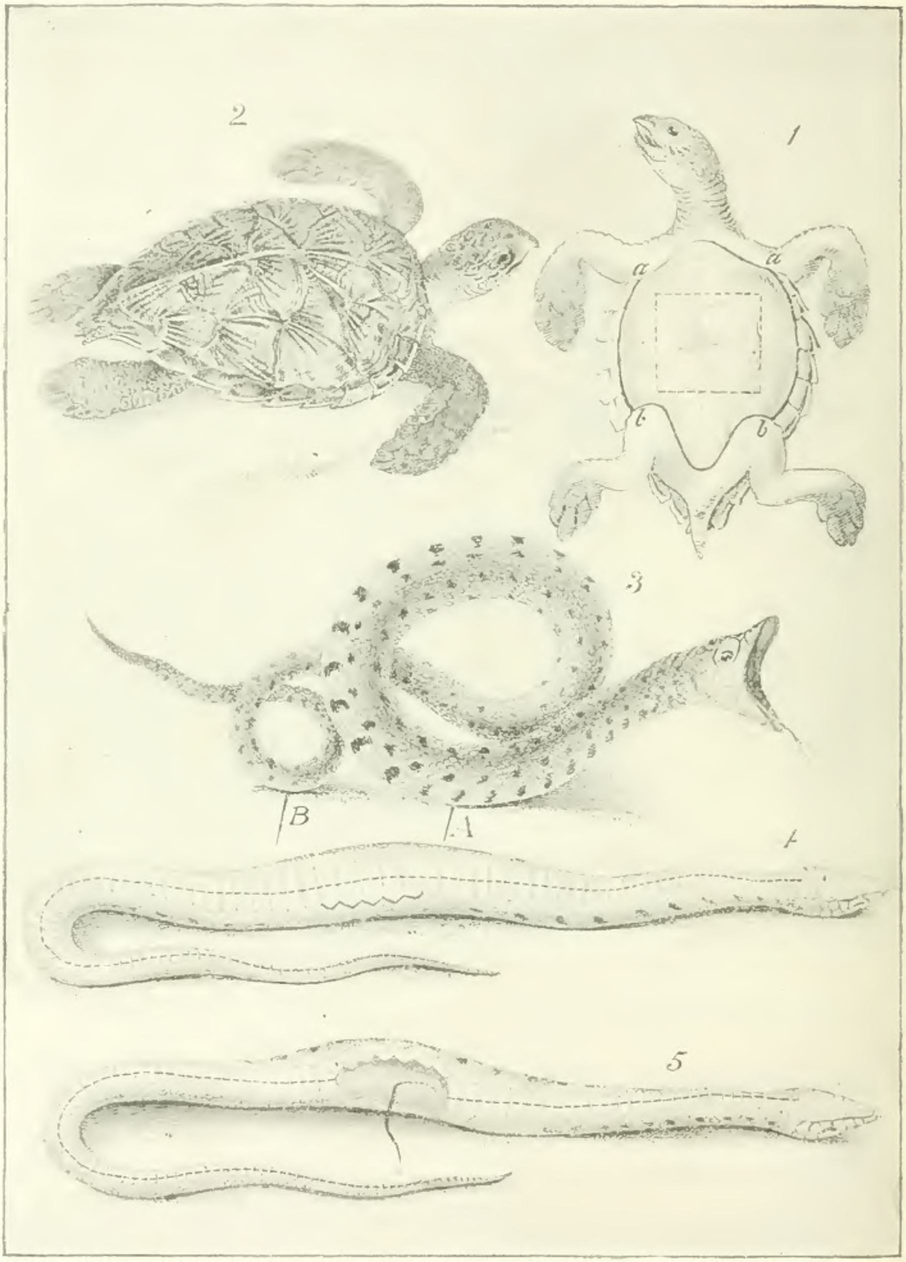

2
1
a
a
b
b
3
B
A
4
5

PLATE LXXIX.

SKINNING AND MOUNTING TURTLES AND SNAKES.

Figs. 1, 2, Hawkbill turtle; Fig. 1, *a*, *a*, *b*, *b*, showing where the plastron should be separated in order to skin a turtle; the cut should be begun at the rear edge of the plastron and continued to the letters *a*, *a*, where the plastron should remain attached to the front edge of the skin. The plastron may be lifted like the lid of a chest and the turtle skinned. The dotted square in Fig. 1 is another method of skinning a turtle, by cutting a section out of the plastron, through which the animal is skinned. Fig. 3, A, B, showing the extra supporting wires in a snake which are attached to the main or center wire for the support of the snake. These are brought out at a point where it is desired to anchor the serpent fast to a pedestal or base. The dotted lines in Fig. 4 show where the opening incision should be made in order to skin a snake. Fig. 5, shows a single extra wire which is attached to the center wire, when only one coil is to be made in a snake.

porary pedestal go over it carefully, marking in the wrinkles and working out the prominences, and, if needful, adding, by way of the mouth, clay and tow to complete the throat.

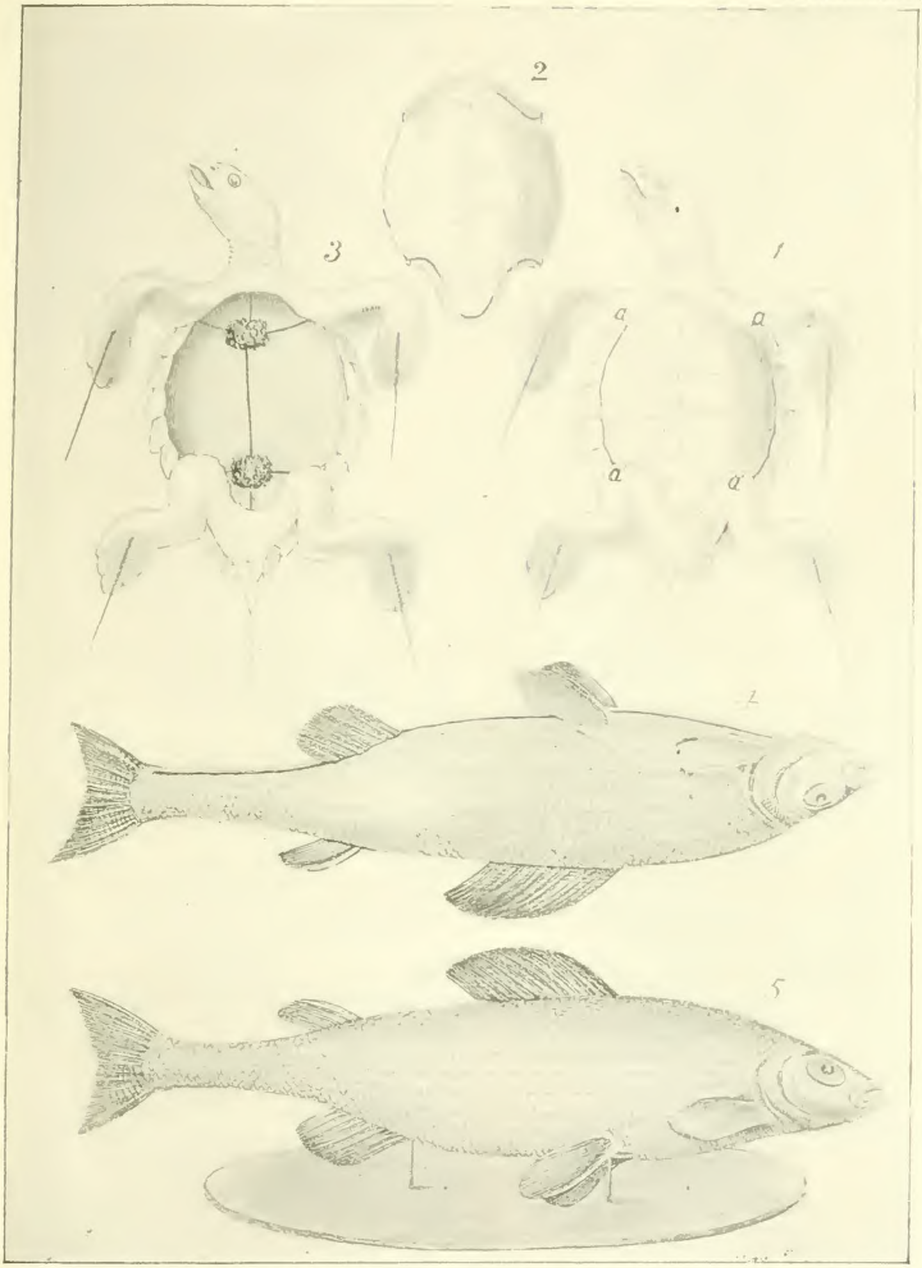
"In mounting small turtles the wires of each end are secured as follows: Having made the tail and hind legs, bend an eye in the tail wire, opposite the inner ends of the legs, pass the leg-wires through this, and twist all firmly together. Fasten the neck and front legs in a similar manner, and twist the wires of both ends firmly together, so that the united wires form a sort of backbone.

"In making the legs of small turtles be sure that they are *flattened* instead of round, and before skinning note well their shape. Fasten the leg-wire solidly to the bone, and wrap firmly and smoothly around with tow, forming a leg much smaller than the finished one will be. All the vacancy is to be supplied with the clay and tow mixture, which can be modeled into shape from the outside. It will be remembered that in the beginning it was noted that it would greatly facilitate the mounting to make a cut along the foot and under the lower part of the leg. Through this cut superfluous clay can be removed or additional clay introduced; and it is a very easy matter to sew up this cut in such a manner as to render it practically invisible. The manipulation of clay will be found at first somewhat aggravating, as it will persist in going where it is *not* wanted rather than where it is; but without the use of such a material it is practically impossible to correctly mount a turtle. The neck-wire of turtles can be fastened to the head by running it into the occiput and down through the base of the skull, and then twisting it upon itself. Be careful to get enough clay on the upper back portion of the skull to properly supply the great temporal muscles, as any deficiency there will create a very ugly, shrunken appearance. Modeling the neck and its junction with the fore legs is the most difficult part in mounting, and unfortunately no directions can be given which will insure success. The main thing, after the mechanical part of the work has been mastered, is to study well the form of the living and dead animal, and to strive to reproduce that form *exactly*. "That is good enough," is a phrase I am sorry to say most of us use, but it is a very mischievous little sentence, and can usually be translated — that is *not* good enough. There is no royal road to good taxidermy, nor can it be done by machinery, nor by the use of unlimited tools. Tools are a great help, but they are *only* a help, and to do good work you must be careful, thoughtful and observant. Without those requisites, although your work may be good enough, it will never be *good*. Occasionally in the making of groups, or in mounting specimens for museum purposes, it is needful to place a turtle in a swimming attitude. In such cases the work of procedure is the same as that previously described in the paper on mounting crustacea. A block of wood is fastened in the body, to which all the wires are attached, and to this is secured a rod of sufficient size to bear the weight of the finished piece.

"A word in regard to finishing: Sea-turtles, snapping-turtles, and a few others, whose colors are dull, need only a coat of varnish, greatly thinned with turpentine, to render them fresh looking. It is, of course, understood that you have thoroughly washed the specimen. But all turtles marked with bright colors will need to be painted, and this must be done with thin color, often stippled over to avoid a streaked appearance. Large cracks and broken scales can be repaired with papier-maché; small ones, such as seams, etc., with colored wax. White wax can be colored by melting it and stirring in a little tube-color; use hot. Of course particular cases will often require particular modes of treatment; but once the general principles are thoroughly mastered these can be readily met."

Another Method of Preparing Turtles. — A very ingenious and exceptional method of preparing a turtle so as to show both the skeleton and the outside in a single specimen is the subject of Plate LXXXIII. Our drawings were made from a specimen of the "Slider" *Pseudemys rugosa*, beautifully prepared by Mr. Lucas. This method of preparing a turtle is particularly valuable when it is desirable to preserve the bony structure and, at the same time, show the external characteristics of a rare turtle. It is likewise advisable to use this method in the common species as study specimens. Our illustration, we think, gives a fair idea of the manner in which they may thus be prepared. Specimens of this kind may be mounted on a brass standard which is split at the upper end like a Y, the stems being riveted to the lower part of the shell. One-half of the plastron may be fastened on the other by means of small brass hinges so that it may open like a door. Mr. Jules Bailly was the originator of this method of preparing the skin and skeleton of a turtle.

Crocodiles and Alligators (*Crocodilia*).— The crocodiles and alligators form the highest order of existing reptiles. Their tough skin, thick scales, their shape determined beforehand, make them easy subjects for the experienced taxidermist to handle. For him it amounts to little more than physical exertion to mount one of the largest specimens. The very small ones require more delicate manipulation. To skin an alligator, make an opening incision at the throat and continue it along the middle line of the abdomen, and all the way to the tip of the tail. The legs should be detached at the shoulder-girdle and pelvis, and the cervical vertebræ at the base of the skull so that the brain may be removed through the occipital opening. Cut the skin away from the flesh all the way around the body and remove the carcass. The eyes may be removed from the inside. In shaping the legs in the larger specimens I always form them with tow around the leg bones and leg irons, using clay wherever it will assist in developing any peculiar shape. When this has been done I prepare a narrow center-board of tough wood in which the leg irons are anchored in holes bored the proper distance apart, and then they are bent down and clinched with staples on opposite sides of the center-board. The neck iron is fastened to the center-board by means of staples and so is the tail support, the latter being made a trifle shorter than the full length of the tail, to allow for shrinkage. We must now provide for guy wires to hold the tail down while drying. Around the tail iron, at two points, there should be securely fastened heavy copper wires *doubled*, designed to pass down through the pedestal and to fasten beneath, for the purpose of holding the tail flat to the ground; otherwise, when the specimen is dry, it will be sure to spring up. This little device I have used in all sizes of alligators, varying the size of the wire according to the size of the subject. It is of great importance in the larger specimens. When these details have been arranged and the entire skin thoroughly poisoned, fill the body (in the large specimens) with tow or straw, filling the skin out full and even, first placing a heavy cushion under the center-board. Be sure that the center-board is in the middle of the body and that the bend in the leg irons is correct. The filling on all sides and in every part should be uniform. The sewing up of the opening should begin at the tip of the tail and continue to the ending of the opening in the throat. In the process of sewing you will have sufficient opportunity to add or take away filling where it is necessary to produce a particular shape. You will find that the use of potter's clay mixed with chopped tow will help most wonderfully in forming the different parts where tow alone or other springy substances will not produce the desired form. Use a large curved surgeon's needle, with strong linen thread doubled and waxed for sewing up the opening. An awl must be used to make holes in the skin so that the needle will easily pass through it. Arrange the legs in a natural position; and, to accomplish this successfully, you *must study a living specimen*. The pedestal, which has been previously prepared, must have holes bored in it for the reception of



SKINNING AND MOUNTING TURTLES AND FISH.

Fig. 1, *a a a a*, showing where the plastron should be detached and taken off entire. (Fig. 2). This is not the best method, see page 301. Fig. 3, system of wiring a small turtle, joining the leg wires to the center wire, see page 301; Fig. 4, showing where to make the opening cut in a fish; Fig. 5, fish mounted on pedestal.

the leg irons which have been threaded and provided with nuts. By this means the animal is fastened securely to the pedestal. The copper guy wires which are attached to the tail rod to hold the tail down may be fastened through holes bored in the pedestal, and held in place by staples underneath. For modeling and coloring of open mouths, tongues, etc., see page 207.

For mounting all the small alligators I employ M. B. Stollas' system of wiring as shown in Plate XLV. The legs and the thin tail of the diminutive ones are chiefly made of clay mixed with chopped tow. The eyes are set in clay mixed with strong glue water.

PLATE LXXXI.

SYSTEM OF WIRING A FROG.

A frog should be skinned through the mouth and the entire vertebrae column should remain intact attached to the skin of the back in order to preserve the peculiar characteristic shape of the back. The legs are made with cotton and the body is filled with same material through the mouth. The manner of wiring is clearly shown.

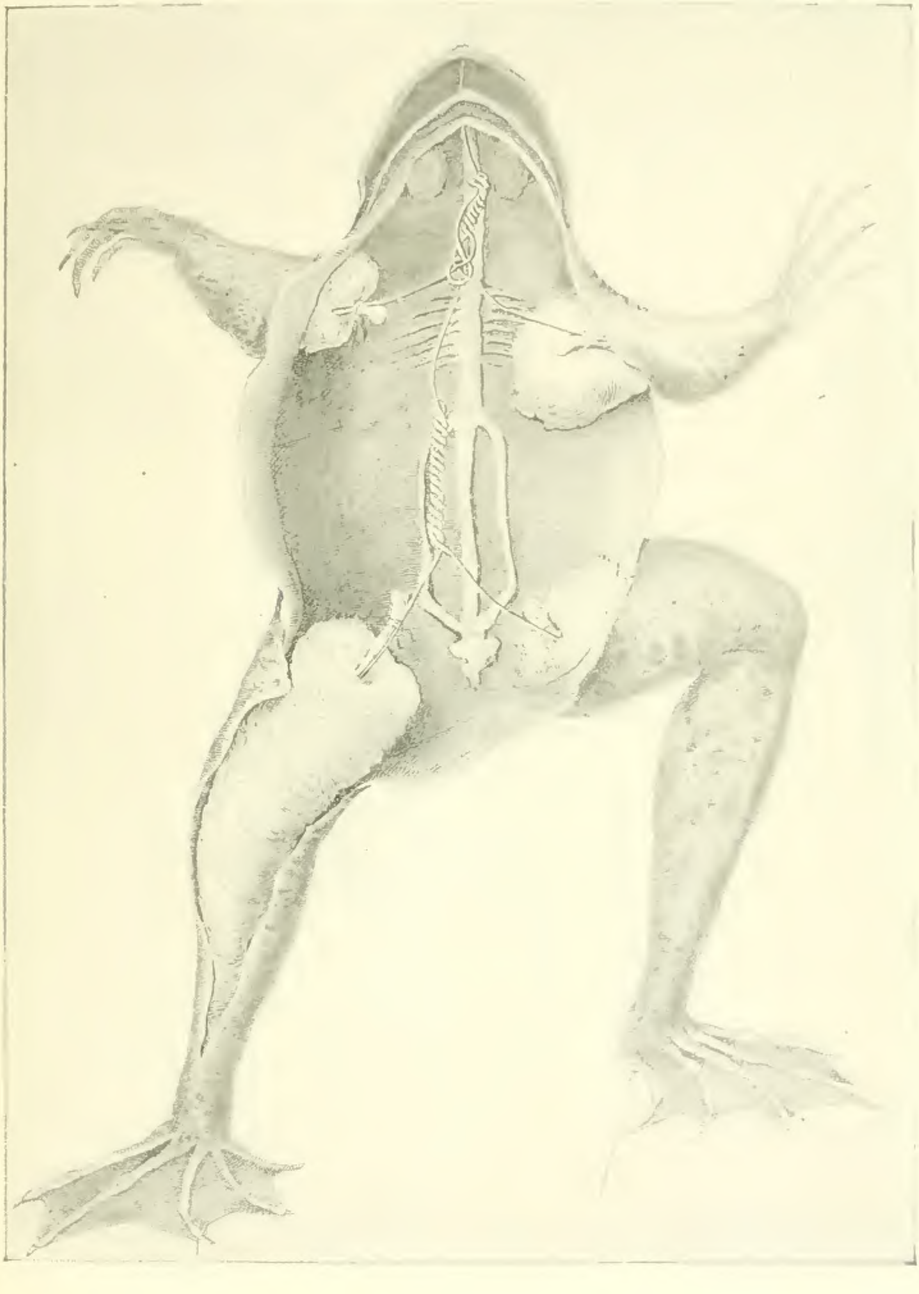


PLATE LXXXII.

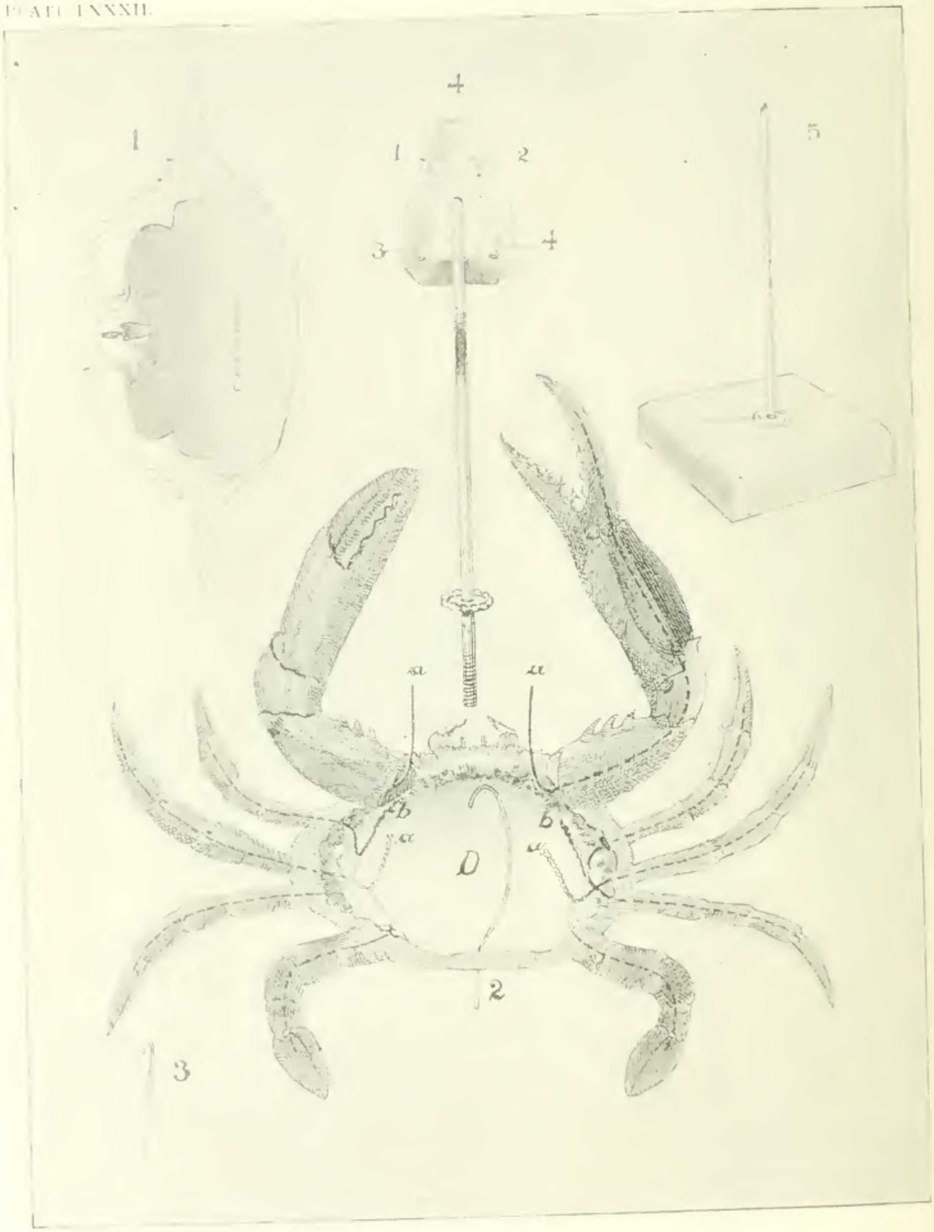


PLATE LXXXII.

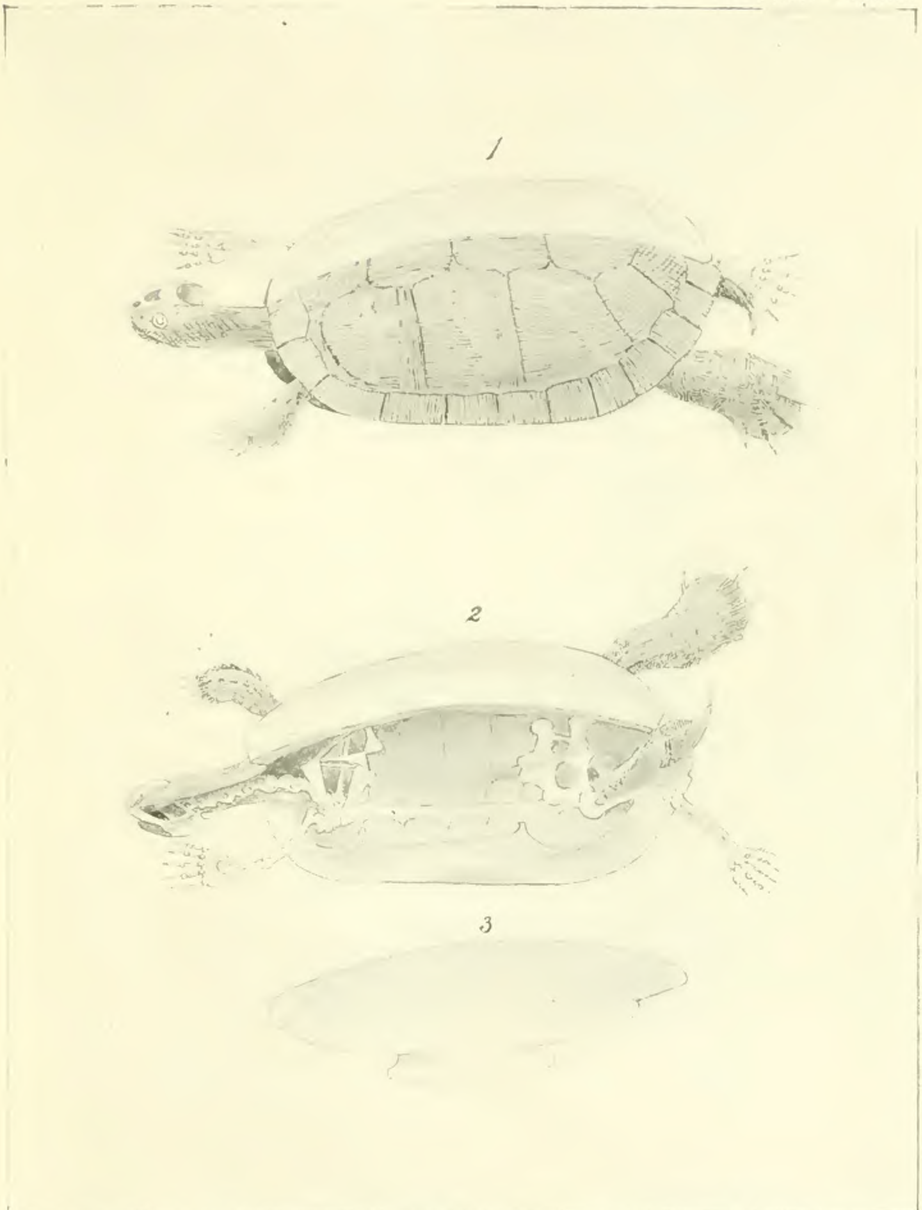
SYSTEM OF WIRING AND MOUNTING A CRAB.

Fig. 1, carapace, or covering of the back, detached from the body; Fig. 2, illustrating a system of wiring; the lower *a a* and *b b* show the wires of the legs in pairs twisted together; they should be long enough to reach to the opposite sides and should be hooked together, before the plaster is poured over them, to unite them in one solid mass. The wires may also be hooked together singly — without twisting them in pairs as in upper *a a*. The letter D in Fig. 2, indicates the U-shaped wire which passed over all the leg wires and enters the pedestal when the crab is to be mounted in a walking position. Fig. 3, hooked-shape wire for drawing the flesh out of the legs. Fig. 4, brass rod with piece of wood attached which is placed in the body, showing the hooks where the leg wires should be anchored, Figs. 1, 2, 3, 4. This is done when it is desirable to have the animal "stand on end." See Chapter XIII.

PLATE LXXXIII.

MOUNTING AND SKELETONIZING A TURTLE IN A SINGLE SPECIMEN.

This plate illustrates a method of preparing a turtle so as to exhibit one side of the animal mounted as shown in Fig. 1; and the entire bony structure in the same specimen preserved intact as in Fig. 2; Fig. 3, shows how the plastron is divided in order to expose the interior. This is an excellent method when it is desirable to preserve the skeleton and at the same time exhibit the exterior peculiarities of rare turtles. See page 311.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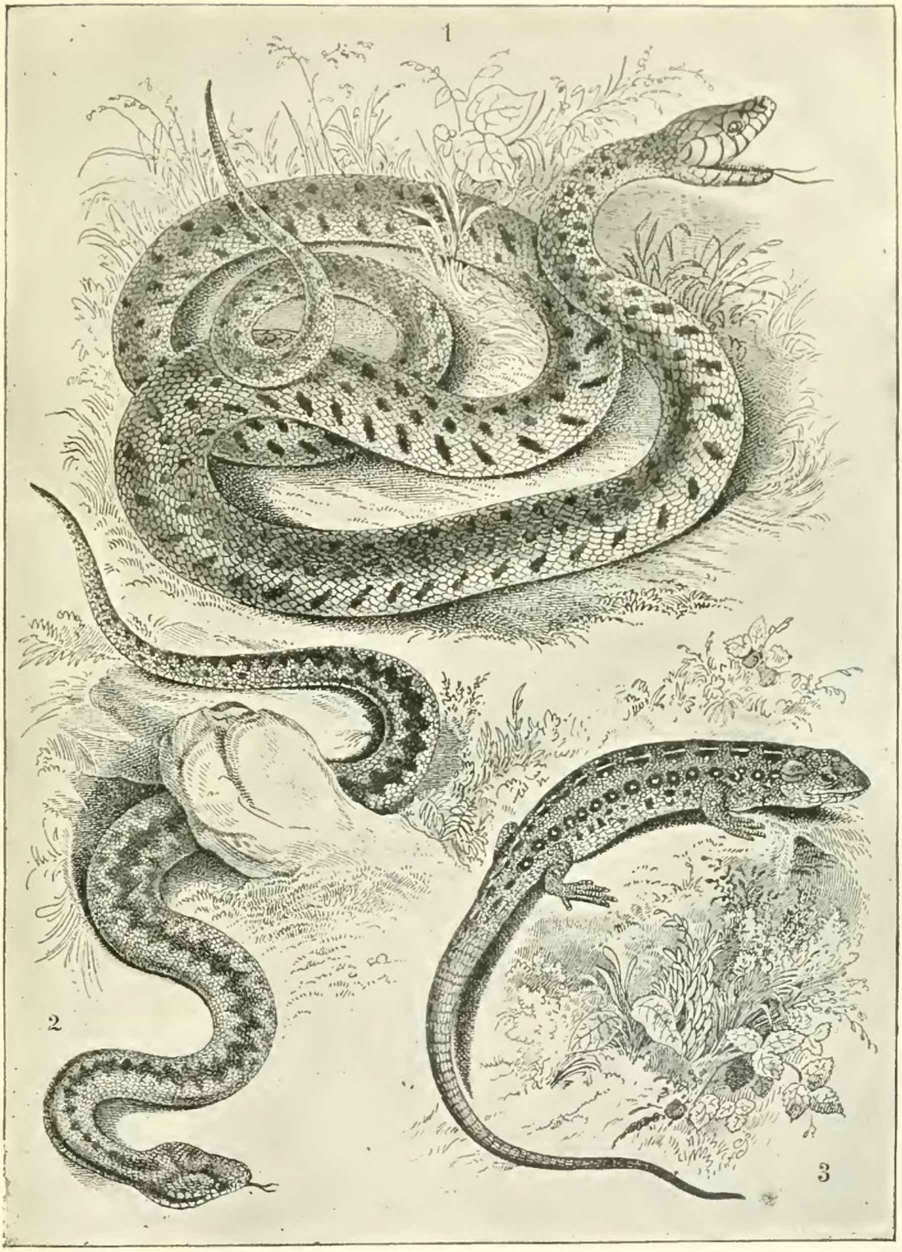


REPTILES.

In making up groups of reptiles we must depend largely upon the truthful reproduction or imitation of the natural surroundings which they inhabit, which this plate fairly illustrates.

BOB-WHITES.

Mounted under convex glass, with painted back-ground by Charles K. Reed, Worcester, Mass.

CHAPTER XIV.

ORNAMENTAL TAXIDERMY.

Taxidermy furnishes some of the most beautiful and artistic articles of decoration that can be devised. The variety of the designs is numerous, and the ideas which may be worked into useful or ornamental pieces all depend upon the skill and taste of the artist.

Some of the most handsome and skillfully wrought pieces of this class ever made were those exhibited at the third annual exhibition of the Society of American Taxidermists. There were designs in the shape of bird medallions, gilded crescents with owls, fire screens, grotesque groups of frogs, table pieces of various kinds and rugs with mounted heads. A few of these I shall take occasion to mention: Mr. Thomas W. Fraine exhibited one of the handsomest styles of screens ever designed, in the shape of a

Peacock Fire-screen.—With the tail feathers, head, neck, breast, and feathers of the back, a gorgeous screen can be made with this bird of royal colors. In our frontispiece a figure of one of these screens may be seen which I prepared on the same plan. Out of thin pine boards, less than a quarter of an inch in thickness, cut three circles twenty-eight inches in diameter. Fasten them together with glue and screws. In laying the circles together the grain of the wood should cross in order to keep the circle from warping, which it is sure to do if it is made of a single piece. A better way by which these circles may be made and whereby their weight may be lessened considerably is by making a felly and screwing the thin circular boards to it. Now fasten a tripod stand to the edge and gild it; cover the side on which the feathers are to be arranged with green muslin or satin. The back of the circle should be covered with some rich color of satin or silk, plaited from the outer edge to the center, where it is held with a drawstring. The tail feathers are arranged in circles and held in position with double-pointed tacks. For the one represented in our frontispiece I had a pattern made for the legs of the stand which were cast in brass and then gold-plated. They are fastened by means of bolts, screwed into the ornamental upright. In the center of the back where the plaited satin is drawn together there is a gold-plated knob which serves the purpose of lifting the screen.

Mammal and Bird Medallions. — One of the finest ways to display a bird to be represented as *dead* is on a panel. Bunches of snipe, duck, geese and grouse prepared in this way make handsome dining-room ornaments. Squirrels, rabbits and other small mammals may be arranged in the same manner. Be sure that your specimen looks *dead*. In order to do this with accuracy you must hang the specimen up before skinning it and study it carefully.

A bird medallion may be made by mounting one-half of a bird on a back ground of suitable color. If, for instance, the bird is white, a black velvet back-ground is the proper color.

Mr. Frederic S. Webster's style of bird medallions surpasses anything of the kind that has been designed. The entire bird is mounted. In preparing a snowy heron, for example, the back-ground is of velvet; it is surrounded with a deep, massive frame with a glass top. The heron is standing on a gilt log. Mr. Webster's exquisite skill and taste in the preparation of the specimen make these bird medallions all that the most critical in art can desire in this line.

An Arctic hare medallion, prepared by Mr. Webster and exhibited at the third annual exhibition of the Society of American Taxidermists, was the first mammal medallion ever made.

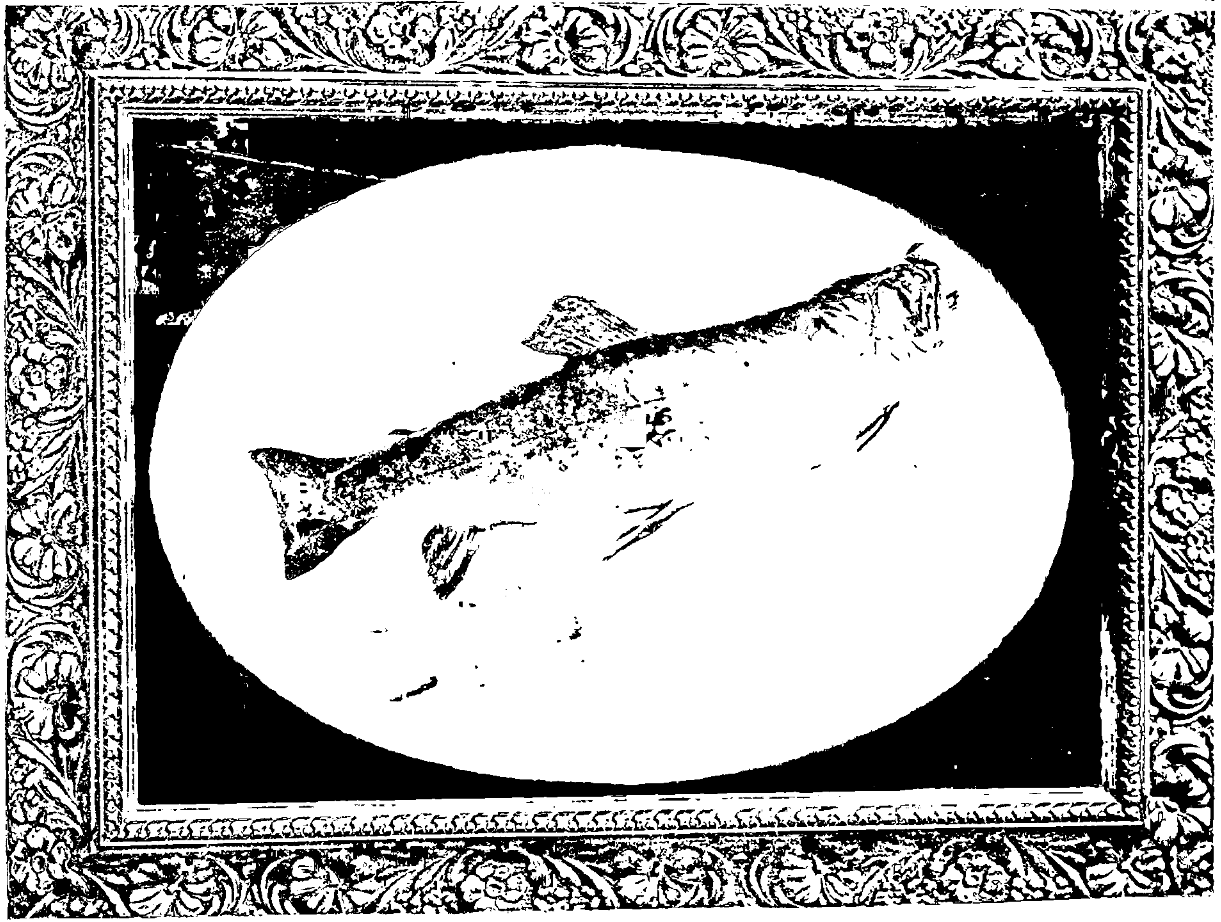
Miscellaneous.—A very desirable wall ornament may be made by carving and gilding a crescent and placing an owl on the point, as is shown in Plate LXXXVIII.

Mr. Frank B. Webster's "Wounded Great Black-back Gull" in Plate LXXXVII is an example of a table-piece in the writer's museum. It is a fine piece of work, beautifully and skillfully executed.

If it is desired to prepare single birds of any kind for the top of book cases, on wall brackets, etc., they may be placed on turned stands, or pedestals more or less elaborately made to suit the design and the location they are to occupy.

Frogs mounted to caricature man make some of the most amusing subjects the taxidermist can prepare. All imaginable human attitudes may be given them; groups representing negro minstrels on stools, the end-men holding their tambourines as when playing; frogs playing leap-frog; billiards, fencing, dueling, smoking, etc. The best work I have ever seen of this nature is that done by Mr. J. F. D. Bailly. On page 294 I give full directions for the skinning and mounting of frogs, and the system of wiring of these is illustrated in Plate LXXXI.

The mounting of mammal heads, so desirable for the decoration of halls and dining-rooms, is fully treated in Chapter XII.



TROUT. Mounted under convex glass, with painted back-ground by Charles K. Reed, Worcester, Mass.

No one who visited the anthropological building at the World's Columbian Exposition is likely to forget the highly artistic group of birds, small mammals, and the fish pieces with painted back-grounds in handsome frames with convex glass, by Charles K. Reed, of Worcester, Massachusetts. In these we have pictures of exquisite beauty for our walls, with the actual mounted specimen in the foreground and scenes in the back-ground painted from old nature. The accessories are usually a combination of natural and artificial leaves, branches, tree stumps, etc., the ground work also being made of natural and artificial material. The sky or other back-ground is painted in oil. Plates LXXXV and LXXXVI are reproductions from photographs of two subjects.

Perhaps one of the most admired of Mr. Reed's pieces is that of a group of screech owls, representing a hollow tree stub containing four downy young of the same species. On the top of the stub is one of the parent birds, presumably the female, with a dead bird in her talons, and is just making ready to spread a feast before its waiting young. Close by sits the male quietly watching in another direction. The scene is picturesque and pleasing, the accessories and painted back-ground are true to nature, and, the whole being encased in an elegant massive frame under convex glass, forms a picture of unusual interest and beauty.

Fur Rugs with Mounted Heads.—All but the head of a skin which is to be made up into a rug should be tanned in the regular manner by a tanner. If you have the skull you may mount it according to the directions given in Chapter XII. Some prefer to mount the head without the lower jaw, using only the upper part of the skull, so that it will lie flat on the floor. The finest manner to mount the head on the skin of a leopard or tiger is with the mouth snarling, similar to the one figured in the frontispiece. If you have no skull for the skin you must either carve one out of wood or purchase a papier-maché one. Papier-maché skulls can now be obtained from dealers in natural history supplies for nearly all the commoner mammals. To give the proper stiffness to a rug it should be lined with thin leather or buckskin, and beneath that the felt lining should be placed, allowing the edge of the latter to project two inches beyond the edge of the skin. It should then be pinked with pinking iron.

Polishing Horns.—Some very handsome pieces of furniture are made up with highly polished horns. The chief element necessary to polish a pair of horns by hand is physical force. If machinery is at your service, so that you can use a buffer, then the labor is not so great, and a higher degree of polish can be obtained in a short space of time. We shall take for our trial a pair of steer horns. With a piece of glass scrape the horns perfectly smooth, and then go over the surface carefully with fine sandpaper. After this has been done, rub it down with pumicestone and linseed oil. A high polish may now be obtained by rubbing the surface with a heavy piece of felt.

By soaking the horns in concentrated lye you can give to them any curve you may desire and they may be scraped and polished much more easily. If any holes are to be bored in the horns it must be done while they are soft, for when they become dry the horn is as brittle as glass and is easily broken.

GREAT BLACK-BACKED GULL.

Wounded Great Black-backed Gull, mounted by Frank B. Webster, Hyde Park, Mass. In the author's collection. From photograph by Baker.

CHAPTER XV.

MAKING PLASTER CASTS.

The first knowledge I received concerning the value of making casts for taxidermic purposes was from the late eminent sculptor, Thomas D. Jones. Describing to him the dermoplastic method of mounting mammals, he remarked in words to this effect: "Do you call this process stuffing animals? If you do, I beg to differ with you on this point. Your method involves the highest principles of art. My young friend, I should never think of mounting an animal on the principles you have laid down without taking plaster casts of the carcass. To obtain accuracy in the size and form of the muscles you should depend on something more than mere measurements. You should learn to make casts of the carcasses of the animals you intend to mount, and I will agree to teach you the process." His offer was quickly accepted. I spent one-half day with Mr. Jones in making "piece moulds" of various objects, and a "waste mould" and cast of a raccoon head.

I should advise those who intend to practice taxidermy to any great extent to learn by all means the simple art of making plaster casts. Casts of mammal heads, legs or other parts, or casts of fishes and reptiles will serve to secure accuracy in the form of mounted specimens better than any other means you may adopt. A quick, skillful hand, with a knowledge of how to proceed, is all that is necessary. When the object you are to make a cast of has elevations and hollows in it you will be compelled to make the mould in several pieces, because the mould will not "draw" away without breaking. For illustration you can make a mould of one-half of a perfectly round object and it will "draw" off readily because there are no "undercuts" in which the plaster can catch. Therefore, for an object having hollows or elevations, of which several casts are to be made, the mould must be of several pieces, and is called a

Piece Mould.—All references to figures refer to Plate LXXXIX. We shall take for our lesson in the making of a piece mould a pear. The first thing to do is to wipe it off clean and imbed the smaller end in *damp* sand up to a point just before the oval begins to turn (Fig. 1), and the larger end, which is exposed, should be coated with sweet oil, lard oil, or clay water, so that the plaster will not stick to the pear. Now pat the sand down all around the pear and make it flat and smooth.

Whittle a small plug of soft wood sufficiently rounded at one end so that it will "draw" out of the plaster. Place this plug in the sand as we have it in A, Fig. 1. When the plaster is poured over the pear to the edge of the sand this plug will form a counter-sunk hole in the rim of the one-half of the mould as shown in Fig. 4, A. The exposed end of the plug should be oiled as well as the pear, in order to keep the plaster from adhering.

Mix up some water and plaster of Paris considerably thicker than cream and cover the exposed portion of the pear as shown in Fig. 2. While the plaster is hardening you can trim it off and shape the exterior. When it has become hard, lift the pear out of the sand with the plaster around it. Trim the edges of the plaster smooth and flat around the pear and, with a camel hair brush, paint the edges with shellac dissolved in alcohol. In order to give this sufficient body, it should contain one part of shellac and four parts of alcohol.

When the shellac is dry, coat the edges of the plaster with oil, or clay water and also the surface of the pear. Now imbed the pear with the one-half covering of plaster in the sand sidewise as we have it in Fig. 3. Be sure to have the counter-sunk hole which the wooden plug has made buried in the sand.

Place three wooden plugs around the pear in the sand, one at each side and one at the end, as shown in A, B, C, Fig. 3. These should be oiled the same as the surface of the pear and edges of the surrounding plaster. When this quarter of the pear has been covered with plaster it will have about the same appearance as is represented in Fig. 2, and the wooden plugs will make the counter-sunk holes as seen in B, Fig. 4. It may be preferable to some to make these counter-sunk holes with a knife blade as each section of the mould is made.

When the plaster has become sufficiently hard you may lift the pear with the plaster around it and you will have covered three quarters of it. The section just covered is B, Fig. 4, showing the counter-sunk holes which the wooden plugs have made. Without taking this section off, proceed to cover the last portion with plaster, first giving the fresh edge of section B a painting of shellac and alcohol and then anoint the pear and edges of the plaster all around with oil. When you have covered this with the plaster and it has "set" sufficiently hard, by tapping on it gently and, with a little trimming and cutting the three sections will come apart and the pear can be

PLATE LXXXVIII.

GILDED CRESCENT WITH SHORT-EARED OWL.

Prepared by the author. From a photograph by Charles H. Doty.

taken out. Fig. 4, C, represents the last section, showing the "retaining points" [1] formed by the counter-sunk holes in sections A and B.

The manner of filling the mould to make the cast is as follows: After coating the interior of each piece of the mould with shellac and alcohol, cut a groove around them on the outside in order to bind them firmly together with cord. After giving the inside of each section a coating of oil, place together in their position sections A and C, Fig. 4, filling these first with a thin mixture of plaster; the third, B, should be filled with plaster last and then placed in position and the whole tied together with cord and revolved slowly around until the plaster sets. While turning the mould over and over, tap on it gently in order to have the plaster form in every part, free from air-bubbles. When the plaster is thoroughly dry, work around the joints by carefully cutting and prying, and the cast may easily be taken out. Innumerable casts may be made from moulds if they are preserved.

Waste Mould.—This is an excellent method of making casts when only one copy of the object is desired and when you do not care to preserve the mould. Any part of a mammal's carcass, or of a fish, reptile, etc., may be cast by this method. Either the whole object or half of it may be copied. The subject may have undercuts in various places, but if it is soft and fleshy enough to yield and "draw" from the mould a cast may easily be taken by this process.

We shall take a raccoon's head to illustrate this manner of making casts. Bury it in damp sand [2] to half its depth on its side, as shown in Fig. 5. Make the sand around it perfectly smooth and flat. Give the exposed part of the head a coating of sweet or lard oil, being careful not to slight the eye or teeth. Now, mix up some water and plaster and cover the entire exposed portion of the head with the plaster, to about a quarter of an inch in thickness all over. Wait for the plaster to harden. If you want a cast of the entire head, turn the hardened plaster over, with the head in it; paint the edges of the plaster around the head with shellac and, when this is dry, coat the edges and head with oil, and then cover this side with plaster as you did the other. When dry, the two parts of the mould can easily be separated and the head taken out. Before pouring in the plaster to make the cast be sure to give the inside of the mould two or three coats of shellac, and when this is dry give it a coat of oil; then pour the plaster in each half of the mould, tie them together and turn the mould over constantly until the plaster has set. When the plaster is hard lay it on some soft surface and chisel the mould off carefully.

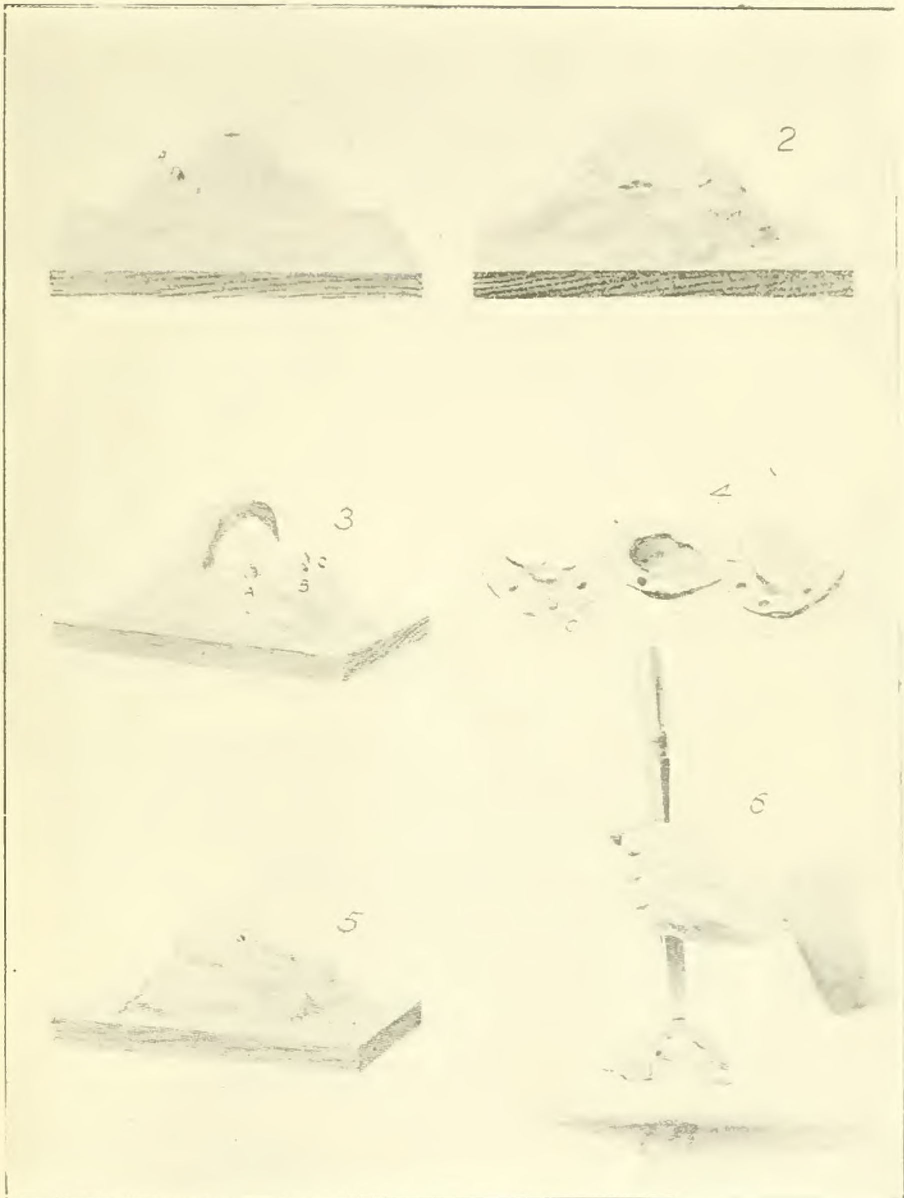
1. Or dowel pins. 2. Wet saw-dust will answer.

Of course, if you only desire a cast of one-half of the object, simply use one-half of the mould, coating the inside with shellac, then oil before filling in the plaster. When hardened lay it on a cushion and carefully chisel the plaster mould off as represented in Fig. 6.

When a mould breaks it may easily be mended with more plaster, or the pieces may be stuck together with glue or shellac. If it is desirable to make a cast of one side of a mammal with the skin on, the hair must be held down with thick clay water so that the plaster will not adhere to it. The whiskers and eyelids may be coated with warm bees-wax. It requires careful manipulating to work a subject out of a mould in this case.

Casting Fishes.—After all that has been said in Chapter XIII on the skinning and mounting of fishes there is at least one objection which may make a plaster cast, *properly colored*, the most desirable. No matter *how well* a fish may be skinned and prepared, it is sure to get greasy *about the jaws*. Those mentioned on page 123 may be the most successfully mounted for a time without this defect, but even these will "grease" sooner or later. The Cat-fishes and many others "grease out" very soon and are utterly worthless as mounted subjects. By making casts we are enabled to obtain correct copies of the shapes and peculiarities of any specimen. When a specimen has any curious appendage, as, for instance, the snout of the Paddle-Fish or Spoon-Bill, *Polyoden spathula*, the body can be cast, the snout or paddle cut off, treated with benzine to get the grease out, poisoned with arsenic and set in position on the cast.

My method of making a plaster cast of one side of a fish which is mounted in high relief on a flat slab or back-ground is as follows: When the mucus of the fish has been washed off with alum water or diluted vitriol, lay the fish on its side, with the side which is to be cast uppermost, and build clay around the fish until the *upper* half only is exposed. Build under the fins, including the caudle one, spreading them out as you may desire, which should of course appear as they are in life. The clay should extend at least one inch beyond the edge of the fish, all around. Now coat the entire exposed portion of the fish very lightly with sweet oil. When this has been done mix up some plaster of Paris and water and pour it on a little at a time until it has completely covered the fish to a thickness of about one-half inch. While you are building on the plaster you can shape the exterior as you please. When the plaster has hardened sufficiently you may turn the mould over, pull off the clay and carefully lift the fish from the mould. You will now have exactly the same kind of a mould as shown in



MAKING CASTS.

Figs. 1, 2, 3, 4 illustrate the various steps in making a piece mould, see page 337; Fig. 5, the first step in making a waste mould; Fig. 6, chiseling the mould from the cast, see page 342.

Fig. 6, Plate LXXXIX. The entire inside and edges of the mould must be painted with shellac and then carefully coated with oil. Plaster of Paris and water should be mixed to the consistency of cream and poured in the mould, which should be constantly shaken until the plaster has settled in every part of the impression made by the fish. This, too, will prevent air-bubbles from forming in the cast. You may keep on building out the plaster until you have made a square slab on which your cast, when the mould is chiseled off, will stand in bold relief. The finishing lies in neatly pointing up the surface here and there which is sometimes pitted with air-bubbles, taking the rough edges off the background, and, finally, the coloring, which is a very important part. This is a quick and simple method of making a cast of a fish when only one copy is desired. When several copies of the cast are wanted the piece mould is the proper method to employ. Casts of fishes may be painted and mounted on polished medallions with fine effect, or on brass rods previously prepared and inserted in the mould before filling in the plaster.

Casting Reptiles.—In casting reptiles both the piece mould and waste processes are used, according to the formation of the subject. If it be a serpent and its attitude is to be that of fighting or striking a wire for support must be placed in the mould and the plaster poured in around it. The piece mould for making the casts of some reptiles is often divided into numerous, intricate sections, requiring considerable ingenuity in their preparation. They are in this case taken away from the cast, piece by piece.

Painting Plaster Casts of Fishes and Reptiles.—After you have pointed up the air-bubbles or other defects in your cast and allowed it to become thoroughly dry, begin to carefully and artistically put on the oil colors, reproducing all the varied tints as they appear in the freshly caught specimen. When the first coat has been laid on, give the entire surface a coat of enamel varnish, and, when this is dry, go over the cast again for the final artistic touches. If you are an artist and can blend colors you will have an opportunity to display your ability here. On page 52 are given directions for mixing tints, and elsewhere in the work will be found the manner of laying on colors. There are absolutely no rules for putting on these final touches, upon which the beauty of the finished piece so much depends. The greatest care and delicacy of touch, with a knowledge of blending and applying colors, are necessary to produce a highly artistic and natural effect.

CHAPTER XVI.

CARE OF SPECIMENS.

In the preparation of all specimens one of the most important objects in view is to poison every skin so thoroughly as to make its destruction by the ravages of insects, such as dermestes, anthernus, moths, etc., impossible. If there happens to be a spot in any of your specimens which has not been thoroughly poisoned it is sure to be attacked sooner or later by insects. All specimens coming from unknown hands should be quarantined and carefully inspected before putting them into your collection. "Eternal vigilance," together with a knowledge of how to destroy and prevent the progress of the destroyer, are the best safeguards.

Moths.—The first in rank of destructiveness are the moths, of which four species are known as persistent workers: *Tinca flavifrontella* Linn., the common or cloth moth; *T. tapetzella* Linn., or carpet moth; *T. pellionella* Linn., or fur moth, and *T. granella* Linn., or grain moth. They are nocturnal insects, although the little "millers" may often be seen flying in darkened rooms during the day. They begin to fly about actively in May, but in warm rooms their work of destruction is carried on all winter. They infest woolens, furs, grain, etc., and the destruction wrought by the larvæ is well known. The stage in which this insect does its destructive work, is a plump, white caterpiller, provided with strong mandibles and sixteen legs.

Dermestes.—There are none of the destructive insects which give the museum builder more trouble than this small, universal pest, known as the "bacon beetle." The most common species is *D. lardarius*. In my museum I have encountered him several times; I know him well and I know how to conquer him. His color is brownish, the body being encircled with a transverse band of grayish. The larva is hairy, brown back, and white abdomen, and jaws equipped with drilling tools equal to any steel instrument made. He can drill a hole as round and clean as though done with a gimlet. Whenever you discover brown dust, and sometimes the color of cayenne pepper on the pedestal of any of your mounted specimens, it is high time to look for the larvæ of *Dermestes* at work.

Anthernus.—Another pest is the "buffalo bug," *Anthernus lepidus* Linn., and, like the *tinea* larva, the "buffalo bug" larva cuts leather, woolen goods or fur. The adult is a small, round, brown beetle with white or variegated scales on the wing covers. The larvæ, which do the damage, are short, plump worms with numerous stiff brown hairs.

Remedies.— Whenever any of your specimens are attacked by the larvæ of moths, *Dermestes*, etc., a simple and most effective remedy for destroying the insects and their larvæ is by the use of the corrosive sublimate solution, as given on page 35. It may be applied on hair or feathers by spraying with an atomizer. This is a strong, volatile solution and should be used with care. A weakened arsenical solution, the same as that given on page 34 and as directed in *poisoning feathers and hair*, page 35, may also be applied in the same manner. A solution of alcohol and arsenic may be used with similar effect. When poisoned with either of the above it is impossible for an insect to live in the hair or feathers.

Before applying any of these solutions to hair or feathers their strength should be tested by dipping black feathers or hair into the liquid and allowing it to dry. If a white deposit forms the solution is too strong and should be weakened. In tight cases naphthaline cones or crystals may be used.

One of the very best remedies to use on infected specimens is to spray them with benzine containing a percentage of arsenical solution. This makes a very volatile and effective poison; the benzine carries the arsenic to the roots of the hair or feathers and deposits the poison "all along the line." The fumes of the benzine *immediately destroy all larvæ and eggs;* after the benzine evaporates the arsenic "will hold its own" for all time. Care should be taken not to make this solution too strong of arsenic; it should be tested as above directed. Wherever the arsenic forms a deposit it can be washed out with warm water and sponge.

When the feathers of your birds have been eaten in two in various places and the feathers of the tail and wings begin to drop out; when the larvæ are visible, and the hair of your mammals pull out easily from the roots, their preservation is a matter of no small difficulty. In such cases the bird or mammal may be taken from its pedestal and literally soaked with this solution. In a valuable article by John B. Smith, entitled:

"Some Observations on Museum Pests"[1] the author states that the only real chance of safety consists in constant examination, tight

1. Published in the proceedings of the Entomological Society of Washington, Vol. 1, No. 2, p. 113.

boxes and a free use of chloroform or bisulphide of carbon. According to Mr. Smith the principal enemy in the Museum collection is *Anthernus varius*, though *Trogoderma* is not uncommon. A large number of boxes received from North Carolina, containing principally Coleoptera, were found to be infested with *Trogoderma*. Bisulphide of carbon was freely used, and naphthaline cones were placed in all the boxes. For a while no larvæ developed, and throughout the summer the boxes remained free. With the approach of cold weather, and when the cones were nearly all evaporated, it was found that a very general development of larvæ had begun, all of them *Trogoderma*, and none of them more than two to three millimetres in length, most of them apparently just hatched. This was in December. The entire collection was scrutinized and an occasional *Anthernus* larva was found but no other *Trogoderma*, even in the most exposed boxes.

The following is from Walter Hough's excellent paper on "The Preservation of Museum Specimens from Insects and the Effects of Dampness," in the Smithsonian Report for 1887; Vol. II, pp. 549-558. The quotations which we make from this article will be found useful to the taxidermist, furrier, entomologist, botanist and the housewife:

"There are several classes of substances to be poisoned, in which the colors, fabric, or character of material, and therefore the kind of poison and the strength of solution, are important factors. For instance, goods not fast dyed (especially cotton), or which are dyed with colors that contain solutions, will start; also fabrics or substances which may be corroded or hardened, or otherwise injured, as feathers, fur, dressed deer-skin, etc. Too strong a solution may also cause a deposit on fur, etc., with a dulling effect. As a test for this, a black feather should be dipped in the solution, if it is of corrosive sublimate or arsenic in alcohol. If the solution be too strong, it will produce a white coating when dry. Any solution should exert its action in two ways, first to repel the adult insect, and second to destroy the hatched larva. Pungent odors are noxious to moths and the higher orders of insects, but this is hardly true in the case of the beetles to which we have before alluded. The pungency of odor can not be made to last long, so that the poisoning quality is of prime importance. The substances used for solutions are deadly poisons, and no one who has not had experience in handling them had better undertake to apply them. Corrosive sublimate will attack the finger-nails and the skin. It is also volatile. Arsenic is prejudicial to the health; the dust, it is said, produces catarrh, both gastric and nasal, though this has not been confirmed by observation.

"Before poisoning, all objects should be treated with benzine, by putting them in a close box or vessel, and pouring the benzine in, leaving them tightly closed therein for several days. This operation destroys any larvæ or eggs. They should then be hung up until the benzine evaporates before proceeding with the poisoning solutions. Bisulphide of carbon is more volatile and more quickly effective than benzine, and may be used, if preferred. There is reason to believe that both kill the eggs — quickly, if the fluid comes in contact with them, and less rapidly if they are directly affected only by the fumes in the vapor. Great care must be taken not to allow fire of any kind to come in contact with the vapor of bisulphide of carbon. There are several reasons why benzine is preferable, and the latter is sure to be effective when followed by the arsenic-naphtha solution. The solution found more satisfactory for poisoning nearly every kind of specimens is as follows:

Saturated solution of arsenic acid and alcohol	1 pint.
Strong carbolic acid	25 drops.
Strychnine	20 grains.
Alcohol strong	1 quart.
Naphtha, crude or refined	1 pint.

"The use of strychnine is not absolutely necessary; but it is a very good agent and adds much to the value of the solution. Other solutions and poisons will be noticed below. It will be found advisable to apply solutions in the form of spray to delicate objects, such as feathers or specimens of similar character. In this treatment an atomizer may be used. Some small specimens may be dipped and allowed to drain, and the solution may be applied with a brush to a large class of objects, taking care to saturate every part. The specimens can then be hung up to dry or laid away as they are. They should be kept free from dust, which is exceedingly injurious to them. As soon as poisoned, they ought, if intended for exhibition, to be mounted in dust-tight cases, or carefully stowed away in close-fitting drawers or boxes. In unit or costume boxes a small packet of naphthaline may be concealed behind the specimens, and the junction of the lid should be made dust-proof by pasting on strips of paper with paste containing arsenic or corrosive sublimate.

"Some specimens present problems that do not fall under any rule and have to be left to judgment and experiment. As an instance in point, we mention a fine deer-skin robe collected by Mr. Turner, beautifully tawed, with the hair on, and ornamented with a medium which will not stand wetting. It is obvious that no solution can be used in this case, since alcohol or water will harden the buck-skin and destroy the decoration. Satisfactory results might be obtained by judicious spraying, but there would be doubt as to the completeness of the poisoning. It would be better to rub into the kid surface a powder made of precipitated chalk and white arsenic. The fur side should then be well rubbed, care being taken to allow the powder to penetrate into the roots of the hair. By all means protect the hands with gloves. Powdered soap would also be a good medium for the arsenic. Great care should be taken in applying this poison and in handling a specimen poisoned in this way. Such specimens should be at once closed up tightly and put on exhibition.

"Corrosive sublimate has been much used for poisoning and is a valuable agent. Several specimens in the Museum, which were poisoned years ago with this substance, were so filled with it that they are dusty. They are made of fur-skin, and are stiff and unpresentable for exhibition. I do not know what was the condition of the articles when they were acquired; they are, however, undeniably moth-proof. I have found numerous adult moths destroyed in the act of laying their eggs. A careful use of corrosive sublimate is very effective, if it is not brought in contact with skins, as it coagulates albumen. It is also volatile, and Dr. G. H. Beyer, U. S. Navy, has proposed to take advantage of this property in preventing the growth of fungi on materia-medica specimens in jars. One objection to corrosive sublimate is that it crystallizes out very easily; this might be obviated by adding a little naphtha to the alcoholic solution.

"Naphthaline is used by Mr. J. B. Smith, of the Museum, and by other entomologists, to preserve insect collections from *Acari*, *Psoci*, *Dermestes*, *Antherni*, and other museum pests. It destroys the two former, but only tends to repel the others. It also acts as an antiseptic, destroying schizomycetes, moulds, bacteria, etc. The salt is perfectly neutral, is not poisonous to man, and is cheap. It is customary in this department to put a small packet or cones in cases containing mounted costumes.

"Vaseline may be called perfect grease, since it does not become rancid or corrosive. It is especially useful to protect iron and steel from rust, and no doubt would preserve woodwork from extraneous attack. It is also good to soften leather which has become hard. In the case of clubs, spears, and implements of hard wood, like those of Polynesia, a fine polish may be obtained by using vaseline. I regard vaseline as a good vehicle in which to apply white arsenic to skins, as is done with arsenic soap. It penetrates very well, especially if thinned a little with naphtha. Vaseline is also used on book-backs to soften them, to prevent mould, and to keep insects away."

"For botanical specimens this is said to be an excellent preservative:

One ounce of corrosive sublimate to one quart of alcohol, diluted fifty per cent. The best plan is to dip the specimens and then carefully dry them. The poison can also be painted on with a camel's hair brush.

"For the preservation of entomological specimens, the strongest solution used should be corrosive sublimate and alcohol, 1 to 100, and the weakest 0.1 to 100.

"For insects on plants, the following solutions are recommended:

FIRST SOLUTION.

Salt	2½ pounds.
Saltpeter	4 ounces.
Water	1 gallon.

Filter.

SECOND SOLUTION.

First solution	1 quart.
Arseniate of potash	2 ounces.
Water	1 gallon.

"A cheaper solution can be made by taking—

White arsenic	1 pound.
Sal soda	4 ounces.
Water	1 gallon.

Boil till a solution is made. Take one quart to forty gallons of water. These solutions have been found by the Department of Agriculture to be very useful in destroying the scale-bug and the red spider, so harmful to plants.

"The following method is employed by furriers in the treatment of fur skins for the purpose of rendering them pliable: The skin is steeped and scoured in a bath of alum, bran and salt, in order to remove greasiness; then in a bath of soap and soda, to remove the oil from the fur. When thoroughly washed and dried it is found that the pelt has become tawed or kid leather.

"To soften and cleanse buck-skin or chamois leather, rub plenty of castile soap into the skin and soak for two hours in a weak solution of sal soda in warm water and rub well until quite clean. Afterwards rinse in a weak solution of sal soda and soap in water; after rinsing, wring it dry in a coarse towel, and when fully dry beat it until soft and smooth.

"For domestic purposes the following preventives from moth ravages are suggested. Dissolve in 200 parts of alcohol two parts of salicylic acid and two parts of thymol; perfume with oil of lemon. This is a neutral solution and will not injure colors or texture, and has a pleasant odor, but is rather expensive.

"A good preparation to sprinkle among furs being packed away in a close box or drawer, is naphthaline and menthol or thymol, in proportion of one ounce of the former to twenty grains of either of the latter, rubbed together. The odor will disappear from the furs or goods after they have been aired for a short time. Even if moths are present and are hatched, they will not feed when closely shut up in the odor of this mixture, and in this respect it is far superior to camphor. Thymol alone is very good. Naphthaline is now on the market in a very convenient shape called "moth marbles," and seems to be going into general use."

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